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DICTIONARY
of the
Fungi

10th Edition

Edited by
Paul M Kirk, Paul F Cannon,
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AINSWORTH & BISBY'S

DICTIONARY OF THE FUNGI

by

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and J.A. Stalpers

with the assistance of

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Preface

This *Dictionary*, now in its 65th year, aims to provide an entry point into the sum total of our accumulated knowledge on systematic mycology for all those who work with fungi. All organisms traditionally studied by mycologists are covered, including lichens, mushrooms, slime moulds, water moulds and yeasts.

As more molecular data have become available it has been possible to attain greater certainty about the higher-level relationships of fungi and to see some enigmatic taxa at last find a home. While many of the classes and phyla recognized in the ninth edition of this *Dictionary* are retained here, we are aware that further significant change is likely among the fungi *sensu stricto*, with the proposal of several new high-level taxa in the near future. Likewise, we can expect further significant changes in the chromistan and protozoan fungus-like analogues as sequence data for more taxa become available. It has been our aim to recognize such changes while at the same time maintaining a servicable and comprehensive hierarchy for users.

In preparing the tenth edition, therefore, our efforts have been directed most of all to revision of the classification of higher ranks within the *Fungi*, largely based on the results from the AFTOL (Assembling the Fungal Tree of Life) project to which several of the Editors of this *Dictionary* had inputs. Phylogenetic information gained from multi-gene sequence analyses, culminating in 2006-7 with the results of the first phase of the AFTOL project, have revolutionized our understanding of how this kingdom should be classified. Phylogenetic analyses tend to stimulate recognition of many levels of the systematic hierarchy, and in partial response to this trend we now recognize the rank of subphylum in addition to classes and subclasses for the kingdom *Fungi*.

The second major development area for Edition 10 of the *Dictionary of the Fungi* has been to incorporate taxa at family level into the new classificatory framework, as the AFTOL project focused only on ranks at order and above. Where possible this has been carried out using molecular data, but there still remains a substantial number of fungal families for which sequence information is not available. More information may be found in the *Dictionary's* new sister publication, *Fungal Families of the World* (CABI, 2007).

Many recent phylogenetic studies have been hypothesis-driven, designed to test the accuracy in evolutionary terms of traditional morphology-based classifications. As anamorph taxa have only recently started to be incorporated fully into holomorphic systems, they are substantially under-represented in molecular phylogenetic studies. Edition 9 of this *Dictionary* was the first to abolish separate classification systems for anamorphs and teleomorphs, though for the overwhelming proportion of genera it was only possible to assign them at subphylum level – i.e. to the filamentous *Ascomycota* or *Basidiomycota*. Recent studies have allowed more accurate placement of many asexual taxa, but today we still cannot place two thirds of the 3000-odd anamorph genera included in Edition 10 even to class level. Now the basic classificatory framework has been established to an acceptable degree of certainty, we hope that attention will be shifted towards insertion of these orphan taxa into their rightful place within the fungal system.

The already large and rapidly increasing body of evidence from molecular studies has also led us to the radical decision that this edition should comprise three parts – a Dictionary of the *Fungi*, a Dictionary of the chromistan/stramenopile fungi-like organisms, and a Dictionary of the protozoan fungi-like organisms. Many people, unfamiliar with classifications which have now been accepted by systematists for many years, still think of fungi as ‘plants’. But in reality fungi are a disparate assemblage of organisms from at least three different kingdoms, their unifying characteristic being that they are studied by mycologists. In terms of evolutionary origin, the sister group of the kingdom *Fungi* is *Animalia*: *Fungi* are more closely related to the humans who study them than to green plants which they were previously classified with. But this statement also hides the fact that chromistan fungus-like organisms, of which *Phytophthora infestans* (the causal agent of potato blight) is perhaps the best known example, are only very distantly related to *Fungi*, being instead more allied with the brown seaweeds, among others – a clear indication that the mycelial way of life evolved on at least two separate occasions. Surprisingly, however, protozoan fungus-like organisms are closer to the *Fungi*, being classified in the *Amoebozoa* with other protozoan amoebae. *Fungi*, together with *Animalia* and a

few other protozoan groups constitute the *Opisthokonta*; and this group and the *Amoebozoa* form the first major branches at the base of the *Eukaryota*.

In earlier editions, for historical reasons, some biographies and longer entries (i.e. the essay-style accounts of topics relevant to mycologists) seem to have been written from the viewpoint of a native speaker of English and to have treated the fungi as an adjunct of botany. Given that the *Dictionary* is now truly international in character and its theme is clearly not botanical, some effort has been made to adjust these entries so that, in addition to being updated, they are seen from a global and explicitly mycological perspective. One result of this has been a considerable increase in the number of eminent but deceased mycologists commemorated by a biography in these pages, notably from India, Japan and Russia, but also including for the first time scientists native to Argentina, China, Cuba, Pakistan, Portugal, Puerto Rico, Spain and Ukraine. Another has been a sprinkling of new topics covered by long entries, in particular covering the new technologies which have come in, and the gradually developing infrastructure of mycology as a science. Limited resources have meant that the work of updating the essay-style accounts has been incomplete and imperfect, in a few cases to the extent that it has been necessary to flag the entry with a warning note. For this edition, all of the biographies, definitions and other longer entries are located in the first part, even when they might more appropriately belong in one of the other two parts. Resources have also, again, not allowed us to update the keys to families and these continue to be omitted. As higher taxa of fungi are increasingly defined using molecular rather than morphological characteristics, it remains to be seen whether morphology-based keys at this level of the new systematic hierarchy can be made workable.

The overall style of the individual entries in this *Dictionary* remains similar to those of previous editions. References are cited in full throughout the taxonomic name entries. Much bibliographic information is becoming available on the Internet and the tenth edition of this *Dictionary* reflects the increasing availability of information from this source. CABI has been producing the *Bibliography of Systematic Mycology* since 1943 and production was computerized in the late 1980s. This database has been available on the internet since late 1999 and users of this *Dictionary* should visit that web site (www.indexfungorum.org) for up-to-date bibliographic references on the systematics of fungi.

Having been intimately involved in the compilation and proof-stage revisions, we are acutely aware of imperfections and improvements that we would have liked to have made. We can do no more than repeat the comment in the ninth edition that our aspiration is that this edition will at least prove to be the same ‘marvellously imperfect work needed by all’.

Do send us your corrections and comment so that the database, and whatever product succeeds this book, will be less imperfect and of even more value to mycologists of all disciplines world-wide.

The tenth edition may well be the last ‘ink-on-paper’ version of Ainsworth & Bisby’s *Dictionary of the Fungi* – it will certainly be the last for which three of the main editors are at the helm. For like the tenth, in its 65th year, the next edition, if there will be one, will be produced after the retirement from formal, full-time employment of these editors. As such, like so many good things, ...

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User's Guide

To extract the maximum amount of information from this *Dictionary* with the minimum of effort it is necessary to understand the scope of the compilation and certain conventions.

Content. The longest series of entries are those of the generic names (both accepted names and synonyms) compiled to the end of *Index of Fungi* 7(15) January 2008. Every accepted generic name is referred to a higher group (family, order, class, or phylum) and brief descriptions are given of these higher taxa. The systematic entries are supplemented by a glossary of terms, some English common names, and the names of important fungal antibiotics, toxins, etc. In addition, there are entries on general mycological topics, ecology and distribution, applied mycology, and historical and biographical notes on some well known mycologists and major reference collections.

Names. Every generic name is followed by the name (abbreviated according to Kirk & Ansell, 1992; see Author) of the author(s) who first proposed the genus and the year of publication. The place of publication of a generic name can be found on the CABI database web site at www.indexfungorum.org where additional information on typification is available. A similar layout is adopted for suprageneric names but only those at the rank of family and accepted names above order can be relied upon as well researched and thus likely to be correct. The available Catalogues of names are listed under 'Literature'.

The list of generic names is as complete as possible. Some dates and authorities differ from those that may be found in the literature, many of which have been checked in the original, some names omitted from previous compilations are included, as are some which are not validly published (included as nevertheless present in the mycological literature).

For generic names consigned to synonymy, the authority for the disposition is usually given. For each accepted genus estimates are given for the number of its species and its geographical distribution. Where possible these data are based on recent revisions or the personal knowledge of specialists, but in the majority of cases they have not been updated in the absence of such authorities. In the case of larger genera particularly, we have not revised species numbers upwards even though many may have been described since the last edition, in the absence of modern treatments (see Numbers of fungi). This policy is adopted as critical reassessments in such genera usually result in reductions in species numbers.

The distributions given are approximate, especially for genera not critically revised in recent years, and should be regarded as indicative rather than comprehensive. Whenever possible users should verify the facts for themselves and draw their own conclusions.

Coding. The coding used for anamorphic fungi follows that of the ninth Edition and is explained under that entry. This system, borrowing from that given in the seventh Edition, uses letters or symbols instead of numbers to provide a 'mnemonic' for the conidiomatal and conidial characters. With the removal of traditional morphological groupings of conidial fungi we hope that the new codes will make it easier to gain an idea of the morphological features. Some recently published generic names have not been assessed and are not coded.

Abbreviations. See p. 1.

Validation of names in this Edition

Naumovozyma Kurtzman, *nom. nov.*

≡ *Naumovia* Kurtzman, *FEMS Yeast Res.* **4**: 240 (2003), non *Naumovia* Dobrozr., *Bolezni rastenii* **16**: 197 (1928) [‘1927’].

Naumovozyma castellii (Capr.) Kurtzman, comb. nov.

Saccharomyces castellii Capr., *Studi sassar.* III Agr. **14**: 457 (1967) [‘1966’].

Naumovia castellii (Capr.) Kurtzman, *FEMS Yeast Res.* **4**: 241 (2003).

Naumovozyma dairenensis (H. Nagan.) Kurtzman, comb. nov.

Saccharomyces dairenensis H. Nagan. (as ‘*dairensis*’), *Bot. Mag.* Tokyo **31**: 107 (1917).

Naumovia dairenensis (H. Naganishi) Kurtzman, *FEMS Yeast Res.* **4**: 241 (2003).

Helicobasidiaceae P.M. Kirk, fam. nov.

with the characters of the *Helicobasidiales* R. Bauer, Begerow, J.P. Samp., M. Weiss & Oberw. *Mycol. Progr.* **5**: 48 (2006) [q.v. for Latin diagnosis]; type *Helicobasidium* Pat. 1885.

Trappeaceae P.M. Kirk, fam. nov.

with the characters of *Trappea* Castellano, *Mycotaxon* **38**: 2 (1990) [q.v. for Latin diagnosis]; type *Trappea* Castellano 1990.

Gallaceaceae Locq. ex P.M. Kirk, fam. nov.

Gallaceaceae Locq., *De Taxia Fung.* **1A**: 52 (1974), nom. inval., Art. 36.1

with the characters of *Mesophellia scleroderma* Cooke, *Grevillea* **14**(no. 69): 11 (1885) [q.v. for Latin diagnosis, measurements excluded]; type *Gallacea* Lloyd 1905.

Sclerogastraceae Locq. ex P.M. Kirk, fam. nov.

Sclerogastraceae Locq., *De Taxia Fung.* **1A**: 48 (1974), nom. inval., Art. 36.1

with the characters of *Sclerogaster* sensu Saccardo, *Syll. fung.* (Abellini) **11**: 169 (1895) [q.v. for Latin diagnosis]; type *Sclerogaster* R. Hesse 1891.

Contents

Section	Page
Dictionary of the Fungi	1
Dictionary of the chromistan fungal analogues	747
Dictionary of the protozoan fungal analogues	759

Dictionary of the Fungi

a- (**an-**) (prefix), not having; not; as in acaudate, anaerobe, aniso-.

AAA pathway, alpha-aminoadipic acid pathway for lysine synthesis (cf. DAP pathway).

Aaosphaeria Aptroot (1995), ? Dacampiaceae. Anamorph *Microsphaeropsis*. 1, widespread. See van der Aa (*Stud. Mycol.* **31**: 15, 1989; as *Didymosphaeria*), Aptroot (*Nova Hedwigia* **60**: 325, 1995; posn).

ab- (prefix), position away from.

Abacina Norman (1853) ≡ *Diplotomma* Flot.

Abaphospora Kirschst. (1939) = *Strickeria* fide Bose (*Phytopath. Z.* **41**, 1961), Aptroot (*Nova Hedwigia* **66**: 89, 1998).

abaxial (of a basidiospore), the side away from the long axis of the basidium (Corner, 1948); cf. adaxial.

Abbreviations. Abbreviations and signs frequently used in this work are:

adj(ective)

Afr(ica)

Am(eric)

Ann(ales) Myc(ologici)

Auct(ores), authors; used esp. as the authority of a name to indicate frequent (and usually incorrect) usage

Austr(alasia)

bibl(iography)

Biog(raphie)s

B(ulletin Trimestriel de la) S(ociété) M(ycologique de) F(rance)

C(anadian) J(ournal of) B(otany)

C(entral)

(International) Code (of Botanical Nomenclature)

c(irca), approximately

c(on)f(er), compare; make a comparison with cosmop(olitan), probably in almost all countries

D(ematiaceous) H(yphomycetes) (1971)

E(ast)

Ed(itor)

Ed(itor)s

ed(itio)n

et al(ia), and others

e(xempli) g(ratia), for example

em(ended by)

esp(ecially)

Eur(ope)

Fam(ily, -ilies)

fide, used for 'on the authority of'

Fig(ure)

f(orm) cat(egory)

gen(us, -era)

Hemisph(ere)

hypog(eous)

I(ndex) N(ominum) G(enericorum)

Isl(and, -s)

L(ichen-forming)

Lit(erature)

Mediterr(anean region)

M(ore) D(ematiaceous) H(yphomycetes) (1976)

Mycol(ogia)

Mycol(ogical) Pap(ers)

M(ycological) R(eseach)

n(oun)

N(orth)

nom(en) cons(ervandum), nom(en) rej(iciendum),

nom(en) utique rej(iciendum); see Nomenclature

obit(uarie)s

obsol(ete), no longer in use

p(atho)v(ar)

Philipp(ine Islands)

pl(ural)

portr(ait)

pos(itio)n

p(ro) p(arte), in part

Publ(ication)s, principal mycological publications

q(uod) v(ide), which see

R(eview of) A(pplied) M(ycology)

R(eview of) P(lant) P(athology)

S(ystema) A(scomycetum)

s(ensu) l(ato), in the broad sense; widely

s(ensu) str(icto), in the strict sense; narrowly

S(outh)

sp(ecies), spp. (pl.)

syn(onym, -s) (q.v.)

T(axonomic) L(iterature) (edition)-2

T(ransactions of the) B(ritish) M(ycological)

S(ociety)

T(ransactions of the) M(ycological) S(ociety of)

J(apan)

temp(erate parts)

trop(ics), -(ical)

v(erb)

W(est)

widespr(ead), in a number of countries

O, I, II, III, see *Pucciniales*

=, is heterotypic (taxonomic, facultative) a synonym of

≡, is homotypic (nomenclatural, obligate) a synonym of

(), sign for 'is the cause of'; e.g. *Ascochyta pinodella* (foot rot of pea)

±, more or less

µm, micron

∴, in references precedes page number; in author citations, see Nomenclature.

See also Anamorphic fungi for abbreviations for conidiomatal types (1-9), spore groups (A1, B1, etc.), and conidiogenous events (1-44).

Most abbreviations of names of periodicals, except for those noted above, are taken from the *World List of Scientific Periodicals*, 1952 and 1965-67.

And see Authors' names.

Abeliella Mägd. (1937), Fossil Fungi (mycel.) Fungi. 2 (Cretaceous, Oligocene), Europe.

Abelspora C. Azevedo (1987), Microsporidia. 1. See Azevedo (*J. Parasit.* **49**: 83, 1987).

aberrant, an organism that deviates in one or more ways from the norm.

Abgliophragma R.Y. Roy & Gujarati (1966) ? = *Wiesneriomyces* fide Roy & Gujarati (*TBMS* **49**: 363, 1966), Pirozynski (*Mycol. Pap.* **129**, 1972).

abhymenial, opposite the spore-producing surface.

abjection, the separating of a spore from a sporophore or sterigma by an act of the fungus.

abjunction, the cutting off of a spore from a hypha by a septum.

Abkultur, see Normkultur.

aboospore, a parthenogenetic oospore.

Abortiporus Murrill (1904), ? Meruliaceae. Anamorph *Sporotrichopsis*. 3, widespread. See Ryvarden (*Syn. Fung.* **5**: 104, 1991).

abraded (of lichen thalli), having the surface worn; eroded.

Abropelta B. Sutton (1986), anamorphic *Pezizomycotina*, Cpt.≡ eH.15. 1, India. See Sutton (*TBMS* **86**: 1, 1986).

Abrothallomyces Cif. & Tomas. (1953) = *Dacty-*

- lospora fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Abrothallus** De Not. (1845), Pezizomycotina. Anamorph *Vouauxiomyces*. c. 41 (on lichens), widespread. See Bellemère *et al.* (*Cryptog. Mycol.* 7: 47, 1986; ultrastr.), Hafellner (*Herzogia* 13: 139, 1998), Bernasconi *et al.* (*Aust. Syst. Bot.* 15: 527, 2002; Patagonia), Suija (*Ann. bot. fenn.* 43: 193, 2006).
- abrupt**, as if cut off transversely; truncate.
- abscission**, separating by disappearance of a joining layer or wall, as of conidia from a conidiogenous cell.
- Abscuditella** Vězda (1965), Stictidaceae (L.). c. 9, widespread (esp. Europe & N. America). See Vězda & Vivant (*Folia geobot. phytotax.* 10: 205, 1975; key 5 spp.), Vězda & Pišút (*Nova Hedwigia* 40: 341, 1984), Nimis (*Lichenologist* 30: 427, 1998; generic concept), Ceynowa-Gieldon (*Acta Mycologica Warszawa* 38: 99, 2003; Poland), Grube *et al.* (*MR* 108: 1111, 2004; phylogeny), Lücking *et al.* (*Mycol.* 96: 283, 2004), Lumbsch *et al.* (*Mol. Phylogen. Evol.* 31: 822, 2004; phylogenetic position), Kantvilas (*Muehlenia* 21: 91, 2005).
- Absidia** Tiegh. (1878), Mucoraceae. 18 (esp. in soil), widespread. See Hesseltine & Ellis (*Mycol.* 56: 568, 1964; cylindrical-spored spp.), Hesseltine & Ellis (*Mycol.* 57: 234, 1965; globose-spored spp.), Ellis & Hesseltine (*Sabouraudia* 5: 59, 1966), Hesseltine & Ellis (*Mycol.* 58: 761, 1966; ovoid-spored spp.), Zycha *et al.* (*Mucorales*, 1969), Nottebrock *et al.* (*Sabouraudia* 12: 64, 1974), Váňová (*Česká Mykol.* 37: 151, 1983), Burmester *et al.* (*Curr. Genet.* 17: 155, 1990; transformations), Hesseltine *et al.* (*Mycol.* 82: 523, 1990; key), Schipper (*Persoonia* 14: 133, 1990; key), Wöstemeyer *et al.* (*Curr. Genet.* 17: 163, 1990; somatic hybrids), Ginman & Young (*Microbios* 66: 39, 1991; ultrastr.), Kayser & Wöstemeyer (*Curr. Genet.* 19: 279, 1991; karyotype), Pajak *et al.* (*Mycopathologia* 118: 109, 1992; keratinolysis), Wöstemeyer & Burmester (*Microbiol. Res.* 149: 407, 1994; rDNA), Lopes *et al.* (*Mycopathologia* 130: 89, 1995; mucormycosis), Mimura *et al.* (*J. Med. Vet. Mycol.* 33: 137, 1995; mucormycosis), Chen & Zheng (*Mycotaxon* 69: 173, 1998; thermophile), O'Donnell *et al.* (*Mycol.* 93: 286, 2001; phylogeny), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny), Kwasna *et al.* (*MR* 110: 501, 2006; phylogeny soil isolates), White *et al.* (*Mycol.* 98: 872, 2006; phylogeny), Hoffman *et al.* (*MR* 111: 1169, 2007; phylogeny, classification).
- Absidiaceae** Arx (1982) = Mucoraceae.
Lit.: Kirk (*in litt.*).
- absorb**, to obtain food by taking up water and dissolved substances across a membrane. Cf. ingest.
- Abstoma** G. Cunn. (1926), Agaricaceae. 2, widespread. See Wright & Suarez (*Cryptog. Bot.* 1: 372, 1990; key).
- abstriction**, abjunction and then abscission, esp. by constriction.
- Abundisporus** Ryvarden (1999), Polyporaceae. 7, widespread. See Ryvarden (*Belg. Jl Bot.* 131: 154, 1998), Dai *et al.* (*Ann. bot. fenn.* 39: 169, 2002; China).
- Abyssomyces** Kohlm. (1970), Pezizomycotina. 1 (marine, on hydrozoans in deep water), S. Atlantic. See Kohlmeyer (*Ber. dt. bot. Ges.* 83: 505, 1970), Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 34: 1, 1991), Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 46: 285, 2003).
- Acallomyces** Thaxt. (1903), Laboulbeniaceae. 3 (on staphylinid beetles), widespread. See Tavares (*Mycol.* 65: 929, 1973), Tavares (*Mycol. Mem.* 9: 627 pp., 1985; monogr.), Santamaria *et al.* (*Treb. Inst. Bot. Barcelona* 14: 123 pp., 1991; European spp.).
- Acalyptospora** Desm. (1848) nom. dub., Plantae. Based on gland-like hairs.
- acantha**, a sharp pointed process; a spine.
- Acantharia** Theiss. & Syd. (1918), Venturiaceae. Anamorphs *Fusicladium*, *Stigmina*-like. 7 (on leaves, necrotrophic), widespread. See Bose & Müller (*Indian Phytopath.* 18: 340, 1965), Sivanesan (*TBMS* 82: 507, 1984; anamorphs), Barr (*Sydowia* 41: 25, 1989; N America), Hsieh *et al.* (*MR* 99: 917, 1995; key).
- Acanthellorhiza** P. Roberts (1999), anamorphic *Heteroacanthella*. 2 (saprobic on dead wood), widespread. See Roberts (*Rhizoctonia-forming fungi*, 1999).
- Acanthobasidium** Oberw. (1965), Stereaceae. 3, Europe. See Oberwinkler (*Sydowia* 19: 45, 1965), Boidin *et al.* (*BSMF* 101: 345, 1994).
- Acanthocystis** (Fayod) Kühner (1926) = *Hohenbuehelia* fide Singer (*Agaric. mod. Tax.* edn 3, 1975).
- acanthocyte**, spiny cell produced on a short branch from the vegetative mycelium of *Stropharia* spp. (Farr, *Mycotaxon* 11: 241, 1980).
- Acanthoderma** Syd. & P. Syd. (1917), anamorphic *Pezizomycotina*, ? = eH.?, 1, Philippines.
- Acanthodochium** Samuels, J.D. Rogers & Nagas. (1987), anamorphic *Acanthocystis*, *Collodiscula*, *Rosellinia*, Hsp.0eH.10. 2 (on dead bamboo culms), widespread (esp. tropical). See Samuels *et al.* (*Mycotaxon* 28: 453, 1987), Ju & Rogers (*Mycol.* 82: 342, 1990; *Rosellinia* teleomorph), Ju & Rogers (*Mycotaxon* 73: 343, 1999), Kang *et al.* (*Fungal Diversity* 2: 135, 1999).
- Acanthofungus** Sheng H. Wu, Boidin & C.Y. Chien (2000), Stereaceae. 3, widespread. See Wu *et al.* (*Mycotaxon* 76: 154, 2000).
- Acanthographina** (Vain.) Walt. Watson (1929) = *Acanthothecis*.
- Acanthographis** (Vain.) Walt. Watson (1929) = *Acanthothecis* fide Staiger (*Bibliotheca Mycol.* 85, 2002).
- Acanthogymnomycetes** Udagawa & Uchiyama (2000), Gymnoascaceae. 2 (from soil etc.), India; Japan. See Udagawa & Uchiyama (*Mycotaxon* 76: 412, 2000).
- acanthohyphidium**, see hyphidium.
- Acantholichen** P.M. Jørg. (1998), Corticiaceae. 1, Costa Rica. See Jørgensen (*Bryologist* 101: 444, 1998).
- Acanthomyces** Thaxt. (1892) [non *Akanthomyces* Lebert 1858] = *Rhachomyces*.
- Acanthonitschkea** Speg. (1908), Nitschkiaceae. Anamorph *Acremonium*-like. 8 (on wood and lichens), widespread. See Nannfeldt (*Svensk bot. Tidskr.* 69: 49, 1975), Subramanian & Sekar (*Kavaka* 18: 19, 1993; Indian spp.), Huhndorf *et al.* (*MR* 108: 1384, 2004; phylogeny, rel. with *Nitschkea*).
- Acanthophiobolus** Berl. (1893), Tubeufiaceae. 2 (saprobic on plants), widespread. See Walker (*Mycotaxon* 11: 1, 1980), Scheuer (*Bibliotheca Mycol.* 123: 274 pp., 1988; Austria), Barr (*Mycotaxon* 64: 149, 1997), Crane *et al.* (*CJB* 76: 602, 1998; key), Kodsueb *et al.* (*Fungal Diversity* 21: 105, 2006; phylogeny).
- Acanthophysellum** Parmasto (1967), Stereaceae. 3, widespread. See Parmasto (*Izv Akad. Nauk Estonsk*

- SSR Ser. Biol. 16: 377, 1967), Larsson & Larsson (*Mycol.* 95: 1037, 2003; phylogeny) Close to *Xylobolus*.
- Acanthophysaceae** Boidin, Mugnier & Canales (1998) = Stereaceae.
- acanthophysis**, see hyphidium.
- Acanthophysium** (Pilát) G. Cunn. (1963), Stereaceae. c. 20, widespread. See Cunningham (*Bull. N.Z. Dept. Sci. Industr. Res., Pl. Dis. Div.* 145: 150, 1963).
- Acanthorhynchus** Shear (1907), Hyponectriaceae. 1 (saprobic on leaves of *Vaccinium*), N. America. See Barr (*Mycol.* 68: 611, 1976), Fallah & Shearer (*Mycol.* 93: 566, 2001; as *Physalospora*).
- Acanthorus** Bat. & Cavalc. (1967), anamorphic *Capnodiaceae*, Cpt.0eH.?. 1 (on leaves of *Bertholletia*), Brazil. See Batista & Cavalcanti (*Atas Inst. Micol. Univ. Pernambuco* 4: 246, 1967).
- Acanthosphaeria** Kirschst. (1939), Trichosphaeriaceae. 2, Europe. See Petrak (*Annls mycol.* 38: 198, 1940).
- Acanthostigma** De Not. (1863), Tubeufiaceae. Anamorphs *Helicomycetes*, *Helicosporium*. 8 (saprobic on wood or other fungi), widespread. See Réblová & Barr (*Sydowia* 52: 258, 2000; monogr.), Kodsueb *et al.* (*Mycol.* 96: 667, 2004; Hong Kong), Kodsueb *et al.* (*Fungal Diversity* 21: 105, 2006), Tsui *et al.* (*Mycol.* 98: 94, 2006; rels with *Tubeufia* and helicosporous anamorphs), Tsui *et al.* (*Mycol.* 99: 884, 2007; phylogeny, anamorph).
- Acanthostigmella** Höhn. (1905), Tubeufiaceae. Anamorph *Xenosporium*. 6 (saprobic), widespread. See Barr (*Mycotaxon* 6: 17, 1977; key), Untereiner (*MR* 99: 897, 1995), Crane *et al.* (*CJB* 76: 602, 1998).
- Acanthostigmella** Rick (1933) = *Acanthostigma* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Acanthostigmia** Höhn. (1909) = *Acanthostigma* fide Rossman (*Mycol. Pap.* 157, 1987), Crane *et al.* (*CJB* 76: 602, 1998), Réblová & Barr (*Sydowia* 52: 286, 2000; monogr.).
- Acanthostoma** Theiss. (1912) = *Phaeodimeriella* Speg. fide Müller & von Arx in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 87, 1973).
- Acanthotheca** Clem. & Shear (1931) [non *Acanthotheca* DC. 1838, *Compositae*] = *Acanthotheciella*.
- Acanthotheciella** Höhn. (1911), Sordariomycetes. Anamorph *Ypsilonia*. 3 (on dead scale insects), Asia (tropical); S. America. See Nag Raj (*CJB* 55: 1599, 1977), Barr (*Mycotaxon* 39: 43, 1990; posn).
- Acanthotheciopsis** Zahlbr. (1923) = *Acanthothecis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Staiger (*Biblthca Lichenol.* 85: 526 pp., 2002; revision).
- Acanthothecis** Clem. (1909), Graphidaceae (L). 25, S. America (primarily tropical). See Staiger & Kalb (*Mycotaxon* 73: 69, 1999), Staiger (*Biblthca Lichenol.* 85, 2002), Archer (*Biblthca Lichenol.* 94, 2006; revision), Archer (*Systematics & Biodiversity* 5: 9, 2007; Solomon Is), Makhija & Adawadkar (*Lichenologist* 39: 165, 2007; India, key).
- Acanthothecium** Speg. (1889) = *Ypsilonia* See Nag Raj (*CJB* 55: 1599, 1977).
- Acanthothecium** Vain. (1890) = *Acanthothecis*.
- Acanthothecomycetes** Cif. & Tomas. (1953) = *Acanthothecis*.
- Acanthotrema** Frisch (2006), Graphidaceae (L). 1, Africa (tropical); S. America. See Frisch (*Biblthca Lichenol.* 92: 3, 2006), Frisch *et al.* (*Biblthca Lichenol.* 92: 517, 2006; phylogeny), Staiger *et al.* (*MR* 110: 765, 2006; inclusion in *Graphidaceae*).
- Acarella** Syd. (1927), anamorphic *Morenoina*, Cpt.0eH.?. 3 (saprobic on leaves etc.), C. America. See Farr (*Sydowia* 38: 65, 1985).
- Acarellina** Bat. & H. Maia (1960), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1 (on leaves of *Psidium*), Brazil. See Batista & Maia (*Publções Inst. Micol. Recife* 246: 4, 1960).
- Acariniola** T. Majewski & J. Wiśn. (1978) = *Pyxidiphora* fide Lundqvist (*Bot. Notiser* 133: 121, 1980), Blackwell & Malloch (*MR* 94: 415, 1990; recognition as ascospores), Weir & Blackwell (*Insect-Fungal Associations Ecology and Evolution*: 119, 2005; biology).
- Acaroconium** Kocourk. & D. Hawksw. (2008), anamorphic *Pezizomycotina*. 1 (lichenicolous), Europe; N. America. See Kokourcová & Hawksworth (*Lichenologist* 40: 105, 2008).
- Acarocybe** Syd. (1937), anamorphic *Pezizomycotina*, Hsy.0eP.28. 3, Africa; Brazil. See Ellis (*Mycol. Pap.* 76, 1960; key), Mena-Portales *et al.* (*MR* 103: 1032, 1999; comparison with *Acarocybiopsis*).
- Acarocybella** M.B. Ellis (1960), anamorphic *Pezizomycotina*, Hso. = eP.28. 1, pantropical.
- Acarocybellina** Subram. (1992), anamorphic *Pezizomycotina*, Hso. = eP.26. 1, widespread (tropical). See Lanzoni (*Boll. Gruppo Micol. 'G. Bresadola'* 28: front & inside, 1985; separation from *Sporidesmium*), Mena-Portales *et al.* (*MR* 103: 1032, 1999; comparison with *Acarocybiopsis*).
- Acarocybiopsis** J. Mena, A. Hern. Gut. & Mercado (1999), anamorphic *Pezizomycotina*, Hso. = eP.?. 1 (saprobic on wood), Cuba. See Mena-Portales *et al.* (*MR* 103: 1032, 1999; description), Mercado-Sierra *et al.* (*Nova Hedwigia* 75: 533, 2002; comparison with *Veracruzomyces*).
- Acaromyces** Boekhout, Scorzetti, Gerson & Sztejn. (2003), anamorphic *Exobasidiomycetidae*. 1 (from mites), Israel. See Boekhout *et al.* (*Int. J. Syst. Evol. Microbiol.* 53: 1662, 2003; phylogeny, family placement), Yasuda *et al.* (*Mycoscience* 47: 36, 2006; phylogeny).
- Acaropeltis** Petr. (1937), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1 (on living leaves), C. America. See Petrak (*Annls mycol.* 35: 95, 1937; orig. description).
- Acarospora** A. Massal. (1852), Acarosporaceae (L). c. 128, widespread. See Weber (*Lichenologist* 4: 16, 1968; sect. *Xanthothallia*), Golubkova & Shapiro (*Nov. Sist. niz. Rast.* 13: 150, 1976; sect. *Trochia*), Clauzade & Roux (*Bull. Mus. Hist. nat. Marseille* 41, 1981; key 69 Eur. spp.), Castello & Nimis (*Lichenologist* 26: 283, 1994; Antarct.), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998; DNA), Lutzoni *et al.* (*Am. J. Bot.* 91: 1446, 2004; posn), Reeb *et al.* (*Mol. Phylogen. Evol.* 32: 1036, 2004; posn, phylogeny), Temina *et al.* (*Nova Hedwigia* 80: 433, 2005; Israel and vicinity), Wedin *et al.* (*MR* 109: 159, 2005; position within *Lecanoromycetes*), Crewe *et al.* (*MR* 110: 521, 2006; molecular phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Knudsen *et al.* (*Opuscula Philolichenum* 5: 1, 2008; S America).
- Acarosporaceae** Zahlbr. (1906), Acarosporales (L). 11 gen. (+ 10 syn.), 183 spp.
- Lit.*: Golubkova (*Lishainiki semeistva Acarosporaceae Zahlbr. v. SSSR*, 1988; keys 8 gen., 91 spp.), Bellemère (*Bull. Soc. linn. Provence* 45: 355, 1994), Hafellner (*Cryptog. Bot.* 5: 99, 1995), David & Cop-

- pins (*Lichenologist* 29: 291, 1997), Kocourková-Horáková (*Czech Mycol.* 50: 271, 1998), Rambold & Hagedorn (*Lichenologist* 30: 473, 1998), Seppelt *et al.* (*Lichenologist* 30: 249, 1998), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998; DNA), Navarro-Rosinés *et al.* (*CJB* 77: 835, 1999), Lutzoni *et al.* (*Nature* 411: 937, 2001; posn), Kauff & Lutzoni (*Mol. Phylogen. Evol.* 25: 138, 2002; posn), Lutzoni *et al.* (*Am. J. Bot.* 91: 1446, 2004; posn), Miadlikowska & Lutzoni (*Am. J. Bot.* 91: 449, 2004; posn), Reeb *et al.* (*Mol. Phylogen. Evol.* 32: 1036, 2004), Wedin *et al.* (*MR* 109: 159, 2005), Crewe *et al.* (*MR* 110: 521, 2006), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny).
- Acarosporales** Reeb, Lutzoni & Cl. Roux (2007). Acarosporomycetidae. 1 fam., 11 gen., 183 spp. Fam.:
- Acarosporaceae**
For *Lit.* see under fam.
- Acarosporina** Sherwood (1977), Stictidaceae. Anamorph *Phacidiella*-like. 4, widespread. See Johnston (*Mycotaxon* 24: 359, 1985; anamorph), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Schoch *et al.* (*MR* 110: 257, 2006; phylogeny).
- Acarosporium** Bubák & Vleugel ex Bubák (1911), anamorphic *Pycnopeziza*, St.1eH-P.39. 4, north temperate. See Korzenok (*Mikol. Fitopatol.* 25: 107, 1991; Russia).
- Acarosporomyces** Cif. & Tomas. (1953) = *Pleopsidium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Acarosporomycetidae** Reeb, Lutzoni & Cl. Roux (2004), Lecanoromycetes. Ord.:
- Acarosporales**
Lit.: Lumbsch *et al.* (*MR* 111: 257, 2007; phylogeny), Lutzoni *et al.* (*Am. J. Bot.* 91: 1446, 2004), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006), Reeb *et al.* (*Mol. Phylogen. Evol.* 32: 1036, 2004), Wedin *et al.* (*MR* 109: 159, 2005).
- Acarothallium** Syd. (1937) = *Wentomyces* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- acaryallagic**, see caryallagic.
- acaudate**, not having a tail.
- Acaulium** Sopp (1912) = *Scopulariopsis* fide Raper & Thom (*Manual of the Penicillia*, 1949).
- Acaulopage** Drechsler (1935), Zoopagaceae. 27, widespread. See Drechsler (*Mycol.* 27: 185, 1935), Drechsler (*Mycol.* 28: 363, 1936), Drechsler (*Mycol.* 30: 137, 1938), Drechsler (*Mycol.* 31: 128, 1939), Drechsler (*Mycol.* 33: 248, 1941), Drechsler (*Mycol.* 34: 274, 1942), Drechsler (*Mycol.* 37: 1, 1945), Drechsler (*Mycol.* 38: 120, 1946), Drechsler (*Mycol.* 39: 253, 1947), Drechsler (*Mycol.* 40: 85, 1948), Drechsler (*Mycol.* 47: 364, 1955), Drechsler (*Mycol.* 51: 787, 1959), Drechsler (*Am. J. Bot.* 49: 1089, 1962), Saikawa & Kadowaki (*Nova Hedwigia* 74: 365, 2002; amoeba capture).
- Acaulospora** Gerd. & Trappe (1974), Acaulosporaceae. 26, widespread. See Mosse (*Arch. Mikrobiol.* 70: 167, 1970), Mosse (*Arch. Mikrobiol.* 74: 120, 1970; life cycle, ultrastr.), Mosse (*Arch. Mikrobiol.* 74: 146, 1970; life cycle, ultrastr.), Schenck *et al.* (*Mycol.* 76: 685, 1984; key), Berch (*Mycotaxon* 23: 409, 1985; emend.), Morton (*Mycol.* 78: 787, 1986; effect of mountants & fixatives on spores), Błaszkowski (*Karstenia* 27: 32, 1987), Sieverding & Toro (*Angew. Bot.* 61: 217, 1987), Sieverding (*Angew. Bot.* 62: 373, 1988), Błaszkowski (*Mycol.* 82: 794, 1990), Gazey *et al.* (*MR* 96: 643, 1992; sporulation), Maia & Kimbrough (*MR* 97: 1183, 1993; spore wall ultrastr.), Błaszkowski (*Mycorrhiza* 4: 173, 1994), Ingleby *et al.* (*Mycotaxon* 50: 99, 1994), Błaszkowski (*MR* 99: 237, 1995), Yao *et al.* (*Kew Bull.* 50: 349, 1995), Błaszkowski (*Mycotaxon* 61: 193, 1997), Morton *et al.* (*MR* 101: 625, 1997; synanamorph), Saikawa *et al.* (*Mycoscience* 39: 477, 1998; phylogeny & synanamorph), Zhang *et al.* (*Mycosystema* 17: 15, 1998), Schultz *et al.* (*Mycol.* 91: 676, 1999), Redecker & Raab (*Mycol.* 98: 885, 2006; phylogeny), Velazquez *et al.* (*Mycotaxon* 103: 171, 2008; Argentina).
- Acaulosporaceae** J.B. Morton & Benny (1990), Diversisporales. 2 gen., 31 spp.
Lit.: Morton & Benny (*Mycotaxon* 37: 471, 1990), Maia & Kimbrough (*MR* 97: 1183, 1993), Azcon-Aguilar & Barea (*Mycorrhiza* 6: 457, 1996), Morton *et al.* (*MR* 101: 625, 1997), Sawaki *et al.* (*Mycoscience* 39: 477, 1998), van der Heijden *et al.* (*Nature Lond.* 396: 69, 1998), Stürmer & Morton (*Mycol.* 91: 849, 1999), Rodriguez *et al.* (*New Phytol.* 152: 159, 2001), Schüßler *et al.* (*MR* 105: 1413, 2001), Fracchia *et al.* (*Nova Hedwigia* 77: 383, 2003), Pringle *et al.* (*Mycorrhiza* 13: 227, 2003), Redecker (*Glomeromycota* Arbuscular mycorrhizal fungi and their relative(s). In *The Tree of Life Web Project*, <http://tolweb.org>: [unpaginated], 2005).
- accumbent**, resting against anything.
- acellular**, not divided into cells, e.g. a myxomycete plasmodium.
- Acephala** Grünig & Sieber (2005), anamorphic *Vibriseaceae*, sterile. 1 (associated with conifer roots), Europe; N. America. See Grünig & Sieber (*Mycol.* 97: 634, 2005), Grünig & Sieber (*Mycol.* 97: 628, 2005; descr., phylogeny), Grünig *et al.* (*Fungal Genetics Biol.* 43: 410, 2006; population genetics).
- Acephalis** Badura & Badurowa (1964) = *Syncephalis* fide Skirgiełło & Zadara (*Beih. Sydowia* 8: 366, 1979).
- acephalous**, not having a head.
- Acerbia** (Sacc.) Sacc. & P. Syd. (1899) ? = *Rosenscheldia* fide Eriksson & Yue (*SA* 13: 129, 1994).
- Acerbiella** Sacc. & D. Sacc. (1905), Sordariomycetes. 2, S. America; Java.
- acerose**, needle-like and stiff; like a pine needle (Fig. 23.3).
- acervate**, massed up; heaped; growth in heaps or groups.
- Acerviclypeatus** Hanlin (1990), anamorphic *Ophiidothella*, St.0fH.?. 1 (on living leaves of *Vaccinium*), USA. See Hanlin (*Mycotaxon* 37: 379, 1990; descr.), Hanlin (*Mycol.* 95: 506, 2003; development).
- Acervulopsora** Thirum. (1945) = *Maravalia* fide Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983).
- acervulus** (pl. -i; adj. -lar), a ± saucer-shaped conidioma (embedded in host tissue) in which the hymenium of conidiogenous cells develops on the floor of the cavity from a pseudoparenchymatous stroma beneath an integument of host tissue which ruptures at maturity; acervular conidioma (Fig. 10 O).
- Acervus** Kanouse (1938), Pyronemataceae. 4, widespread. See Pfister (*Occ. Pap. Farlow Herb. Crypt. Bot.* 8: 1, 1974; key), Pant (*TBMS* 71: 326, 1978), Pfister & Bessette (*Mycotaxon* 22: 435, 1985),

- Kimbrough & Curry (*Mycol.* 78: 735, 1986; ultra-structure), Zhuang & Wang (*Mycotaxon* 69: 339, 1998; 3 spp. China), Prasad & Pant (*Journal of Mycology and Plant Pathology* 34: 147, 2004; spore ornamentation), Perry *et al.* (*MR* 111: 549, 2007; phylogeny, isolated posn within *Pyronemataceae*).
- Acetabula** (Fr.) Fuckel (1870) = *Helvella* fide Dissing (*Dansk bot. Ark.* 25 no. 1, 1966).
- Acetabularia** (Berk.) Masee (1893) [non *Acetabularia* J.V. Lamour. 1812, *Algae*] = *Cyphellopus* fide Singer (*Agaric. mod. Tax.*, 1951).
- acetabuliform**, saucer-like in form.
- Achaetobotrys** Bat. & Cif. (1963), *Antennulariaceae*. Anamorph *Antennariella*. 3 (probably saprobic on plant exudates), widespread (primarily tropical). See Hughes (*Mycol.* 68: 693, 1976), Barr & Roger-son (*Mycotaxon* 71: 473, 1999; USA).
- Achaetomiaceae** Mukerji (1978) = *Chaetomiaceae*.
- Achaetomiella** Arx (1970) = *Chaetomium* fide Udagawa (*TMSJ* 21: 34, 1980), Cannon (*TBMS* 87: 50, 1986).
- Achaetomium** J.N. Rai, J.P. Tewari & Mukerji (1964), *Chaetomiaceae*. 7 (from soil etc.), widespread (pan-tropical). See von Arx (*Proc. Indian Acad. Sci. Pl. Sci.* 94: 341, 1985), Cannon (*TBMS* 87: 50, 1986; key), Sultana *et al.* (*Biologia Lahore* 34: 257, 1988; Pakistan spp.), von Arx *et al.* (*Beih. Nova Hedwigia* 94, 1988), Lee & Hanlin (*Mycol.* 91: 434, 1999; DNA), Rodríguez *et al.* (*Stud. Mycol.* 50: 77, 2004; key).
- Acharius** (Erik; 1757-1819; Sweden). Country doctor, Vadstena. A pupil of Linnaeus (q.v.) defending his dissertation in 1776, and correspondent of Fries (q.v.). Laid scientific basis for the study and classification of lichen-forming fungi, and responsible for the terms thallus, podetium, apothecium, perithe-cium, soredium, cyphella as applied to those organ-isms. Described many new species, especially from Europe. Main collections in H, other material in BM, UPS, LINN (Smith collection). *Publs. Methodus qua Omnes Detectos Lichenes.* (1803); *Lichenographia Universalis* (1810); *Synopsis Methodica Lichenum* (1814). *Biogs, obits etc.* Galloway (*Bulletin of the British Museum of Natural History Botany* 18: 149, 1988 [influence on British lichenology, specimens in BM]); González Bueno & Rico (*Acta Botanica Ma-lacitana* 16: 141, 1991 [impact on Spanish lichenol-ogy]); Grumann (1974: 469); Vitikainen (Introduc-tion, *Lichenographia Universalis*, 1976 [reprint]); Stafleu & Cowan (*TL-2* 1: 4, 1976); Stafleu & Men-nega (*TL-2, Suppl.* 1: 14, 1992); Tibell (*Annales Botanici Fennici* 24: 257, 1987 [*Caliciales*]).
- Achitonium** Kunze (1819) = *Pactilia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Achlyella** Lagerh. (1890), ? *Chytridiales*. 1, Europe.
- Achlyites** Mesch. (1902), *Fossil Fungi*. 1 (Silurian, Tertiary), Atlantic.
- Achlyogeton** Schenk (1859), *Chytridiales*. 1, wide-spread (north temperate). See Blackwell & Powell (*Mycotaxon* 64: 91, 1997).
- Achorella** Theiss. & Syd. (1915), ? *Dothideomycetes*. 10, widespread. Type material is inadequate. See Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Achorion** Remak (1845) = *Trichophyton* fide Hawk-sworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Achorodopsis** Syd. (1926), *Mycosphaerellaceae*. 2 (in leaves), Costa Rica. See Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Achoropeltis** Syd. (1929), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1 (on living leaves), Costa Rica.
- achroic (achromatic, achrous)**, having no colour or pigment; see Colour.
- Achroomyces** Bonord. (1851) nom. dub, *Agaricomycotina*. See Donk (*Persoonia* 4: 145, 1966; syn. of *Platyglea*).
- Achrotelium** Syd. (1928), *Chaconiaceae*. c. 5 (on di-cots, 3 on *Asclepiadaceae*), Philippines; USA; India; Zimbabwe.
- Acia** P. Karst. (1879) [non *Acia* Schreb. 1791, *Rosaceae*] = *Mycoacia*.
- acicular**, slender and pointed; needle-shaped (Fig. 23.33).
- Aciculariella** Arnaud (1954), anamorphic *Pezizomy-cotina*, Hso.0fP.?. 2, Europe. The two original spp. were not formally described.
- Aciculoconidium** D.S. King & S.C. Jong (1976), ana-morphic *Saccharomycetales*, Hso.0eH.3. 1, USA. See King & Jong (*Mycotaxon* 3: 407, 1976), Smith in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 439, 1998), Kurtzman (*Antonie van Leeu-wenhoek* 88: 121, 2005), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Aciculopsora** Aptroot & Trest (2006), ? *Ramalinaceae* (L). 1, Costa Rica. See Aptroot *et al.* (*J. Hattori bot. Lab.* 100: 617, 2006; Costa Rica).
- Aciculosporium** I. Miyake (1908), *Clavicipitaceae*. Anamorph *Albomyces*. 2 (in living bamboos), Japan. See Kao & Leu (*Pl. Prot. Bull. Taiwan* 18: 276, 1976), Tubaki & Ando (*Acta Mycol. Sin. Suppl.* 1: 426, 1987), Tsuda *et al.* (*Bull. natn. Sci. Mus. Tokyo*, B 23: 25, 1997; host range), Oguchi (*Mycoscience* 42: 217, 2001), Tanaka *et al.* (*Mycoscience* 43: 87, 2002; phylogeny), Pažoutová *et al.* (*MR* 108: 126, 2004; conidial devel.), Walker (*Australas. Pl. Path.* 33: 211, 2004; comp. with *Cepsiclava*).
- Acid rain**. The wet acidic deposition of air pollutants can affect fungi including lichen-forming species. While many show a decline, a small number of gen-eralist species may actually increase in incidence in response to this pollution (Kowalski & Stanc-zykiewicz, *Phytopathologia Polonica* 19: 69, 2000). Endophytes possibly implicated in pH regulation within leaves of forest trees (Stephan, *Eur. J. For. Path.* 3: 112, 1973) may be particularly vulnerable (Ei-Ichiro Asai *et al.*, *MR* 102: 1316, 1998). Lichen-forming fungi with cyanobacterial partners are strongly affected and have declined dramatically in some parts of Europe (Farmer *et al.*, in Bates & Farmer, 1992: 284); nitrogenase activity may be af-fected (Fritz-Sheridan, *Lichenologist* 17: 27, 1985). Reductions in many mycorrhizal fungi in Europe have been correlated with acid rain, though it is not often clear whether this is a cause of or a result from damage seen in the trees. The decline in fruiting of *Cantharellus cibarius* has been especially noticeable (Jansen & van Doben, *Ambio* 16: 211, 1987; Derbsch & Schmitt, *Atlas der Pilze des Saarlandes* 2, 1987). *Russula mustelina* fruiting has been singled out as a valuable early indicator of acid rain problems in European forests (Felher, *Agric. Ecosyst. Envir.* 28: 115, 1990). *Rhytisma acerinum* is also strongly af-fected (Greenhalgh & Bevan, *TBMS* 71: 491, 1978), perhaps because of damage to the delicate mucilagi-nous sheaths around ascospores during dispersal in wet weather. Mycorrhizal fungi may mollify the ef-

fect of acid rain on trees (Blum *et al.*, *Nature* 417: 729, 2002). In Europe, with legislation to control acid rain pollution, there has been some amelioration of the problem.

Lit.: Arnolds (in Hawksworth (Ed.), *Frontiers in mycology*: 243, 1991), Bates & Farmer (Eds) (*Bryophytes and lichens in a changing environment*, 1992), Pegler *et al.* (Eds) (*Fungi of Europe*, 1993), Richardson (*Pollution monitoring with lichens*, 1992).

See Air pollution, Bioindication.

acid-fast (of bacteria), keeping carbol fuchsin stain after the addition of 25 per cent sulphuric acid (H₂SO₄).

acidiphilous (**acidophilous**, **acidophilic**), growing on or in conditions of low hydrogen ion concentration (q.v.); e.g. *Scytalidium acidophilum* with an optimum pH for growth of 3, with good growth even at pH 1 (Miller *et al.*, *Internat. Biodet.* 20: 27, 1984); also used of lichens on peaty soils or bark of a pH below 5.

Acidomyces B.J. Baker, M.A. Lutz, S.C. Dawson, P.L. Bond & Banfield (2004), ? Teratosphaeriaceae. 1 (from acid mine drainage), California. See Baker *et al.* (*Appl. Environm. Microbiol.* 70: 6270, 2004), Hoog *et al.* (*Stud. Mycol.* 51: 33, 2005), Crous *et al.* (*Stud. Mycol.* 58: 1, 2007; posn).

Aciella (P. Karst.) P. Karst. (1899) [non *Aciella* Tiegh. 1894, *Loranthaceae*] = *Asterodon* fide Donk (*Taxon* 5: 69, 1956).

Aciesia Bat. (1961) nom. dub. ? = *Tricharia* Fée fide Lücking *et al.* (*Lichenologist* 30: 121, 1998).

Acinophora Raf. (1808) nom. dub., Agaricales.

Acinula Fr. (1822), anamorphic *Pezizomycotina*, Sc.-.-. 1, Europe. Apparently sterile.

Acithecra Currah (1985), Gymnoascaceae. 1 (on bark), USA. See Currah (*Mycotaxon* 24: 1, 1985), Currah (*SA* 7: 1, 1988; key).

Ackermannia Pat. (1902) = *Sclerocystis* fide Zycha *et al.* (*Mucorales*, 1969).

Acladium Link (1809), Botryobasidiaceae. 20. See Wright (*Cryptog. Bot.* 1: 26, 1989), Partridge *et al.* (*Mycotaxon* 82: 41, 2002; key).

Acleistia Bayl. Ell. (1917), anamorphic *Calycina*, Ccu.0eH.15. 1 (saprobic on *Alnus* catkins), Europe. The connexion with *Calycina* is not well established. See Bayliss Elliott (*TBMS* 5: 417, 1916).

Acleistomyces Bat. (1961) = *Sporopodium* fide Lücking *et al.* (*Lichenologist* 30: 121, 1998).

Acmosporium Corda (1839) = *Aspergillus* fide Hughes (*CJB* 36: 727, 1958).

Acoliomyces Cif. & Tomas. (1953) = *Thelomma* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Acolium (Ach.) Gray (1821), Caliciaceae (L). c. 5, widespread. See Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Acolium Trevis. (1862) ≡ *Pseudocolium*.

Acompsomyces Thaxt. (1901), Laboulbeniaceae. 7 (on insect cuticles), widespread. See Benjamin (*Mem. N. Y. bot. Gdn* 49: 210, 1989; key, ontogeny), Santamaria (*Mycotaxon* 49: 313, 1993; Spain), Santamaria (*Fl. Mycol. Iberica* 5, 2003; Iberian spp.).

Acontiopsis Negru (1961) nom. inval., Nectriaceae. 1 (on twigs of *Crataegus*), Europe. See Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995; ? syn. of *Cylindrocladiella*), Crous (*Taxonomy and Pathology of Cylindrocladium (Calonectria) and Allied Genera*: 278 pp., 2002).

Acontium Morgan (1902), anamorphic *Pezizomycotina*, Hso.0eH.?. 4, N. America.

acquired immunity, see immune.

acquired resistance, see resistance.

acrasin, a chemotactically active substance which controls the streaming together of the myxamoebae of *Dictyostelium discoideum* (Bonner, *J. exp. Zool.* 110: 259, 1949) and other *Acrasiales*.

Acremoniella Sacc. (1886) nom. illegit. = *Harziella* Costantin & Matr. fide Groves & Skolko (*Can. J. Res. C* 24: 74, 1946), Holubová-Jechová (*Folia Geobot. Phytotax.* 9: 315, 1974), Warcup (*MR* 95: 329, 1991; synonymy of *A. atra* auct. with *Harziella*).

Acremonites Pia (1927), Fossil Fungi. 1 (Oligocene), Europe.

Acremoniula G. Arnaud (1954) nom. inval. ≡ *Acremoniula* G. Arnaud ex Cif.

Acremoniula G. Arnaud ex Cif. (1962), anamorphic *Pezizomycotina*, Hso.0eP.1. 6 (on sooty moulds, esp. *Schiffnerula* and *Meliola*), pantropical. See Deighton (*Mycol. Pap.* 118, 1969), Mercado Sierra *et al.* (*Mycotaxon* 55: 491, 1995; Mexico), Hosagoudar *et al.* (*J. Econ. Taxon. Bot.* 25: 281, 2001; India).

Acremonium Link (1809), anamorphic *Hypocreales*, Hso.0eH.15. c. 117, widespread. Still polyphyletic and perhaps best considered as a basic structural type rather than a genus. Grass endophytes formerly placed here are now considered to be *Neotyphodium* spp. See Gams (*Cephalosporium-artige Schimmelpilze*, 1971; monograph), Gams (*TBMS* 64: 389, 1975), Samuels (*N.Z. Jl Bot.* 14: 231, 1976; teleomorphs), Walz (*Biblthca Mycol.* 147: 1, 1992; *A. chrysogenum*), Lowen (*Mycotaxon* 53: 81, 1995; lichenicolous spp.), Alfaro-García *et al.* (*Mycol.* 88: 804, 1996; on *Cucurbitaceae*), Glenn *et al.* (*Mycol.* 88: 369, 1996; phylogeny), Abad *et al.* (*Diagnosis and Identification of Plant Pathogens. Proceedings of the 4th International Symposium of the European Foundation for Plant Pathology*: 287, 1997; VCGs), Ito *et al.* (*MR* 104: 77, 2000), Rossman (*Stud. Mycol.* 45: 27, 2000; spp. with Hypocrealean affinities), Seifert & Gams in McLaughlin *et al.* (Eds) (*The Mycota A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research* 7A: 307, 2001; polyphyly), Wang *et al.* (*Mycosystema* 21: 192, 2002; Chinese spp.), Lin *et al.* (*Plant Pathology Bulletin* Taichung 13: 91, 2004; *A. lactucae*), Hsiao *et al.* (*J. Clin. Microbiol.* 43: 3760, 2005; identification using arrays), Ma *et al.* (*Life in Ancient Ice*: 159, 2005; in glacial ice), Rakeman *et al.* (*J. Clin. Microbiol.* 43: 3324, 2005; mol. analysis of clinical spp.).

acro- (combining form), at the end; apical; terminal.

acroauxic (of conidiophores), growth in length restricted to the apical region.

Acrocalymma Alcorn & J.A.G. Irwin (1987), anamorphic *Massarina*, Cpd.0eH.15. 1 (on *Medicago*), Australia. See Alcorn & Irwin (*TBMS* 88: 163, 1987), Shoemaker *et al.* (*CJB* 69: 569, 1991; teleomorph), Aptroot (*Nova Hedwigia* 66: 89, 1998; tax. placement).

acrochroic, see Colour.

Acrocladium Petr. (1949) [non *Acrocladium* Mitt. 1869, *Musci*] = *Periconiella* fide von Arx (*Persoonia* 11: 389, 1981).

Acroconidiella J.C. Lindq. & Alippi (1964) ? = *Cladosporium* fide Lindquist & Alippi (*Darwiniana* 13: 612, 1964), Dugan *et al.* (*Schlechtendalia* 11,

- 2004).
- Acroconidiellina** M.B. Ellis (1971), anamorphic *Pezizomycotina*, Hso.1eP.26. 3, widespread (tropical). See Ellis (*Mycol. Pap.* 125: 22, 1971).
- Acrocordia** A. Massal. (1854), Monoblastiaceae (L). 10, widespread (esp. north temperate). See Coppins & James (*Lichenologist* 10: 179, 1978; UK spp.), Harris (*More Florida Lichens*, 1995).
- Acrocordiaceae** Oksner ex M.E. Barr (1987) = Monoblastiaceae.
- Acrocordiella** O.E. Erikss. (1982) = *Requienella* fide Boise (*Mycol.* 78: 37, 1986; synonymy), Eriksson & Hawksworth (*SA* 7: 59, 1988).
- Acrocordiomyces** Cif. & Tomas. (1953) = *Acrocordia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Acrocordiopsis** Borse & K.D. Hyde (1989), Melanommataceae. 2 (marine), widespread. See Borse & Hyde (*Mycotaxon* 34: 535, 1989), Alias *et al.* (*Fungal Diversity* 2: 35, 1999).
- Acrocorelia** R. Doll (1982) nom. nud., ? Dothideales (L).
- Acrocylindrium** Bonord. (1851), anamorphic *Pezizomycotina*, Hsc.0eH.?. 3, Europe. ? = *Sarocladium* fide Gams (*in litt.*). See Gams & Hawksworth (*Kavaka* 3: 60, 1976).
- Acrodesmis** Syd. (1926) = *Periconiella* fide Ellis (*Mycol. Pap.* 111, 1967).
- Acrodictyella** W.A. Baker & Partridge (2001), anamorphic *Pezizomycotina*. 1, Alabama. See Baker *et al.* (*Mycotaxon* 78: 30, 2001), Baker & Morgan-Jones (*Mycotaxon* 85: 371, 2003; contrast with *Pseudacrodictys*).
- Acrodictyopsis** P.M. Kirk (1983), anamorphic *Pezizomycotina*, Hso.#eP.1. 1, British Isles. See Kirk (*Mycotaxon* 18: 260, 1983), Kendrick (*CJB* 81: 75, 2003; morphogenesis).
- Acrodictys** M.B. Ellis (1961), anamorphic *Pezizomycotina*, Hso.#eP.1/19. c. 38 (saprobic on wood etc.), widespread. See Ellis (*Dematiaceous Hyphomycetes*, 1971), Ellis (*More Dematiaceous Hyphomycetes*, 1976), Chang (*Bot. Bull. Acad. sin. Taipei* 38: 197, 1997), Whitton *et al.* (*Fungal Diversity* 4: 159, 2000; on *Pandanaceae*), Cai *et al.* (*Nova Hedwigia* 75: 525, 2002; Philippines), Baker & Morgan-Jones (*Mycotaxon* 85: 371, 2003; contrast with *Pseudacrodictys*), Kodsueb *et al.* (*Cryptog. Mycol.* 27: 111, 2006; Thailand).
- Acrodontiella** U. Braun & Scheuer (1995), anamorphic *Pezizomycotina*, Hso.?.?. 1, Austria. See Braun & Scheuer (*Sydowia* 47: 146, 1995), Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 2, 1998).
- Acrodontium** de Hoog (1972), anamorphic *Pezizomycotina*, Hso.0eH.1. 9, widespread. See de Hoog (*Stud. Mycol.* 1, 1972), Sutton *et al.* (*Guide to Clinically Significant Fungi*, 1998; clinical taxa), van Wyk *et al.* (*S. Afr. J. Sci.* 96: 580, 2000; conidiogenesis), Czezug *et al.* (*Feddes Repert.* 112: 81, 2001; Czech Republic).
- Acrogenospora** M.B. Ellis (1971), anamorphic *Farlowiella*, Hso.0eP.19. 6 (saprobic on wood and bark), widespread. See Hughes (*N.Z. J. Bot.* 16: 312, 1978), Goh *et al.* (*MR* 102: 1309, 1998; key), Zhu *et al.* (*Mycotaxon* 92: 383, 2005; China).
- Acrogenotheca** Cif. & Bat. (1963), Dothideomycetes. Anamorph *Hiospira*. 2, widespread (tropical). See Hughes (*N.Z. J. Bot.* 5: 504, 1967), Hughes (*Mycol.* 68: 693, 1976).
- acrogenous**, development at the apex.
- Acrogynomyces** Thaxt. (1931), Laboulbeniaceae. 6 (on insect exoskeletons), Africa. See Tavares (*Mycol. Mem.* 9: 627 pp., 1985), Santamaría (*MR* 99: 1071, 1995).
- acronema**, extension of flagellum tip containing the two central microtubules but none of the nine peripheral elements.
- acropetal** (1) describes chains of conidia in which the youngest is at the apex, basifugal; cf. basipetal; (2) a pattern of apical growth.
- Acrophialophora** Edward (1961), anamorphic *Pezizomycotina*, Hso.0eH.15. 2, widespread. See Samson & Mahmood (*Acta Bot. Neerl.* 19: 804, 1970; key), Al-Mohsen *et al.* (*J. Clin. Microbiol.* 38: 4569, 2000; clinical), Kendrick (*CJB* 81: 75, 2003; morphogenesis).
- Acrophragmis** Kiffer & Reisinger (1970), anamorphic *Pezizomycotina*, Hso.≡ eP.19. 4, widespread (esp. tropical). See Kiffer & Reisinger (*Rev. Écol. Biol. Sol* 7: 16, 1970), Mercado Sierra & Mena Portales (*Acta bot. Szeged* 32: 189, 1986; Cuba), Rao & Hoog (*Stud. Mycol.* 28, 1986; India), Wu & Zhuang (*Fungal Diversity Res. Ser.* 15, 2005; China).
- Acrophytum**, see *Akrophyton*.
- acropleurogenous**, formed at the end and on the sides.
- Acrorixis** Trevis. (1860) = *Thelenella* fide Mayrhofer & Poelt (*Herzogia* 7: 13, 1985), Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Acroscyphus** Lév. (1846), Caliciaceae (L). 1, widespread. See Tibell (*Symb. bot. upsal.* 32 no. 1: 291, 1997; anam), Tibell (*Biblthca Lichenol.* 71: 107 pp., 1998), Joneson & Glew (*Bryologist* 106: 443, 2003; N America), Tibell & Thor (*J. Hattori bot. Lab.* 94: 205, 2003; Japan).
- Acrospeira** Berk. & Broome (1857), anamorphic *Pezizomycotina*, Hso.#eP.1. 1 (parasitic on *Castanea*), widespread (north temperate). See Wiltshire (*TBMS* 21: 211, 1938).
- Acrospermaceae** Fuckel (1870), Acrospermales. 4 gen. (+ 3 syn.), 15 spp.
Lit.: Webster (*TBMS* 39: 361, 1956), Eriksson (*Ark. Bot.* 6: 381, 1967), Eriksson (*Mycotaxon* 15, 1982), Nogrsek (*Biblthca Mycol.* 133: 271 pp., 1990), Barr (*Mycol.*, 1994; included in *Xylariales*), Winka & Eriksson (*Phylogenetic Relationships Within the Ascomycota Based on 18S rDNA Sequences Akademisk Avhandling [Thesis (PhD), Department of Ecology and Environmental Science, Umeå University]*: [17] pp., 2000).
- Acrospermales** Minter, Peredo & A.T. Watson (2007). Dothideomycetes. 1 fam., 4 gen., 15 spp. Fam.:
- Acrospermaceae**
Lit.: Minter *et al.* (*Bol. Soc. Argent. Bot.* 42: 107, 2007).
- Acrospermoides** J.H. Mill. & G.E. Thoms. (1940), ? Acrospermaceae. 1, USA. See Miller & Thompson (*Mycol.* 32: 1, 1940; descr.), Barr (*Mycotaxon* 39: 43, 1990; family placement).
- Acrospermum** Tode (1790), Acrospermaceae. Anamorph *Gonatophragmium*. 11 (saprobic, esp. on grasses), widespread. See Webster (*TBMS* 39: 361, 1956; conidia), Eriksson (*Ark. Bot.* ser. 2 6: 381, 1967), Sherwood (*Mycotaxon* 5: 39, 1977; posn), Winka & Eriksson (*Phylogenetic Relationships Within the Ascomycota Based on 18S rDNA Sequences Akademisk Avhandling [Thesis (PhD), De-*

- partment of Ecology and Environmental Science, Umeå University]: [17] pp., 2000; phylogeny), Minter *et al.* (*Bol. Soc. Argent. Bot.* **42**: 107, 2007).
- Acrosphaeria** Corda (1842) = *Xylaria* Hill ex Schrank fide Læssøe (*SA* **13**: 43, 1994).
- Acrospira** Mont. (1857), anamorphic *Pezizomycotina*, Hso.?? 1, Europe.
- acrospore**, an apical spore.
- Acrosporella** Riedl & Ershad (1977) = *Cladosporium* fide Sutton (*in litt.*).
- Acrosporium** Bonord. (1851), anamorphic *Pezizomycotina*, Hso.0eH.? 1, Germany.
- Acrosporium** Nees (1816) nom. rej. = *Oidium* Link (1824) fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- acrosporogenous** (of conidial maturation), cells delimited and maturing in sequence from base to apex as the tip of the conidium expands (Luttrell, 1963).
- Acrostalagmus** Corda (1838), anamorphic *Hypocreales*. 2 (isol. ex soil etc.), widespread. See Zare & Gams (*MR* **108**: 576, 2004), Zare *et al.* (*MR* **108**: 576, 2004; rels with *Verticillium*, connexions), Gams *et al.* (*Taxon* **54**: 179, 2005; nomencl.), Pantou *et al.* (*MR* **109**: 889, 2005; phylogeny).
- Acrostaphylus** G. Arnaud ex Subram. (1971) = *Nodulisporium* fide Jong & Rogers (*Tech. Bull. Wash. agric. Exp. Stn* **71**, 1972).
- Acrostaureus** Deighton & Piroz. (1972), anamorphic *Pezizomycotina*, Hso.0bP.19. 1 (fungicolous), widespread (tropical). See Deighton & Pirozynski (*Mycol. Pap.* **128**: 94, 1972).
- Acrostroma** Seifert (1987), anamorphic *Batistia*, Hsy.0eH.15. 1, Venezuela. See Seifert (*CJB* **65**: 2197, 1987), Samuels & Rodrigues (*Mycol.* **81**: 52, 1989; connexion).
- Acrotamnium** Nees (1816) nom. dub. ? = *Tomentella* Pat. fide Stalpers (*Stud. Mycol.* **24**: 72, 1984).
- Acrotellomyces** Cif. & Tomas. (1953) = *Acrotellum*.
- Acrotellum** Tomas. & Cif. (1952) = *Thelidium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Acrothamnium**, see *Acrotamnium*.
- Acrotheca** Fuckel (1860) = *Ramularia* Unger fide Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* **2**, 1998).
- Acrotheciella** Koord. (1907), anamorphic *Pezizomycotina*, Hsp. = eP.?24. 1, Java.
- Acrothecium** (Corda) Preuss (1851), anamorphic *Pezizomycotina*, Hso. = eH.? c. 15, widespread.
- acroton**, a spinule in lichens bearing side branches.
- Actidiographium** Lar.N. Vassiljeva (2000), ? *Hysteriaceae*. 1, Eastern Russia. See Vasil'eva (*Mikol. Fitopatol.* **34**: 4, 2000).
- actidione**, trade name for cycloheximide (q.v.).
- Actidium** Fr. (1815), *Mytiliniaceae*. 9, Europe; N. America. See Zogg (*Ber. schweiz. bot. Ges.* **70**: 195, 1960; key).
- Actigea** Raf. (1814) = *Scleroderma* fide Stalpers (*in litt.*).
- Actigena**, see *Actigea*.
- actin** and **mycosin** are proteins associated with contraction and relaxation of muscle; also present in several lower eukaryotic organisms and responsible for the periodic reversal of protoplasmic streaming in the plasmodium of *Mycetozoa*.
- Actiniceps** Berk. & Broome (1876), *Pterulaceae*. 3, widespread (tropical). See Boedijn (*Persoonia* **1**: 11, 1959), Tanaka & Hongo (*Mycoscience* **42**: 433, 2001; Japan).
- Actiniopsis** Starbäck (1899) = *Trichothelium* fide Santesson (*Symb. bot. upsal.* **12** no. 1: 1, 1952), Samuels (*N.Z. Jl Bot.* **14**: 232, 1976), Rossman *et al.* (*Stud. Mycol.* **42**: 248 pp., 1999).
- Actinobacteria** (Actinomycetes; 'Ray Fungi'). A group of morphologically diverse but usually filamentous Gram positive bacteria which have occasionally been mistaken for conidial fungi. *Actinobacteria* are typically saprobes (esp. in soil) but a few are pathogenic for humans, animals, and plants; some (esp. *Streptomyces*) are important sources of antibiotics (see amphotericin, cycloheximide, nystatin, streptomycin); some form lichen-like associations with green algae (see actinolichen).
- Lit.*: The literature on *Actinobacteria* is extensive. A hierarchical description has been produced by Stackebrandt *et al.* (*Int. J. Syst. Bacteriol.* **47**: 479, 1997). Generic names are listed by Skerman *et al.* (*Approved lists of bacterial names*, Amended Edn, 1989). See Williams *et al.* (Eds) (*Bergey's manual of systematic bacteriology* **4**, The actinomycetes, 1989), Balows *et al.* (*The procaryotes*, 2nd edn, 1992), Goodfellow *et al.* (Eds) (*Biology of the actinomycetes*, 1984), Ortiz-Ortiz *et al.* (Eds) (*Biological, biochemical, and biomedical aspects of actinomycetes*, 1984), Goodfellow *et al.* (Eds) (*Actinomycetes in biotechnology*), Goodfellow & Williams (*Ann. Rev. Microbiol.* **37**: 189, 1983).
- Actinocephalum** Saito (1905) = *Cunninghamella* fide Hesseltine (*Mycol.* **47**: 344, 1955).
- Actinochaete** Ferro (1907) nom. conf., anamorphic *Pezizomycotina*. = *Aspergillus* (Trichocom.) p.p. and *Septobasidium* (Septobasid.) p.p. fide Ellis (*in litt.*).
- Actinocladium** Ehrenb. (1819), anamorphic *Pezizomycotina*, Hso.0bP.1. 5, widespread. See Wu & Zhuang (*Fungal Diversity Res. Ser.* **15**, 2005; China).
- Actinocymbe** Höhn. (1911), *Chaetothyriaceae*. 1 or 2, widespread (tropical). See Verma & Kamal (*Indian Phytopath.* **40**: 410, 1988).
- Actinodendron** G.F. Orr & Kuehn (1963) = *Oncocladium* fide Hughes (*CJB* **46**: 939, 1968).
- Actinodermium** Nees (1816) = *Sterbeekia*.
- Actinodochium** Syd. (1927), anamorphic *Pezizomycotina*, Hsp.0eH.3. 2, C. America; India.
- Actinodothidopsis** F. Stevens (1925) = *Venturia* Sacc. fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* **11** no. 2, 1962).
- Actinodothis** Syd. & P. Syd. (1914) = *Amazonia* fide Hansford (*Beih. Sydowia* **2**, 1961).
- Actinoglyphis** Mont. (1856) = *Sarcographa* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Actinogyra** Schol. (1934) = *Umbilicaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- actinogyrose** (actinogyr) (of apothecia), disc gyrose and having no proper margin.
- actinolichen**, a lichen-like association between a green alga and an actinomycete (e.g. *Chlorella* and *Streptomyces* sp.; Lazo & Klein, *Mycol.* **57**: 804, 1965) occurring in nature and also in mixed laboratory cultures. See Kalakoutskii *et al.* (*Actinomycetes*, n.s. **1**(2): 27, 1990; lab. expts, bibliogr.).
- Actinomadura** H. Lechev. & M.P. Lechev. (1968), *Actinobacteria*. q.v.
- Actinomma** Sacc. (1884) = *Atichia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Actinomortierella** Chalab. (1968) = *Mortierella* fide Gams (*Nova Hedwigia* **18**: 30, 1969).

- Actinomucor** Schostak. (1898), Mucoraceae. 1, widespread. See Benjamin & Hesseltine (*Mycol.* 49: 240, 1957), Jong & Yuan (*Mycotaxon* 23: 261, 1985), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny), Zheng & Liu (*Nova Hedwigia* 80: 419, 2005), Khan *et al.* (*Antonie van Leeuwenhoek* 94: in press, 2008; zygomycosis, n.sp.).
- Actinomyce** Meyen (1827) nom. dub., ? Fungi.
- Actinomyces** Harz (1877), Actinobacteria. q.v.
- Actinomycetes**, see Actinobacteria.
- Actinomyces** D. Ellis (1916), Fossil Fungi, Actinobacteria. 1 (Jurassic), British Isles. q.v.
- Actinomycoedium** K.M. Zalessky (1915), Fossil Fungi (anamorphic fungi) or Actinomycetes anamorphic *Pezizomycotina*. 1 (Permo-Carboniferous), former USSR.
- Actinomyxa** Syd. & P. Syd. (1917), Microthyriaceae. 1, Australia.
- Actinonema** Fr. (1849) = *Spilocaea* fide Sutton (*Mycol. Pap.* 141, 1977).
- Actinonema** Pers. (1822) nom. dub., anamorphic *Pezizomycotina*. The type contains sterile mycelium, but often used for *Marssonina rosae* (teleomorph *Diplocarpon rosae*) (black spot of rose). See Sutton (*Mycol. Pap.* 141, 1977).
- Actinonemella** Höhn. (1916) = *Asteroma* fide Sutton (*Mycol. Pap.* 141, 1977).
- Actinopelte** Sacc. (1913) ≡ *Tubakia*.
- Actinopelte** Stizenb. (1861) = *Solorinella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Actinopeltella** Doidge (1924) = *Actinopeltis* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Actinopeltis** Höhn. (1907), Microthyriaceae. 11, widespread. See Ellis (*TBMS* 68: 145, 1977), Spooner & Kirk (*MR* 94: 223, 1990), Geel & Aptroot (*Nova Hedwigia* 82: 313, 2006; fossil taxa).
- Actinophora** Merr. (1943) ≡ *Acinophora*.
- Actinoplaca** Müll. Arg. (1891), Gomphillaceae (L). 4, widespread (primarily tropical). See Vězda & Poelt (*Folia geobot. phytotax.* 22: 180, 1987), Lücking (*Biblthca Lichenol.* 65: 1, 1997; Costa Rica), Aptroot *et al.* (*Mycotaxon* 88: 41, 2003; Yunnan), Farkas (*Biblthca Lichenol.* 88: 111, 2004; S Africa), Lücking *et al.* (*Lichenologist* 37: 123, 2005; phenotype cladistics), Lücking (*Cryptog. Mycol.* 27: 121, 2006; French Guiana).
- Actinoplacomycetes** Cif. & Tomas. (1954) ≡ *Actinoplaca*.
- Actinoplanes** Couch (1950), Actinobacteria. q.v.
- Actinopolyspora** Gochn., K.G. Johnson & Kushner (1975), Actinobacteria. q.v.
- Actinoscypha** P. Karst. (1888) = *Micropeziza* fide Nannfeldt (*Bot. Notiser* 129: 323, 1976).
- Actinosoma** Syd. (1930) ? = *Actinopeltis* fide Spooner & Kirk (*MR* 94: 223, 1990), Eriksson & Hawksworth (*SA* 9: 6, 1991; status).
- Actinospora** Corda (1854) ≡ *Myxotrichum*.
- Actinospira** Ingold (1952) [non *Actinospira* Turcz. 1835, *Ranunculaceae*] ≡ *Actinosporella*.
- Actinosporella** Descals, Marvanová & J. Webster (1999), anamorphic *Miladina*, Hso.1bH.23. 1 (in water), widespread. See Descals (*TBMS* 67: 208, 1976), Descals & Webster (*TBMS* 70: 466, 1978; teleomorph), Descals *et al.* (*CJB* 76: 1647, 1998), Descals (*MR* 109: 545, 2005).
- Actinostilbe** Petch (1925), anamorphic *Lanatonectria*, Hsp.0-1eH.15. 3, widespread. See Sutton (*TBMS* 76: 97, 1981; synonym of *Sarcopodium*), Samuels & Seifert in Sugiyama (Ed.) (*Pleomorphic Fungi: The Diversity and its Taxonomic Implications*: 29, 1987), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Actinostroma** Klotzsch (1843) = *Cymatoderma* fide Donk (*Taxon* 6: 17, 1957).
- Actinosynnema** T. Haseg., H. Lechev. & M.P. Lechev. (1978), Actinobacteria. q.v.
- Actinoteichus** Cavalc. & Poroca (1971) = *Asterothyrium* Müll. Arg. fide Lücking *et al.* (*Lichenologist* 30: 121, 1998).
- Actinotexis** Arx (1960), anamorphic *Pezizomycotina*, Cpt.0fH.?. 1, Brazil. See von Arx (*Publções Inst. Micol. Recife* 289: 4, 1960).
- Actinothecium** Ces. (1854), anamorphic *Pezizomycotina*, Cpt.0eH.?. 5, widespread.
- Actinothecium** Flot. (1855) = *Verrucaria* Schrad. fide Hawksworth (*Bull. Br. Mus. nat. Hist. Bot.* 14: 43, 1985; placement), Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Actinothyrella** Edward, Kr.P. Singh, S.C. Tripathi, M.K. Sinha & Ranade (1974) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Actinothyrium** Kunze (1823), anamorphic *Pezizomycotina*, Cpt.0fH.?. 10, widespread. See Barnes *et al.* (*Stud. Mycol.* 50: 551, 2004; links with *Dothistroma*).
- Actinotrichum** Wallr. [not traced] nom. nud., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Actonia** C.W. Dodge (1935) nom. dub., Fungi. See Batra in Subramanian (Ed.) (*Taxonomy of fungi* 1: 187, 1978).
- Actycus** Raf. (1815) nom. dub., Fungi.
- aculeate**, having narrow spines (Fig. 20.3).
- aculeolate**, having spine-like processes.
- acuminate**, gradually narrowing to a point.
- Acumispora** Matsush. (1980), anamorphic *Pezizomycotina*, Hso.≡ eH-P.1. 3, Taiwan. See Matsushima (*Matsush. Mycol. Mem.* 1: 2, 1980), Matsushima (*Matsush. Mycol. Mem.* 6, 1989).
- Acurtis** Fr. (1849) nom. dub., Physalacriaceae. A sterile form of *Armillaria mellea* s.l. when parasitized by *Entoloma abortivum* (Czederpilz *et al.*, *Mycol.* 93: 84, 2001), not the opposite (*E. abortivum* as parasitized by *Armillaria* as suggested by Watling (*Bull. Soc. linn. Lyon* 43(Suppl.): 449, 1970), so technically a hyphal anamorph.
- acute** (1) pointed (Fig. 23.41); (2) less than a right angle.
- Acutocapillitium** P. Ponce de León (1976), ? Agaricaceae. 3, America (tropical). See Demoulin (*in litt.*), Calonge *et al.* (*Boll. Gruppo Micol. 'G. Bresadola'* 43: 51, 2000) ? = *Glyptoderma* (Lycoperd.) fide.
- Adamson's fringe**, the downward growing hyphae of a dermatophyte in the region above the bulb of a hair.
- adapted race** (Magnus), see physiologic race.
- adaxial** (of a basidiospore), the side next to the long axis of the basidium, usually that with the apiculus (Corner, 1948); cf. abaxial.
- Adea** Petr. (1928) = *Seiridium* fide Nag Raj & Kendrick (*Sydowia* 38: 179, 1986).
- Adella** Petr. (1936) = *Wojnowicia* fide Sutton (*Česká Mykol.* 29: 97, 1975).
- Adelococcaceae** Triebel (1993), Verrucariales. 2 gen., 13 spp.
Lit.: Triebel (*Biblthca Lichenol.* 35: 278 pp., 1989), Matzer & Pelzmann (*Nova Hedwigia* 52: 1, 1991), Triebel (*Sendtnera* 1: 273, 1993), Hoffmann & Hafellner (*Biblthca Lichenol.* 77: 181 pp., 2000), Or-

- ange (*Mycotaxon* 81: 265, 2002).
- Adelococcus** Theiss. & Syd. (1918), Adelococcaceae. 6 (on lichens), Europe. See Matzer & Hafellner (*Bibliotheca Lichenol.* 37, 1990), Matzer & Pelzmann (*Nova Hedwigia* 52: 1, 1991; ascospores), Etayo & Breuss (*Öst. Z. Pilzk.* 7: 203, 1998).
- Adelodiscus** Syd. (1931), Helotiales. 1, Philippines.
- Adelolecia** Hertel & Hafellner (1984), Ramalinaceae (L). 3, Europe; N. America. See Hertel & Rambold (*Bibliotheca Lichenol.* 57: 211, 1995), Ekman (*Op. Bot.* 127, 1996), Lumbsch *et al.* (*Mol. Phylogen. Evol.* 31: 822, 2004; posn).
- Adelomyces** Thaxt. (1931) = *Phaulomyces* fide Tavares (*Mycol. Mem.* 9, 1985).
- Adelomycetes**, see Anamorphic fungi (Langeron, *Précis de Mycologie*, edn 1, 1945).
- Adelopus** Theiss. (1918) = *Phaeocryptopus* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- adelphogamy**, pseudomictic copulation of mother and daughter cells, as in some yeasts (Gäumann & Dodge, 1928: 13).
- adenose**, having glands; gland-like.
- Aderkomyces** Bat. (1961), Gomphillaceae (L). 25, neotropics. See Lücking *et al.* (*Lichenologist* 30: 121, 1998; synonymy with *Tricharia*), Lücking *et al.* (*Lichenologist* 37: 123, 2005; accepted genus), Lücking (*Cryptog. Mycol.* 27: 121, 2006; French Guiana).
- Adermatis** Clem. (1909) = *Lecania* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- adherance** (of fungicides), the ability of a fungicide (or other crop protectant) to stick to a surface. Cf. retention.
- adhesive disc**, see holdfast.
- adhesorium**, the organ developed from a resting zoospore of *Plasmodiophora* for attachment to, and penetration of, the host (Aist & Williams, *CJB* 49: 2023, 1971).
- Adhogamina** Subram. & Lodha (1964) = *Gilmaniella* fide Barron (*The genera of hyphomycetes from soil*, 1968).
- adiaspiromycosis**, pulmonary infection in animals (particularly soil-burrowing rodents) and rarely humans by *Emmonsia* spp., esp. *E. parva* (syn. *Haplosporangium parvum*) and *E. crescens* (Jellison, *Adiaspiromycosis* (syn. *Haplomycosis*), 1969); *haplomycosis*. Cf. adiaspore.
- adiaspore**, a large spherical chlamydospore produced in the lungs of animals by the enlargement of an inhaled conidium of *Emmonsia* spp.; cf. adiaspiromycosis. *Chrysosporium pruinosum* produces similar spores in culture (Carmichael, *CJB* 40: 1167, 1962).
- adjunct** (in brewing), any legally permitted substance lacking nutritional properties added to the fermentation.
- adnate** (of lamellae or tubes), joined to the stipe; if lamellae, proximal end not notched (cf. sinuate); sometimes restricted to lamellae widely joined to the stipe (Fig. 19C) (cf. adnexed); (of pellicle, scales, etc.), tightly fixed to the surface.
- adnexed** (of lamellae), narrowly joined to the stipe (Fig. 19B) (cf. adnate); an ambiguous term.
- Adomia** S. Schatz (1985), Sordariomycetes. 1 (marine, on *Avicennia*), Egypt; Australia. Perhaps part of the *Ceriospora* complex, or related to *Urosporellopsis*. See Schatz (*TBMS* 84: 555, 1985; descr.).
- adpressed**, see appressed.
- adspersed**, of wide distribution; scattered.
- aduncate**, bent; hooked; crooked.
- Adustomyces** Jülich (1979), ? Pterulaceae. 1, Europe; Africa. See Jülich (*Persoonia* 10: 325, 1979).
- adventitious septum**, see septum.
- adventive branching** (of fruticose lichens), branching not of the normal pattern; e.g. regenerate branches produced after damage to the original branches in *Cladonia*.
- Aecidiconium** Vuill. (1892), ? Pucciniales. 1 (on *Pinus* (*Pinaceae*)), France.
- Aecidiella** Ellis & Kelsey (1897) = *Pucciniosira* fide Arthur (*N. Amer. Fl.* 7: 126, 1907).
- Aecidiolum** Unger (1832), anamorphic *Pucciniales*. 12. Anamorph name for (0).
- aecidiospore**, see *Pucciniales*.
- Aecidites** Debey & Ettingsh. (1859), Fossil Fungi. 4 (Cretaceous, Tertiary), Europe.
- Aecidium** Pers. (1796), anamorphic *Pucciniales*. c. 600 (on angiosperms), widespread. Anamorph name for (I). The name originally applied to the aecial stage of *Puccinia* but is also widely used for the 'aecioid' aecial stages of other rust families. A number may be 'duplicate' names; some may be species of *Endophyllum* (q.v.). As with other anamorphic fungi, an *Aecidium* name is sometimes used even when there is a named teleomorphic (telial, III) state.
- aecidium**, see *Pucciniales*.
- aeciospore**, see *Pucciniales*.
- aeciotelium**, see *Pucciniales*.
- aecium**, see *Pucciniales*.
- Aeciure** Buriticá & J.F. Hennen (1994), anamorphic *Arthuria*. 1 (on *Croton* (*Euphorbiaceae*)), Brazil. Anamorph name for (II).
- Aedispora** P.J. Kilochitskii (1997), Microsporidia. 8.
- Aedycia** Raf. (1808) nom. rej. = *Mutinus* fide Stalpers (*in litt.*).
- Aegerita** Pers. (1801), anamorphic *Bulbillomyces*. 1, Europe. See Hennebert (*Persoonia* 7: 191, 1973), Jülich (*Persoonia* 8: 59, 1974).
- Aegeritella** Bałazy & J. Wiśn. (1974), anamorphic *Pezizomycotina*, Hsp.0eH.1. 4 (on ants), Europe; Brazil. See Bałazy & Wiśniewski (*Prace Komisji Nauk Rolniczych i Komisji Nauk Leśnych* 38: 13, 1974), Espadaler & Wisniewski (*Butlletí de la Institució Catalana d'Història Natural* secció de Botànica 54: 31, 1987; Spain), Bałazy *et al.* (*MR* 94: 273, 1990; Morocco).
- Aegeritina** Jülich (1984), anamorphic *Subulicystidium*. 1, Europe. See Jülich (*Int. J. Mycol. Lichenol.* 1: 282, 1984).
- Aegeritopsis** Höhn. (1903) nom. dub., Fungi.
- Aenigmatomyces** R.F. Castañeda & W.B. Kendr. (1994), anamorphic *Fungi*, Hso.0eH.1. 1 (on ? *Pythium*), Canada. See Castañeda Ruiz & Kendrick (*Mycol.* 85: 1023, 1993).
- Aenigmatospora** R.F. Castañeda Ruiz, Saikawa, Guarro & Caldach (1999), anamorphic *Pezizomycotina*. 1, Cuba. See Castañeda *et al.* (*Cryptog. Mycol.* 20: 115, 1999).
- aequi-hymeniiferous** (of hymenial development in agarics), having basidia which mature and shed their spores evenly over the surface of each lamella; the non-*Coprinus* type (Buller, *Researches* 2: 19, 1922). cf. inaequi-hymeniiferous.
- aero-aquatic fungi**, fungi that grow under water but produce spores in the air above (van Beverwijk, *TBMS* 34: 280, 1951). See Aquatic fungi.
- aerobe**, an organism needing free oxygen for growth; cf. anaerobe.

aerobiological pathway, the process (comprising the source, liberation, dispersion, deposition, and impact on another living organism) by which air-borne microorganisms are dispersed (Edwards, *Aerobiology*, 1979).

aerogenic, describes an organism that produces detectable gas during the breakdown of carbohydrate.

aerole (of lichens), a scale-like area on the thallus delimited by cracks or depressions.

Aerophyton Eschw. (1824) nom. dub., anamorphic *Pezizomycotina*.

Aeruginospora Höhn. (1908), ? Tricholomataceae. 2, Australia; Southeast Asia. See Horak (*N.Z. J. Bot.* 28: 255, 1990).

Aessosporon Van der Walt (1970), Sporidiobolaceae R.T. Moore. Anamorphs *Bullera*, *Sporobolomyces*. 2, Netherlands. See van der Walt (*Antonie van Leeuwenhoek Ned. Tijdschr. Hyg.* 36: 54, 1970).

aethalium (of *Mycetozoa*), a sessile fruit-body made by a massing of all or a part of the plasmodium.

aetiology, the science of the causes of disease; etiology (Amer.).

Aetnensis Lloyd (1910) nom. nud., Fungi.

Aflatoxins. A series of toxic polybutole metabolites (mycotoxins) esp. of *Aspergillus flavus* strains when growing on groundnuts, cereals, etc., particularly in warm and moist conditions; most well known mycotoxin; most developed countries have statutory limits; gene probes available; the cause of **aflatoxicosis** in poultry and cattle and carcinogenic for rats and humans.

Lit.: Abbas (*Aflatoxin and food safety*, 2005), Heselstine *et al.* (*Bact. Rev.* 30: 795, 1966), *Aflatoxin bibliography, 1960-67*, 1968), Goldblatt (Ed.) (*Aflatoxin: scientific background, control and implications*, 1969), Racovitza (*J. gen. Microbiol.* 57: 379, 1969; aflatoxin toxic to the mite *Glyciphagus domesticus*), Heathcote & Hibbert (*Aflatoxins: chemical and biological aspects*, 1978), Eaton & Groopman (*The toxicology of aflatoxins*, 1994), Flannigan (Ed.) (*Internat. Biodet.* 22 (Suppl.), 1986; in cereals and stored products), Williams *et al.* (*Am. J. Clin. Nutrition* 80: 1106, 2004), Wylie & Morehouse (Eds) (*Mycotoxic fungi, mycotoxins, mycotoxicoses 1-3*, 1977-8), Mycotoxicoses.

African histoplasmosis, infection of humans or animals by *Histoplasma capsulatum* var. *duboisii*.

African Mycological Association, Founded in 1995; recognized as the Committee for Africa within the International Mycological Association (q.v.); structure comprises individual and corporate members, and an elected executive; organizes Regional Mycology Conferences in Africa. Publications: *Mycoafrika*, the *AMA Newsletter*. Website: <http://194.203.77.69/AfricanMycologicalAssociation>.

Afroboletus Pegler & T.W.K. Young (1981), Boletaceae. 7, Africa (tropical). See Pegler & Young (*TBMS* 76: 130, 1981), Watling & Turnbull (*Edinb. J. Bot.* 49: 343, 1993; South and East Central Africa), Heinemann & Rammeloo (*Bulletin du Jardin Botanique National de Belgique* 64: 215, 1995; Burundi).

AFTOL (Assembling the Fungal Tree of Life) is the title of a major project funded by the National Science Foundation of the USA, starting as a proposal in 2002 and in its second stage at the time of this edition going to press. The project has involved more than 100 collaborators in over 20 countries. The objective:

to enhance understanding of evolution in the kingdom Fungi, and thereby of life on Earth in general, leading to development of diagnostic tools to aid discovery of the very many fungal species believed to exist but as yet unknown. In its first stage, the project developed broad datasets of molecular and non-molecular (i.e. morphological) characters across the kingdom, leading to the first unified phylogenetic classification system for higher ranks of the Fungi. It also resulted in the first database of fungal subcellular characters and character states, and various informational tools for studying phylogeny. The project has already made a profound impact on fungal systematics, and its findings have been incorporated in this edn of the *Dictionary*. See: Hibbett *et al.* (*MR* 111: 509, 2007). Website: <http://aftol.org>.

agamic (agamous), asexual.

agar (agar-agar), a substance from certain red algae (*Gelidium* (Japan, USA), *Gracilaria* (USA), *Gigartina* (UK), *Pterocladia* (NZ), etc.) used to make culture media into gels which few microorganisms can liquefy. See Chapman (*Seaweeds and their uses*, 1950), Newton (*Seaweed utilization*, 1951), Humm (*Econ. Bot.* 1: 317, 1947); a possible substitute using granulated tapioca or tapioca pearls (*Manihot esculenta*, cassava) has been proposed for use where agar is unavailable or prohibitively priced (Nene & Sheila, *Indian J. mycol. Pl. Path.* 24: 159, 1994). Cf. gelatin, Media.

agaric (1) one of the *Agaricales*; fly -, *Amanita muscaria*; honey -, *Armillaria mellea*; (2) (in early medicine, obsol.), species of *Fomes* or *Polyporus*; **female**, **white**, or **purging** - (agaricum), *F. officinalis*; **male** -, *Phellinus igniarius* (*F. igniarius*).

Agaricaceae Chevall. (1826), Agaricales. 85 gen. (+ 80 syn.), 1340 spp.

Lit.: Kreisel (*Feddes Repert.* 64: 89, 1962), Homrich & Wright (*Mycol.* 65: 779, 1973), Kreisel (*Bibliotheca Mycol.* 36, 1973; Germany), Brodie (*The Bird's Nest Fungi*: 199 pp., 1975), Brodie (*Lejeunia* n.s. 112: 1, 1984; suppl.), Pegler (*Kew Bull. Addit. Ser.* 12: 519 pp., 1986), Singer (*Agaric. mod. Tax.* 4th ed, 1986), Malloch *et al.* (*Mycol.* 79: 839, 1987), Pegler & Young (*MR* 98: 904, 1994), Breitenbach & Kränzlin (*Fungi of Switzerland* 4 Agarics, 2nd part: *Entolomataceae, Pluteaceae, Amanitaceae, Agaricaceae, Coprinaceae, Bolbitiaceae, Strophariaceae*: 368 pp., 1995), Sarasini & Pina (*Riv. Micol.* 38: 237, 1995), Hibbett *et al.* (*Proc. natn Acad. Sci. U.S.A.* 94: 12002, 1996), Kreisel & Moreno (*Feddes Repert.* 107: 83, 1996), Sarasini & Pina (*Riv. Micol.* 39: 115, 1996), Suárez & Wright (*Mycol.* 88: 655, 1996), Coetzee *et al.* (*Bothalia* 27: 117, 1997), Grgurinovic (*Larger Fungi of South Australia*: 725 pp. + 34 [m, 1997), Portman *et al.* (*Mycotaxon* 62: 435, 1997), Sarasini & Pina (*Riv. Micol.* 40: 19, 1997), Calonge (*Fl. Mycol. Iberica* 3: 271 pp., 1998), Kreisel (*Öst. Z. Pilzk.* 7: 215, 1998), Powell & Blackwell (*Mycotaxon* 68: 505, 1998), Shinnars & Tewari (*Mycol.* 90: 980, 1998), Xu *et al.* (*Mol. Ecol.* 7: 19, 1998), Hopple & Vilgalys (*Mol. Phylogen. Evol.* 13: 1, 1999), Johnson (*Mycol.* 91: 443, 1999), Mitchell & Bresinsky (*Mycol.* 91: 811, 1999), Diehl (*Sydowia* 52: 16, 2000), Krüger *et al.* (*Mycol.* 93: 947, 2001), Redhead *et al.* (*Taxon* 50: 203, 2001), Agerer (*Nova Hedwigia* 75: 367, 2002), Binder & Bresinsky (*Mycol.* 94: 85, 2002), Moncalvo *et al.* (*Mol. Phylogen. Evol.* 23: 357, 2002), Baseia (*Mycotaxon* 88: 107, 2003),

Krüger & Kreisel (*Mycotaxon* 86: 169, 2003), Vellinga (*Mycol.* 95: 442, 2003), Geml *et al.* (*Mycol. Progr.* 3: 157, 2004), Lebel *et al.* (*MR* 108: 210, 2004), Terashima *et al.* (*Mycoscience* 45: 251, 2004), Vellinga (*MR* 108: 354, 2004), Didukh *et al.* (*MR* 109: 729, 2005), Kerrigan (*Mycol.* 97: 12, 2005), Miller *et al.* (*Mycol.* 97: 530, 2005), Stott *et al.* (*MR* 109: 205, 2005), Walther *et al.* (*MR* 109: 525, 2005).

Agaricales Underw. (1899). Agaricomycetidae. 33 fam., 413 gen., 13233 spp. Mushrooms and toadstools, Gill fungi, Agarics. Terrestrial, lignicolous, sometimes muscicolous or fungicolous, saprobic, mycorrhizal (ectomycorrhizal, exceptionally orchid mycorrhizal), rarely parasitic on plants or fungi; edible, poisonous and hallucinogenic; cosmopolitan.

The mycelium, which is frequently seen in leaf mould and decaying wood, may be perennial (with ages more than thousand years, Smith *et al.*, *Nature* 256: 428, 1992); the expanding mycelium frequently forms fairly rings (q.v.); some species form sclerotia, hyphal cords or rhizomorphs.

Classification: Fries (*Syst. mycol.* 1-3, 1821-1832) put almost all fleshy, lamellate toadstools in the genus *Agaricus*, his tribus being the common genera of today. He subsequently elevated several of these infrageneric groups to generic level, but later authors (Staude, Kummer, Quélet, Gillet, Karsten) made most of the changes. Fries based his genera on macroscopic characters of the basidiocarp and colour of spore print and his system had been widely used as it had the advantage that many genera could be identified on field characters. Microscopic studies of basidiocarp structure, initiated by Fayod and Patouillard, have shown a number of Fries's groupings to be unnatural, and new genera and families have been proposed. Singer's monumental work, *The Agaricales in modern taxonomy* (4th ed., 1986), treated three major groups within the *Agaricales* s. l., viz. *Agaricales* s. str., *Boletales*, and *Russulales*. These groups are still accepted in modern treatments based on molecular characters, as the euagarics clade, bolete clade, and russuloid clade (Hibbett & Thorn, *The Mycota*, 7B, 2001) and are accepted as separate orders in this edition of the *Dictionary*. Hibbett *et al.* (*Proc. nat. Acad. Sci. USA* 94: 1202, 1997; see also Hibbett & Thorn, *The Mycota* 7B, 2001) concluded that the lamellate hymenophore has independently arisen in at least 5 out of the 8 clades of the *Homobasidiomycetes*. The results from the AFTOL project now recognize some 20 orders of the *Agaricomycetes* (Hibbett *et al.* (*Mycol.* 98: 917, 2006; molecular phylogeny), Hibbett *et al.* (*MR* 111: 109, 2007). The *Agaricales* s. str. (euagarics clade) also contain fungi of the reduced series (cyphelloid fungi; q.v.), some aphyllorphales (q.v.) and gasteromycetes (q.v.). Consequently, the *Agaricales* and most of its families cannot be characterised in morphological terms and for that reason diagnoses are not provided for many of the families. Fams:

- (1) **Agaricaceae**
- (2) **Amanitaceae**
- (3) **Amylocorticiaceae**
- (4) **Bolbitiaceae**
- (5) **Broomeiaceae**
- (6) **Clavariaceae**
- (7) **Cortinariaceae**
- (8) **Cyphellaceae**
- (9) **Cystostereaceae**

- (10) **Entolomataceae**
- (11) **Fistulinaceae**
- (12) **Gigaspermaceae**
- (13) **Hemigasteraceae**
- (14) **Hydnangiaceae**
- (15) **Hygrophoraceae**
- (16) **Inocybaceae**
- (17) **Limnoperdaceae**
- (18) **Lyophyllaceae**
- (19) **Marasmiaceae**
- (20) **Mycenaceae**
- (21) **Niaceae**
- (22) **Phelloriniaceae**
- (23) **Physalacriaceae**
- (24) **Pleurotaceae**
- (25) **Pluteaceae**
- (26) **Psathyrellaceae**
- (27) **Pterulaceae**
- (28) **Schizophyllaceae**
- (29) **Stephanosporaceae**
- (30) **Strophariaceae**
- (31) **Tapinellaceae**
- (32) **Tricholomataceae**
- (33) **Typhulaceae**

Lit.: Jossierand (*La description des champignons supérieurs*, 1952 (revised 1983)), Reijnders (*Les problèmes du développement des carpophores des Agaricales et de quelques groupes voisins*, 1963), Reijnders & Stalpers (*Stud. Mycol.* 34, 1992), Cléménçon (*Anatomie der Hymenomycetes*, 1997), Moore, Pegler & Young (*Beih. Nova Hedwigia* 35, 1971; spore morphology), Gill & Steglich (*Progr. Chem. Nat. Prod.* 51, 1987; pigment chemistry), Singer (*The Agaricales in modern taxonomy*, 4th ed., 1986), Kühner (*Les Hyménomycètes agaricoïdes, études générales et classification*, 1980; classification), Horak (*Synopsis generum Agaricalium*, 1968), Donk (*Beih. Nova Hedwigia* 2, 1961; nomenclature), Hibbett & Thorn (*The Mycota* 7B, 2001; phylogeny), Moncalvo *et al.* (*Syst. Biol.* 49: 278, 2000; phylogeny), See Krüger *et al.* (*Mycol.* 93: 947, 2001; phylogeny. See also under *Basidiomycetes*, *Macromycetes* and *fams*).

agaricic acid, a hydroxylated tribasic acid from *Fomes officinalis*; used to control tubercular night sweats (Milner, *Med. Klin.* 62: 1443, 1967).

agaricolous, living on agarics.

Agaricites Mesch. (1891), Fossil Fungi. 4 (Tertiary, Quaternary), Europe.

Agarico-carnis Paulet (1793) ≡ *Fistulina*.

Agaricochaete Eichelb. (1906), ? *Pleurotaceae*. 4, Africa; Asia. Perhaps *Tricholomataceae*. See Pegler (*Kew Bull. Addit. Ser.* 6, 1977) Position uncertain, could be *Tricholomataceae*.

Agaricodochium X.J. Liu (1981), anamorphic *Pezizomycotina*, Hsp.0eH.15. 1, China. See Liu (*Acta Microbiol. Sin.* 21: 160, 1981).

agaricoid, of a form resembling *Agaricus*; with a stipe, cap (pileus) and gills (lamellae).

Agarico-igniarius Paulet (1793) ≡ *Fomes*.

Agaricomycetes Doweld (2001), *Agaricomycotina*. 17 ord., 100 fam., 1147 gen., 20951 spp. Ords:

- (1) **Agaricales**
- (2) **Atheliales**
- (3) **Auriculariales**
- (4) **Boletales**
- (5) **Cantharellales**
- (6) **Corticiales**

- (7) Geastrales
- (8) Gloeophyllales
- (9) Gomphales
- (10) Hymenochaetales
- (11) Hysterangiales
- (12) Phallales
- (13) Polyporales
- (14) Russulales
- (15) Sebaciniales
- (16) Thelephorales
- (17) Trechisporales

Lit. (see also under Macromycetes): **General:** Donk (1951-63), Generic names proposed for Hymenomycetes, I ('Cyphellaceae'), II (Hymenolichenes), III ('Clavariaceae'), IV (Boletaceae), *Reinwardtia* 1: 199, 2: 435, 3: 275, 1951-58, V ('Hydnaceae'), *Taxon* 5: 69, 95, 1956, VI (Brachybasidiaceae, Cryptobasidiaceae, Exobasidiaceae), *Reinwardtia* 4: 113, 1956, VII ('Thelephoraceae'), VIII (Auriculariaceae, Septobasidiaceae, Tremellaceae, Dacrymycetaceae), *Taxon* 6: 17, 68, 106, 7: 164, 193, 236, 1957-58, IX ('Meruliaceae', *Cantharellus*), *Fungus* 28: 7, 1958, X ('Polyporaceae'), *Persoonia* 1: 173, 1960 (additions and corrections, 2: 201, 1962): XI (Agaricaceae); *Beih. Nova Hedw.* 5, 1962, XII (Deuteromycetes), XIII (additions and corrections); *Taxon* 11: 75, 12: 113, 1962-63. [I-IX, XII, XIII, reprinted as 1 vol., 1966; X reprinted, 1968. In this valuable series of papers many taxonomic points are also discussed.] Donk (1954-62) Notes on resupinate hymenomycetes: I (*Pellicularia*), *Reinwardtia* 2: 425, 1954; II (Tulasnelloid fungi), 3: 363, 1956; III, IV, V, *Fungus* 26: 3, 27: 1, 28: 16, 1956-58; VI, *Persoonia* 2: 217, 1962. Rea (1922), Bourdot & Galzin (1927), Killerman (1928), Eriksson (*Symb. bot. upsal.* 16(1): 1-172, 1958; N. Sweden), Donk (1954-62; *Reinwardtia* 2: 425, 1954; 3: 363, 1956; *Fungus* 26: 3, 27: 1, 28: 16, 1956-58; *Persoonia* 2: 217, 1962; resupinates), Donk (*Persoonia* 3: 199, 1964; conspectus of families), Shaffer (*in* Parker, 1982, 1: 248), Stephanova-Kartavenko ([Aphyllorphorous fungi of the Urals], 1967; gen. keys), Parmasto (*The Lachnocladiaceae of the Soviet Union with a key to boreal species*, 1970 [*Scripta mycol.* 2]), Pegler (*The polypores*, 1973 [*Bull. BMS Suppl.*]; keys world gen., Br. spp.), Strid (*Aphyllorphorales of N. Central Scandinavia*, 1975 [*Wahlenbergia* 1]), Domański (*Mala Flora Grzyłów* 1, *Aphyllorphorales*, 1975), Rattan (1977), Stalpers (1978). Cléménçon (Ed.) (*The species concept in Hymenomycetes*, 1977). Donk (1966), *Persoonia* 4: 145, 1966; 8: 33, 1974; checklists of European heterobasidiomycetes, annotations, ref., index. Lowy, *Taxon* 17: 118, 1968; (heterobasidiomycete taxonomy); Talbot, *Taxon* 17: 620, 1968. Kühner (*TBMS* 68: 1, 1977; nuclear behaviour, review), Moser (*Röhrlinge und Blätterpilze*, 1978), Jülich (*Bibl. Mycol.* 85, 1992), Jülich & Stalpers (*The resupinate non-poroid Aphyllorphorales of the temperate Northern hemisphere*, 1980), Kühner (*Les Hyménomycètes agaricoïdes (Agaricales, Tricholomatales, Pluteales, Russulales)*, 1980), Parmasto (*Windhalia* 16: 3, 1986), Corner (*Ad Polyporaceas* 1-7 (*Beih. Nova Hedw.*), 1983-1991), Moser & Jülich (*Farbatlas der Basidiomyceten* 1-12, 1994), Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 1351, 2000; mol. phylogeny basidiomycetous yeasts).

Regional: **America, North**, Shaffer (*Keys to genera of higher fungi*, edn 2, 1968; mostly hymenomy-

cetes), **South**, Singer (*Beih. Nova Hedw.* 29, 1969; Agaricales, Aphyllorphorales, Gasteromycetes). **Europe**, Donk (1966); **Great Britain**, Rea (*British Basidiomycetae*, 1922; Suppl. *TBMS* 12: 205, 17: 35, 1927-32, incl. gasteromycetes), Reid & Austwick (*Glasgow Nat.* 18: 255, 1963; annot. list of Scottish basidiomycetes, incl. gasteromycetes, excl. rusts and smuts). **France**, Bourdot & Galzin (*Hyménomycètes de France, Hétérobasidiés, Homobasidiés gymnocarpes*, 1927). **Portugal**, Da Camara (*Catalogus systematicus fungorum omnia Lusitaniae. I, Basidiomycetes. Pars 1, Hymeniales*, 1956; Pars 2, *Gasterales, Phalloidales, Tremelloidales, Uredinales et Ustilaginales*, 1958). **former USSR**, Raitviir [Key to Heterobasidiomycetidae of the USSR, 1967].

Agaricomycetidae Parmasto (1986), Agaricomycetes. Ords.:

- (1) Agaricales
- (2) Atheliales
- (3) Boletales

For *Lit.* see fam.

Agaricomycotina Doweld (2001), Basidiomycota. Class.:

- (1) Agaricomycetes
- (2) Dacrymycetes
- (3) Tremellomycetes

For *Lit.* see fam.

Agaricon Tourn. ex Adans. (1763) ≡ Fomitopsis.

Agarico-pulpa Paulet (1793) ≡ Fomitopsis.

Agaricostilbaceae Oberw. & R. Bauer (1989), Agaricostilbales. 3 gen. (+ 1 syn.), 16 spp. Basidiospores produced in a yeast-like manner.

Lit.: Oberwinkler & Bauer (*Sydowia* 41: 224, 1989), Kendrick & Gong (*Mycotaxon* 54: 19, 1995), Swann & Taylor (*MR* 99: 1205, 1995), Frieders & McLaughlin (*CJB* 74: 1392, 1996), Bandoni & Boekhout *in* Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 639, 1998), Scorzetti *et al.* (*FEMS Yeast Res.* 2: 495, 2002).

Agaricostilbales Oberw. & R. Bauer (1989). Agaricostilbomycetes. 3 fam., 9 gen., 43 spp. Fams:

- (1) Agaricostilbaceae
- (2) Chionosphaeraceae
- (3) Kondoaceae

Lit.: Oberwinkler & Bauer (*Sydowia* 41: 224, 1989).

Agaricostilbomycetes R. Bauer, Begerow, J.P. Samp., M. Weiss & Oberw. (2006), Pucciniomycotina. 2 ord., 3 fam., 10 gen., 47 spp. Ords:

- (1) Agaricostilbales
- (2) Spiculogloeales

Lit.: Bauer *et al.* (*Mycol. Progress* 5: 41, 2006).

Agaricostilbum J.E. Wright (1970), Agaricostilbaceae. 3, Argentina; Congo-Kinshasa; India. See Wright *et al.* (*Mycol.* 73: 880, 1981), Brady *et al.* (*TBMS* 83: 540, 1984; nomencl.), Bauer *et al.* (*Syst. Appl. Microbiol.* 15: 259, 1992; ultrastr.), Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 1351, 2000; mol. phylogeny), Bauer *et al.* (*Mycol. Progr.* 5: 41, 2006).

Agarico-suber Paulet (1793) ≡ Daedalea.

Agaricum P. Micheli ex Haller (1768) ≡ Fomitopsis fide Donk (*Proc. K. ned. Akad. Wet. Ser. C, Biol. Med. Sci.* 74: 125, 1971).

Agaricum Paulet (1812) ≡ Agaricon.

Agaricus L. (1753), Agaricaceae. c. 200, widespread (esp. temperate). *A. bisporus* (= *A. brunnescens* fide Malloch *et al.*, *Mycol.* 68: 912, 1976), the cultivated mushroom (see Mushroom cultivation). The name

- Agaricus* was initially used for a group that more or less coincides with the lamellate *Agaricales*. See Möller (*Friesia* 4: 1, 1950-52; Danish species, as *Psalliota*), Pilát (*Acta Mus. Nat. Prag.* 7, 1951; key Europ. spp.), Möller (*Friesia* 4: 135, 1952; Danish species, as *Psalliota*), Heinemann (*Sydowia* 30: 6, 1978; key), Freeman (*Mycotaxon* 8: 50, 1979; key N. Am. spp.), Capelli (*Agaricus* L. :Fr. ss. Karsten (*Psalliota* Fr.), 1984; key Europ. spp.), Bunyard *et al.* (*Fungal Genetics Biol.* 20: 243, 1996; phylogeny), Mitchell & Bresinsky (*Mycol.* 91: 811, 1999; phylogeny), Robison *et al.* (*Mycol.* 93: 30, 2001; phylogeny), Redhead *et al.* (*Mycotaxon* 83: 19, 2002; phylogeny), Challen *et al.* (*Mycol.* 95: 61, 2003; phylogeny *Agaricus* sect. *Duploannulatae*), Fukuda *et al.* (*Mycoscience* 44: 431, 2003; genetic variation in *Agaricus blazei*), Geml *et al.* (*Mycol. Progr.* 3: 157, 2004; molecular evolution), Vellinga (*MR* 108: 354, 2004; phylogeny), Didukh *et al.* (*MR* 109: 729, 2005; *Agaricus* section *Duploannulati*), Kerrigan *et al.* (*Mycol.* 97: 1292, 2005; *Agaricus* section *Xanthodermatei* phylogeny).
- Agaricus** Murrill (1905) = *Daedalea*.
- Agaricus** Raf. (1830) ? = *Amanita* Pers. fide Stalpers (*in litt.*).
- agaritine**, an amino acid from *Agaricus bisporus*.
- Agarwalia** D.P. Tiwari & P.D. Agrawal (1974), anamorphic *Pezizomycotina*, Hso.0eP.3. 1 (from soil), India. See Tiwari & Agrawal (*J. Indian bot. Soc.* 52: 134, 1973), Kendrick (*CJB* 81: 75, 2003; morphogenesis).
- Agarwalomyces** R.K. Verma & Kamal (1987), anamorphic *Pezizomycotina*, Hsy.0eP.3. 1, India. See Verma & Kamal (*TBMS* 89: 596, 1987).
- Agglomerata** J.I.R. Larsson & Yan (1988), Microsporidia. 5. See Larsson & Yan (*Arch. Protistenk.* 135: 271, 1988).
- agglutinate**, fixed together as if with glue.
- agglutinin**, see antigen.
- aggregate** (1) (in taxonomy; 'agg.' or 'aggr.'), see species; (2) (in descriptions), near together, crowded.
- aggregate plasmodium**, see plasmodium.
- Aglacephalum** W. Weston (1933) nom. nud. = *Pulchromyces* fide Pfister *et al.* (*Mycotaxon* 1: 137, 1974).
- Aglaopisma** De Not. ex Bagl. (1856) = *Caloplaca* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Aglaospora** De Not. (1844) = *Massaria* fide Eriksson (*SA* 5: 116, 1986), Barr (*N. Amer. Fl.* ser. 2 13: 129 pp., 1990; separate from *Massaria*).
- Aglaothecium** Groenh. (1962) nom. rej. = *Gyalidea* fide Hafellner (*Beih. Nova Hedwigia* 79: 241, 1984), Lumbsch *et al.* (*Taxon* 40: 331, 1991; nomencl.).
- Agmasoma** E.I. Hazard & Oldacre (1975), Microsporidia. 2.
- Agmocybe** Earle (1909) = *Inocybe* fide Kauffman (*N. Amer. Fl.* 10, 1924).
- Agonimia** Zahlbr. (1909), Verrucariales (L). 10, widespread. See Coppins & James (*Lichenologist* 10: 179, 1978), Harada (*J. Jap. Bot.* 68: 166, 1993; Japan), Aptroot *et al.* (*Biblhca Lichenol.* 64, 1997), Czarnota & Coppins (*Graphis Scripta* 11: 56, 2000; Poland), Aragón & Sarrión (*Nova Hedwigia* 77: 169, 2003; Spain), Lumbsch *et al.* (*Mol. Phylogen. Evol.* 31: 822, 2004; phylogeny), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny), Aptroot *et al.* (*Biblhca Lichenol.* 97, 2008; Costa Rica).
- Agonimiella** H. Harada (1993) = *Agonimia* fide Aptroot *et al.* (*Biblhca Lichenol.* 64, 1997).
- Agonium** Oerst. (1844) nom. dub., ? Fungi. or Cyanobacteria.
- Agonomycetales**. True conidia absent, but non-dehiscent propagules (allocysts, bromatia, bulbils, chlamydospores, sclerotia etc.) produced in some genera. *Agonomycetes* may be states of basidiomycetes, ascomycetes or other anamorphic fungi. *Rhizoctonia* and *Sclerotium* include important plant pathogens.
- Lit.*: Watling (*in* Kendrick (Ed.), *The whole fungus* 2: 453, 1979; states of basidiomycetes), von Arx (*Genera of fungi sporulating in pure culture*, 1981; keys gen.), Domsch *et al.* (*Compendium of soil fungi*, 1980; identification, refs.).
- Agostaea** (Sacc.) Theiss. & Syd. (1915) = *Anhellia* fide von Arx (*Persoonia* 2: 421, 1963).
- Agrabeeja** Subram. (1995), anamorphic *Pezizomycotina*, Hso.?.?. 1, Singapore. See Subramanian (*Kavaka* 20/21: 2, 1992/1993).
- Agrestia** J.W. Thomson (1961) = *Aspicilia* fide Weber (*Aquilo Bot.* 6: 43, 1967).
- agroclavine**, a clavine alkaloid (an intermediate in the biosynthesis of ergoline alkaloids) which is a major alkaloidal constituent of *Claviceps fusiformis* sclerotia. Cf. ergot.
- Agrocybe** Fayod (1889), Strophariaceae. c. 100, widespread. See Singer (*Sydowia* 30: 194, 1978; key), Flynn & Miller (*MR* 94: 1103, 1990; taxonomy), Moncalvo *et al.* (*Syst. Biol.* 49: 278, 2000; phylogeny), Thomas & Manimohan (*Mycotaxon* 86: 317, 2003; India), Nauta (*Persoonia* 18: 429, 2004; Netherlands).
- Agrogaster** D.A. Reid (1986), Bolbitiaceae. 1, New Zealand. Basidioma gasteroid. See Reid (*TBMS* 86: 429, 1986).
- Agyriaceae** Corda (1838), Agyriales ($\pm$ L). 6 gen. (+ 7 syn.), 32 spp. See *Agyriales* for descr.
- Lit.*: Hertel & Rambold (*Biblhca Lichenol.* 38: 145, 1989), Rambold & Triebel (*Notes R. bot. Gdn Edinb.* 46: 375, 1990), Bellemère (*Bull. Soc. linn. Provence* 45: 355, 1994), Brodo (*Biblhca Lichenol.* 57: 59, 1995), Lunke *et al.* (*Bryologist* 99: 53, 1996), Moberg & Carlin (*Symb. bot. upsal.* 31 no. 3: 319, 1996), Lumbsch (*J. Hattori bot. Lab.* 83: 1, 1997), Lumbsch *et al.* (*MR* 105: 16, 2001), Lumbsch *et al.* (*MR* 105: 265, 2001), Schmitt *et al.* (*Mycol.* 95: 827, 2003), Reeb *et al.* (*Mol. Phylogen. Evol.* 32: 1036, 2004), Wedin *et al.* (*MR* 109: 159, 2005), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny), Lumbsch *et al.* (*MR* 111: 1133, 2007).
- Agyriales** Clem. & Shear (1931). Ostropomycetidae. 4 fam., 17 gen., 147 spp. Thallus absent. Ascomata apothecial, sometimes elongated, often domed, hymenium usually gelatinous, not blueing in iodine. Interascal tissue of branched and anastomosing paraphyses, sometimes with a well-developed pigmented epithelial layer. Asci varied in form, opening by eversion through a vertical split, and blueing faintly in iodine. Ascospores small, hyaline, aseptate, without a gelatinous sheath. Anamorphs pycnidial. Saprobic on bark and wood, esp. on conifers.
- The *Agyriales* was treated for some years as a suborder of the *Lecanorales*, but molecular data confirm its placement within the *Ostropomycetidae*. It may be appropriate to place the order in synonymy with the

Pertusariales, but more studies are required. Fams:

(1) **Agyriaceae**

(2) **Anamylopsoraceae**

Lit.: Lumbsch (*J. Hattori Bot. Lab.* **83**: 1, 1997), Lumbsch *et al.* (*MR* **105**: 16, 265, 2001), Lumbsch *et al.* (*MR* **111**: 257, 2007; phylogeny), Lumbsch *et al.* (*MR* **111**: 1133, 2007; phylogeny), Miadlikowska *et al.* (*Mycol.* **98**: 1088, 2006), Rambold & Triebel (*Notes R. bot. Gdn, Edin.* **46**: 375, 1990).

Agyriella Ellis & Everh. (1897) = *Agyriopsis*.

Agyriella Sacc. (1884), anamorphic *Pezizomycotina*, Hsp.0eH-P.15. 2, Europe. See Ellis (*Dematiaceous Hyphomycetes*, 1971).

Agyriellopsis Höhn. (1903), anamorphic *Pezizomycotina*, St.0eH.15. 2, Europe.

Agyrina (Sacc.) Clem. (1909) = *Steinia* fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).

Agyriopsis Sacc. & P. Syd. (1899) = *Schizoxylon* fide Sherwood (*Mycotaxon* **6**: 215, 1977).

Agyrium Fr. (1822), *Agyriaceae*. 3 (saprobic), widespread (temperate). See Lumbsch (*J. Hattori bot. Lab.* **83**: 1, 1997), Kantvilas (*Muelleria* **16**: 65, 2002; Australia), Zhuang & Yang (*Mycotaxon* **96**: 169, 2006; China).

Agyrona Höhn. (1909) = *Mollerella* fide von Arx (*Persoonia* **2**: 421, 1963).

Agyronella Höhn. (1909) = *Schizothyrium* fide von Arx & Müller (*Stud. Mycol.* **9**, 1975).

Agyrophora (Nyl.) Nyl. (1896) = *Umbilicaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Ahlesia Fuckel (1870) = *Thelocarpon* fide Poelt & Hafellner (*Phyton Horn* **17**: 67, 1975), Rossman *et al.* (*Stud. Mycol.* **42**: 248 pp., 1999).

Ahmad (Sultan; 1910-1983; Pakistan). MSc degree (1932) then BEd (1934) then PhD (1950) then DSc (1957), University of the Punjab, Lahore; academic staff (1947 onwards) then Professor and Head of Department of Botany (to 1970), Government College, Lahore (1970); Professor Emeritus, University of the Punjab, Lahore (1972 onwards). Pioneer in studies of the mycota of Pakistan, collaborating particularly with E. Müller (q.v.) and Petrak (q.v.); founder of the Biological Society of Pakistan, and editor of its journal *Biologia* (1955-1983); Fellow of the Academy of Sciences of Pakistan (1974). His specimens are in the fungal reference collection, Department of Botany, University of the Punjab, Lahore (many duplicates in **BPI** and **IMI**). *Publs.* Fungi of West Pakistan. *Mono-graphs. Biological Society of Pakistan* (1956); Fungi of West Pakistan. Supplement I. *Biologia* Lahore (1969); Ascomycetes of Pakistan Parts I & II. *Mono-graphs. Biological Society of Pakistan* (1978). *Biogs, obits etc.* Ghaffar & Ali (*Pakistan Journal of Botany* **26**: 201, 1994).

Ahmadia Syd. (1939), anamorphic *Pezizomycotina*, Cac. = eH.15. 1, Pakistan.

Ahmadiago Vánky (2004), ? *Ustilaginaceae*. 1 (on *Euphorbia*), India. See Vánky (*Mycotaxon* **89**: 55, 2004), Piątek (*Mycotaxon* **92**: 33, 2005).

Ahmadinula Petr. (1953) = *Truncatella* fide Sutton (*Mycol. Pap.* **141**, 1977), Shoemaker *et al.* (*Sydowia* **41**: 308, 1989; synonymy).

Ahtia M.J. Lai (1980) = *Cetrariopsis*.

Ahtiana Goward (1986), *Parmeliaceae* (L.). 3, N. America. See Thell *et al.* (*Bryologist* **98**: 596, 1995; monogr.), Thell (*Folia Cryptog. Estonica* **32**: 113, 1998), Thell *et al.* (*Mycol. Progr.* **1**: 335, 2002; phy-

logeny), Mattsson & Articus (*Symb. bot. upsal.* **34** no. 1: 237, 2004; phylogeny), Thell *et al.* (*Mycol. Progr.* **3**: 297, 2004; phylogeny).

AIDS, Acquired immunity deficiency syndrome. See Bossche *et al.* (Eds) (*Mycoses in AIDS patients*, 1989; infections by fungi in AIDS patients). See Medical and Veterinary mycology, *Pneumocystis*.

Aigialus Kohlm. & S. Schatz (1986), ? *Pleosporales*. 6 (marine, on mangroves), widespread. See Borse (*TBMS* **88**: 424, 1987; key 4 spp.), Hawksworth (*SA* **6**: 338, 1987; status), Barr (*N. Amer. Fl. ser.* **2** **13**: 129 pp., 1990; posn), Hyde (*MR* **96**: 1044, 1992), Tam *et al.* (*Bot. Mar.* **46**: 487, 2003; posn).

Ailographium, see *Aulographum*.

Ainoa Lumbsch & I. Schmitt (2001), *Baeomycetales* (L.). 2. See Lumbsch *et al.* (*MR* **105**: 272, 2001), Lumbsch *et al.* (*Mol. Phylogen. Evol.* **31**: 822, 2004; phylogeny), Hermansson (*Graphis Scripta* **17**: 41, 2005; Sweden), Wedin *et al.* (*MR* **109**: 159, 2005; phylogeny), Lumbsch *et al.* (*MR* **111**: 257, 2007; phylogeny), Lumbsch *et al.* (*MR* **111**: 1133, 2007).

Ainsworth (Geoffrey Clough; 1905-1998; England). Assistant Mycologist, Imperial Mycological Institute, Kew (1939-1946); Head of Mycological Department, Wellcome Physiological Research Laboratories, Beckenham (1946-1948); Lecturer / Reader, University of the South West, Exeter (1948-1957); Assistant Editor (1957-1960) then Assistant Director (1961-1964) then Director (1964-1968), Commonwealth Mycological Institute, Kew. A mycological scholar, campaigner and visionary; with Bisby (q.v.) co-founder of this Dictionary, the first edition being prepared at night during fire-watch duty in world-war II during the bombing of London; a founder and Honorary President for Life of the International Mycological Association (q.v. Societies and organizations), he chaired the organizing committee of the first International Mycological Congress (Exeter, 1971). *Publs.* (with Sparrow & Sussman) *The Fungi, an Advanced Treatise* 4 vols (1965-1973); *Introduction to the History of Mycology* (1976); *Introduction to the History of Plant Pathology* (1981); *Introduction to the History of Medical Mycology* (1987). *Biogs, obits etc.* Webster (*Mycol.* **91**: 714, 1999); Hawksworth (*MR* **104**: 110, 2000) [portrait].

Ainsworthia Bat. & Cif. (1962) [non *Ainsworthia* Boiss. 1844, *Umbelliferae*] = *Phaeosaccardinula* fide von Arx & Müller (*Stud. Mycol.* **9**, 1975).

Aipospila Trevis. (1857) = *Lecania* fide Hafellner (*Beih. Nova Hedwigia* **79**: 241, 1984).

Air pollution. Human introduction of biological materials, chemicals and particulate matter into the atmosphere can harm fungi. Effects on many foliicolous and stem fungi, and on lichen-forming species on all substrata are well documented.

Lichens are arguably the most sensitive organisms to sulphur dioxide known, some being affected at mean levels of about 30 µg m⁻³. The algae or cyanobacteria in lichens are particularly sensitive to pollutants such as sulphur dioxide which disrupt membranes leading to chlorophyll breakdown. Nylander (q.v.) suggested lichens could be used to monitor air quality in 1866 and there is now a vast literature on this subject. Fluorides are also highly toxic to lichens but particulate deposits (e.g. smoke), heavy metals, and photochemical smog components have less effect. Differential sensitivity due to physiological, structural, and chemical characters enables zones to

estimate pollution levels to be constructed (Hawksworth & Rose, *Nature* 227: 145, 1970; Gilbert, *New Phytol.* 69: 629, 1970); recolonization in response to falling sulphur dioxide levels can be dramatic (Hawksworth & McManus, *Bot. J. Linn. Soc.* 100: 99, 1989; London); statistical and computer assisted approaches are increasingly used (e.g. Nimis *et al.*, *Stud. Geobot.* 11, 1991).

Erysiphales and *Pucciniales* are amongst the other most sensitive fungi; *Diplocarpon rosae* (Saunders, *Ann. appl. Biol.* 58: 103, 1966) and *Rhytisma acerinum* (Bevan & Greenhalgh, *Environ. Pollut.* 10: 271, 1976) can also be used as pollution monitors. Numerous studies of forest decline, often in response to acid rain, have shown that endophyte and saprobic microfungi can be very strongly affected, with typically a small number of resistant (generalist) species increasing in abundance, and most other species declining in numbers (e.g. Asai *et al.*, *MR* 102: 1316, 1998). Leaf-dwelling yeasts (*Sporobolomyces*, *Tilletiopsis*) can be cultured and the density of sporing has been found to be directly related to acidic air pollution (Dowding, in Richardson, *Biological indicators of pollution*: 137, 1987).

Radiation pollution has become more important since the 1986 Chernobyl disaster. In this and other cases, the amount of metal and radionuclides taken up by lichens has been used to map the extent of affected areas (Steinne *et al.*, *J. Environ. Radioact.* 21: 65, 1993). Certain hypogeous fungi, particularly species of *Elaphomyces* accumulate radionuclides in greater quantities than almost any other living organism. After Chernobyl, radionuclides were found to be transmitted from those fungi, along a food chain via wild boar into the human population (Vilic *et al.*, *J. Environ. Radioact.* 81: 55, 2005). Increases in lead contents from traffic, and falls since the introduction of unleaded fuel, are documented by Lawrey (*Bryologist* 96: 339, 1993).

Fungal spores may themselves be a component of air pollution. This can be particularly problematical in modern buildings where, for example, ventilation is insufficient. In those conditions, fungi may trigger various allergic, toxic or other responses, sometimes collectively described as 'sick-building syndrome'.

Lit.: Bates & Farmer (Eds) (*Bryophytes and lichens in a changing environment*, 1992), Coleman (*J. Building Appraisal* 1: 362, 2005), Ferry *et al.* (Eds) (*Air pollution and lichens*, 1973; incl. reviews effects on all plants and fungi), Hawksworth & Rose (*Lichens as pollution monitors*, 1976), Henderson (*Lichenologist* 1974-; twice-yearly bibl.), Nash & Wirth (Eds) (*Lichens, bryophytes and air quality*, [Bibl. Lich. 30], 1988), Nieboer *et al.* (in Mansfield, 1976: 61; review sulphur dioxide toxicity), Purvis *et al.* (Eds) (*Lichens in a changing pollution environment. Environmental pollution* 146: 291, 2007), Richardson (*Bot. J. Linn. Soc.* 96: 31, 1988; *Pollution monitoring with lichens*, 1992). See also Acid rain, Allergy, Bioindicators, Ecology, Index of Atmospheric Purity, lichen desert.

Air spora. Airborne particles originating from fungi and other organisms are collectively referred to as the air spora or bioaerosol. Fungal spores are important components of the air spora. Prevalent genera are *Alternaria*, *Aspergillus*, *Aureobasidium*, *Cladosporium*, *Curvularia*, *Epicoccum*, *Fusarium*, *Geotrichum*, *Nigrospora*, *Neurospora*, *Penicillium*, *Phoma* and

Pithomyces. Probably most originate from saprobes growing in soil or on leaf surfaces (see e.g. Levetin & Dorsey, *Aerobiologia* 22: 3, 2006), but some may be animal or plant pathogens. Knowledge of their occurrence in air was revolutionized by use of continuously operating volumetric samplers (Hirst, *Ann. appl. Biol.* 39: 257, 1952) out of doors and a realization of the importance of the sampling and collection efficiencies of different trapping methods in determining what is caught. The Hirst and subsequent Burkard traps have revealed the importance in the air spora of ascospores and basidiospores that were previously underestimated by using exposed horizontal sticky slides and open Petri dishes. Indoors, fungal spores are often abundant when stored products are handled but their sampling and enumeration require different methods from those used out of doors because of their smaller size and greater concentrations (see Cox & Wathes, *Bioaerosols handbook*, 1994; Elbert *et al.*, *Atmospheric Chemistry and Physics Discussions* 6: 11317, 2006). Molecular and immunological techniques are now applied in studying and identifying air spora (see Lacey & West, 2006).

Out of doors, fungal spores are almost always present in the air but their numbers and types depend on time of day, weather, season, geographical location and the nearness of large local spore sources. Total spore concentrations may range from fewer than 200 to 2 million m⁻³. Terrestrial fungi most commonly produce wind-dispersed spores which then settle by sedimentation, impaction or rain-wash. Active spore discharge provides a means to avoid local settling, to reach potentially turbulent air currents for more distant dispersal. In many basidiomycete species stipe and gills provide a vertical escape path for the spores. Then even delicate air current can change the gradual fall and divert them into turbulent air. Violent ascospore release is more moisture dependent; when the turgid ascus bursts, the wall contracts and spores are ejected into the air. Spores released passively (e.g. of powdery mildews, rusts and smuts) are also often abundant in the air spora, since these mostly disseminate from diseased plant material above ground.

Spores of different species exhibit characteristic circadian periodicities in their occurrence in the air spora because their method of liberation is correlated with time of day (see Spore discharge and dispersal). Spores with active mechanisms requiring water are usually most numerous in the air at night, following dew formation, or rain; those dependent on drying are most numerous in the early morning as the sun dries their colonies; those released through mechanical disturbance occur during the middle of the day, when temperatures are highest and wind speeds, turbulence and convection are greatest. However, some discomycetes release their spores after sunrise, those with large apothecia being later than those with smaller, perhaps because some drying is needed to increase pressure on the asci. *Cladosporium* is the most numerous daytime spore type throughout most of the world although, in some seasons it may be exceeded by *Alternaria* in warm dry climates or by *Curvularia* or *Drechslera* in humid climates. At night time, ascospores, basidiospores and the ballistospores of *Sporobolomyces* and related 'mirror' yeasts become most numerous. Rain initially causes an increase in spore concentrations through 'tap and puff' (Hirst & Stedman, *J. gen. Microbiol.* 33: 335, 1963),

then washes spores from the air, and, afterwards, stimulates release of ascospores.

After exceeding canopy height, fungal spores can migrate long but measurable distances before settling (Nagarajan & Singh, *Ann. Rev. Phytopathol.* **28**: 139, 1990). Intercontinental dispersal of rust spores has been demonstrated for *Puccinia* (Asai, *Phytopathology* **50**: 535, 1960). Variations in the vertical profile of air spora and in their atmospheric concentrations has been used in prognoses for plant disease and allergy development (Lyon *et al.*, *Grana* **23**: 123, 1984; Wu *et al.*, *Atmospheric Environment* **38**: 4879, 2004; Zoppas *et al.*, *Aerobiologia* **22**: 119, 2006). For many fungi, horizontal spore concentration in air is normally minimal at 100–200 m from the source and the vertical concentration decreases logarithmically with height above ground. Fungal spore viability is important in determining migration capacity: rusts spores remain viable for many days and can carry infections great distances.

Large seasonal differences in spore concentrations occur in temperate regions, with few airborne spores in winter (see Li & Kendrick, *Grana* **34**: 199, 1995). In tropical regions, spores may be numerous all the year round although some types may be particularly favoured by wet or dry seasons (see Ogunlana, *Appl. Microbiol.* **29**: 458 (1975); Troutt & Levetin, *International J. Biometeorology* **45**: 64, 2001). Air is rich in spores of common moulds, rusts, downy and powdery mildews in dry weather, and in short-lived ascospores soon after rain. Growing crops form large sources of spores, especially of phytopathogenic fungi, whose occurrence may be correlated with crop growing seasons (see Lacey, in Cole & Kendrick (Eds), *Biology of conidial fungi*: 373, 1981). Sometimes, fungi pathogenic to humans can become airborne in dust in desert areas (e.g., *Coccidioides immitis*) or when deposits of guano beneath bird roosts are disturbed (*Histoplasma capsulatum*) (see also Medical mycology).

Indoors, numbers and types of airborne spores are determined by their source and, with stored products, the conditions in which they have been stored, the degree of disturbance of the substrate and the position and amount of ventilation. Concentrations of fungal spores may exceed 100 million m⁻³ air when mouldy hay and grain are handled, with *Aspergillus* and *Penicillium* spp. predominant. *Aspergillus fumigatus*, an opportunistic pathogen and frequent cause of asthma and mycotic abortion in cattle, may also be abundant. Concentrations of oyster mushroom (*Pleurotus ostreatus*) basidiospores may reach 27 million m⁻³ in growing sheds while up to 14 million m⁻³ *Penicillium* spores can be released when mouldy cork is handled. These concentrations may cause occupational allergies (see Allergy). Sampling of air indoors has shown seasonal variation in fungal spore composition, with *Cladosporium* species in one study predominating during warm periods, and *Penicillium* and *Aspergillus* predominating in winter (Medrelakuder, *International biodeterioration & biodegradation* **52**: 203, 2003). Species of *Cladosporium* common in indoor air spora can trigger allergic reactions. In Japan, *Trichosporon* sp. present in indoor air spora has been correlated with development of allergic alveolitis (Summerbell *et al.*, *Journal of Medical and Veterinary Mycology Suppl.* **1**: 279, 1992).

Lit.: Dimmick & Akers (Eds) (*An introduction to*

experimental aerobiology, 1969), Edmonds (*Aerobiology, the ecological systems approach*, 1979), Gregory (*Microbiology of the atmosphere*, 2nd edn, 1973), Lacey & West *The Air Spora: A manual for catching and identifying airborne biological particles*, 2006, Samson *et al.* (Eds) (*Introduction to food- and airborne fungi*, edn 7, 2004).

Aithaloderma P. Syd. (1913), ? Capnodiaceae. Anamorph *Ciferrioxylum*. 15, widespread (tropical). See Hughes (*Mycol.* **68**: 693, 1976), Olejnik & Ingrouille (*MR* **103**: 333, 1999; numerical taxonomy), Reynolds & Gilbert (*Aust. Syst. Bot.* **18**: 265, 2005; Australia).

Aithalomyces Woron. (1926) = Euantennaria fide Hughes (*N.Z. J. Bot.* **10**: 225, 1972).

Aivenia Svrček (1977), Dermateaceae. 4, former Czechoslovakia. See Svrček (*Česká Mykol.* **43**: 215, 1989).

Ajello (Libero; 1916–2004; USA). Largely self-taught medical mycologists, working on tinea pedis among army recruits, Georgia (1943) then Johns Hopkins University (1944–1945); PhD, Columbia University (1947); Diagnostic Reference & Research Unit, Communicable Disease Centre, eventually as Head of the World Health Organizations Collaborating Center for Mycotic Diseases there, Atlanta (1948–1990). Outstanding medical mycologist of the 20th century, with over 400 publications, playing a pivotal role in the International Society for Human and Animal Mycology, and as an editor of its journal *Medical Mycology*; a great mentor who developed courses for the teaching of medical mycology run within the USA and in many other countries. He also significantly provided editorial support for non-English speaking scientists, particularly from Latin America. *Publs.* The medical mycological iceberg. *HSMHA health rep.* **86**: 437, 1971; (with Arora, Mukerji & Elander) *Handbook of applied mycology* vol. 2, 1991; (with Hay) *Medical mycology. Topley and Wilson's microbiology and microbial infections*, edn 9, 2002. *Biogs, obits etc.* Goodman & DiSalvo (*Mycopathologia* **157**: 359, 2004), Müller (*Mycoses* **46**: 5, 2003).

Ajellomyces McDonough & A.L. Lewis (1968), Ajellomycetaceae. Anamorphs *Blastomyces*, *Histoplasma*. 3, widespread (esp. tropical). *A. dermatitidis* (anamorph *Blastomyces zymonema* (syn. *B. dermatitidis*); see blastomycosis), *A. capsulata* (anamorph *Histoplasma capsulatum*; see histoplasmosis). See Sigler (*J. Med. Vet. Mycol.* **34**: 303, 1996), Guého *et al.* (*Mycoses* **40**: 69, 1997; phylogeny), Sugiyama *et al.* (*Mycoscience* **40**: 251, 1999; phylogeny), Taylor *et al.* (*Fungal Genetics Biol.* **31**: 21, 2000; species concepts), Berbee (*Physiological and Molecular Plant Pathology* **59**: 165, 2001; phylogeny), Sugiyama *et al.* (*Stud. Mycol.* **47**: 5, 2002; phylogeny), Untereiner *et al.* (*Stud. Mycol.* **47**: 25, 2002; phylogeny), Untereiner *et al.* (*Mycol.* **96**: 812, 2004; fam. Placement), Pujol *et al.* (*Evolutionary Genetics of Fungi*: 149, 2005; population genetics).

Ajellomycetaceae Unter., J.A. Scott & Sigler (2004), Onygenales. 7 gen. (+ 3 syn.), 14 spp.

Lit.: Currah (*Mycotaxon* **24**: 1, 1985), Fukushima *et al.* (*Mycopathologia* **116**: 151, 1991), Sigler (*J. Med. Vet. Mycol.* **34**: 303, 1996), Guého *et al.* (*Mycoses* **40**: 69, 1997), Larone *et al.* (*Manual of Clinical Microbiology*: 1259, 1999), Sano *et al.* (*Mycopathologia* **143**: 165, 1998), Bialek *et al.* (*J. Clin. Microbiol.* **38**: 3190, 2000), San-Blas *et al.* (*Medical*

- Mycology* 40: 225, 2002), Semighini *et al.* (*Diagn. Microbiol. Infect. Dis.* 44: 383, 2002), Sugiyama *et al.* (*Stud. Mycol.* 47: 5, 2002), Untereiner *et al.* (*Stud. Mycol.* 47: 25, 2002), Feitosa *et al.* (*Fungal Genetics Biol.* 39: 60, 2003), Sigler (*Mycology Series* 16: 195, 2003), Ueda *et al.* (*Veter. Pathol.* 94: 219, 2003), Untereiner *et al.* (*Mycol.* 96: 812, 2004).
- Ajrekarella** Kamat & Kalani (1964), anamorphic *Pezizomycotina*, St.0eH.19. 1, India. See Sutton (*Mycopath. Mycol. appl.* 33: 76, 1967; redescr.).
- Akanthomyces** Lebert (1858), anamorphic *Cordyceps*, *Torrubiella*, Hsp.0eH.?. 9 (on insects and spiders), widespread. See Mains (*Mycol.* 42: 566, 1950), Samson & Evans (*Acta Bot. Neerl.* 23: 28, 1974), Hywel-Jones (*MR* 100: 1065, 1996; Thailand), Hsieh *et al.* (*Mycol.* 89: 319, 1997; Taiwan), Artjariyasripong *et al.* (*Mycoscience* 42: 503, 2001; phylogeny), Stensrud *et al.* (*MR* 109: 41, 2005; phylogeny), Sung *et al.* (*Stud. Mycol.* 57: 1, 2007; phylogeny, biology).
- Akaropeltella** M.L. Farr (1972), ? Micropeltidaceae. Anamorph *Sporidesmium*-like. 1. See Farr (*Mycol.* 64: 252, 1972), von Arx & Müller (*Stud. Mycol.* 9, 1975; connexion), Réblová (*Mycotaxon* 71: 13, 1999).
- Akaropeltis** Bat. & J.L. Bezerra (1961) [non *Acaropeltis* Petr. 1937] = *Akaropeltella*.
- Akaropeltopsis** Bat. & Peres (1966) ? = *Stomiopeltis* fide von Arx & Müller (*Stud. Mycol.* 9, 1975), Smith *et al.* (*Phytophylactica* 17: 101, 1985).
- akaryote** (of *Plasmodiophoraceae*), the stage in the nuclear cycle before meiosis in which no or little chromatin is seen in the nucleus.
- Akenomyces** G. Arnaud (1954) nom. inval. = *Akenomyces* G. Arnaud ex D. Hornby fide Stalpers (*in litt.*).
- Akenomyces** G. Arnaud ex D. Hornby (1984), anamorphic *Agaricomycetes*. 1 (with clamp connexions), Europe. See Hornby (*TBMS* 82: 653, 1984).
- akinete** (1) a non-motile reproductive structure; (2) a resting cell.
- Akrophyton** Lebert (1858) = *Cordyceps* fide Tulasne & Tulasne (*Select. fung. carpol.* 3: 4, 1865), Sung *et al.* (*Stud. Mycol.* 57: 1, 2007).
- alate**, winged.
- Alatosessilispora** K. Ando & Tubaki (1984), anamorphic *Pezizomycotina*, Hso.1bH.1. 1, Japan. See Ando & Tubaki (*TMSJ* 25: 24, 1984).
- Alatospora** Ingold (1942), anamorphic *Leotiaceae*, Hso.1bH.15. 5 (freshwater), widespread. See Marvanová & Descals (*J. Linn. Soc. Bot.* 91: 1, 1985; key), Gönczöl & Révay (*Fungal Diversity* 12: 19, 2003; ecology), Belliveau & Bärlocher (*MR* 109: 1407, 2005; phylogeny), Descals (*MR* 109: 545, 2005; morphology), Baschien *et al.* (*Nova Hedwigia* 83: 311, 2006; morphology, phylogeny).
- Albatrellaceae** Nuss (1980), Russulales. 7 gen. (+ 3 syn.), 45 spp.
Lit.: Fogel (*CJB* 57: 1718, 1979; as *Leucogastraceae*), Beaton *et al.* (*Kew Bull.* 40: 827, 1985; as *Leucogastraceae*), Keller (*Mycol. helv.* 2: 1, 1986), Corner (*Beih. Nova Hedwigia* 96: 218 pp., 1989), Stalpers (*Persoonia* Suppl. 14: 537, 1992), Zheng *et al.* (*Acta Mycol. Sin.* 11: 107, 1992), Valenzuela *et al.* (*Revta Mex. Micol.* 10: 113, 1994), Agerer *et al.* (*Mycotaxon* 59: 289, 1996), Ginns (*CJB* 75: 261, 1997), Bruns *et al.* (*Mol. Ecol.* 7: 257, 1998), de Hoog *et al.* in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 201, 1998; as *Leucogastraceae*), Dai & Zeng (*Mycosystema* 18: 226, 1999), Montecchi & Sarasini (*Funghi Ipogei d'Europa*: 714 pp., 2000; as *Leucogastraceae*), Thorn (*Karstenia* 40: 181, 2000), Binder & Hibbett (*Mol. Phylogen. Evol.* 22: 76, 2002), Larsson & Larsson (*Mycol.* 95: 1037, 2003), Ryman *et al.* (*MR* 107: 1243, 2003), Binder *et al.* (*Systematics and Biodiversity* 3: 113, 2005), Albee-Scott (*MR* 111: 653, 2007; as *Leucogastraceae*).
- Albatrellopsis** Teixeira (1993) = *Albatrellus*.
- Albatrellus** Gray (1821), Albatrellaceae. 16 (mycorrhizal), widespread (north temperate). See Donk (*Persoonia* 1: 173, 1960; as *Scutiger*), Ginns (*CJB* 75: 261, 1, 1975), Nuss (*Hoppea* 39: 127, 1980; posn), Zheng (*Mycotaxon* 90: 291, 2004; China).
- Albertiniella** Kirschst. (1936), Cephalothecaceae. Anamorph *Acremonium*-like. 1 (on *Ganoderma*), Europe; Japan. See Lundqvist (*Svensk bot. Tidskr.* 86: 261, 1992), Suh & Blackwell (*Mycol.* 91: 836, 1999; phylogeny), Huhndorf *et al.* (*Mycol.* 96: 368, 2004; phylogeny).
- Albigo** Ehrh. ex Steud. (1824) ? = *Sphaerotheca* Lév. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Albocrustum** Lloyd (1925) = *Biscogniauxia* See Pouzar (*Česká Mykol.* 33: 207, 1979), Læssøe (*SA* 13: 43, 1994).
- Alboffia** Speg. (1899) = *Corynelia* fide Fitzpatrick (*Mycol.* 12: 239, 1920).
- Alboffiella** Speg. (1898) = *Itajahya* fide Stalpers (*in litt.*).
- Alboleptonia** Largent & R.G. Benedict (1970) = *Entoloma* fide Stalpers (*in litt.*).
- Albomyces** I. Miyake (1908), anamorphic *Aciculosporium*. 1 (on bamboos), Japan. See Oguchi (*Mycoscience* 42: 217, 2001; morphology, biology).
- Albonectria** Rossman & Samuels (1999), Nectriaceae. Anamorph *Fusarium*. 3 (decaying wood and other plant parts), widespread (esp. tropical). See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Samuels *et al.* (*Tropical Mycology* 2: 13, 2002; key), Summerbell & Schroers (*J. Clin. Microbiol.* 40: 2866, 2002; phylogeny).
- Albophoma** Tak. Kobay., Masuma, Omura & Kyoto Watan. (1994), anamorphic *Pezizomycotina*, Cpd.0eH.19. 1 (from soil), Japan. See Kobayashi *et al.* (*Mycoscience* 35: 399, 1994), Bills *et al.* (*Mycol. Progr.* 1: 3, 2002).
- Albosynnema** E.F. Morris (1967), anamorphic *Bionectriaceae*, Hsy. = eP.1. 2, C. America; Caribbean. See Morris (*Mycopath. Mycol. appl.* 33: 179, 1967), Bills *et al.* (*Sydowia* 46: 1, 1994), Rossman *et al.* (*Mycol.* 93: 100, 2001; posn).
- Albotricha** Raitv. (1970), Hyaloscyphaceae. c. 19, widespread (north temperate). See Raitviir (*Scripta Mycol.* 1: 1, 1970; key), Raitviir (*Folia Cryptog. Estonica* 2: 13, 1973), Raitviir (*Folia Cryptog. Estonica* 12: 1, 1981), Zhuang (*Mycotaxon* 69: 359, 1998), Leenurm *et al.* (*Sydowia* 52: 30, 2000; ultrastr.), Wu (*Mycotaxon* 88: 387, 2003; Taiwan).
- Alciphila** Harmaja (2002), anamorphic *Pezizomycotina*. 1 (on urine-impregnated ground), Scandinavia. See Harmaja (*Karstenia* 42: 34, 2002).
- Aldona** Racib. (1900), Parmulariaceae. 3 (on leaves of *Pterocarpus*), pantropical. See Müller & Patil (*TBMS* 60: 117, 1973; key), Inácio *et al.* (*Mycol. Progr.* 4: 133, 2005).
- Aldonata** Sivan. & A.R.P. Sinha (1989), Parmulariaceae. 1 (on leaves of *Pterocarpus*), India. See

- Sivanesan & Sinha (*MR* 92: 246, 1989).
- Aldridgea** Massee (1892) nom. dub., Agaricomycetes. See Donk (*Taxon* 6: 18, 1957).
- Aldridgiella**, see *Aldrigiella*.
- Aldrigiella** Rick (1934) nom. dub., Fungi. See Donk (*Taxon* 6: 18, 1957).
- ale**, see beer.
- Alectoria** Ach. (1809), Parmeliaceae (L). 8, widespread (montane-boreal and bipolar). See Brodo & Hawksworth (*Op. bot. Soc. bot. Lund* 42, 1977; key), Mattsson & Wedin (*Lichenologist* 31: 431, 1999), Peršoh *et al.* (*Mycol. Progr.* 3: 103, 2004; asci), Thell *et al.* (*Symb. bot. upsal.* 34 no. 1: 429, 2004; biogeography), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Alectoria** Link (1833) = *Usnea* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Alectoriaceae** Tomas. (1949) = Parmeliaceae.
- Alectoriomyces** Cif. & Tomas. (1953) ≡ *Alectoria* Ach.
- Alectoriopsis** Elenkin (1929) = *Ramalina* fide Eriksson & Hawksworth (*SA* 6: 112, 1987).
- Alectorolophoides** Battarra ex Earle (1909) = *Cantharellus* fide Stalpers (*in litt.*).
- alepidote**, having no scales or scurf; smooth.
- aleukia disease** (alimentary toxic aleukia; ATA), see trichothecenes.
- Aleuria** (Fr.) Gillet (1879) ≡ *Peziza* Fr.
- Aleuria** Fuckel (1870), Pyronemataceae. 17 (on soil), widespread (north temperate). See Rifai (*Verh. K. ned. Akad. Wet. tweede sect.*: 1, 1968; Australian spp.), Moravec (*Česká Mykol.* 26: 74, 1972), Kaushal (*Mycol.* 68: 1021, 1976; Indian spp.), Häffner (*Rheinl.-Pfälz. Pilzj.* 3: 6, 1993), Spooner & Yao (*MR* 99: 1515, 1995; excl. spp.), Landvik *et al.* (*Nordic J Bot.* 17: 403, 1997; DNA), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Aleuriaceae** Le Gal (1947) = Pyronemataceae.
- Aleuriella** P. Karst. (1871) = *Mollisia* fide Saccardo (*Syll. fung.* 8: 1, 1889).
- Aleurina** (Sacc.) Sacc. & P. Syd. (1902) = *Peziza* Fr. fide Eckblad (*Nytt Mag. Bot.* 15: 1, 1968).
- Aleurina** Massee (1898), Pyronemataceae. 11, widespread. See Zhuang & Korf (*Mycotaxon* 26: 361, 1986; key), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- aleuriospore** (obsol.), formerly used for a thick-walled and pigmented but sometimes thin-walled and hyaline conidium developed from the blown-out end of a conidiogenous cell or hyphal branch from which it secedes with difficulty, as in *Aleurisma*, *Mycogone*, *Microsporum*; 'chlamydospore' sensu Hughes (1953); gangliospore. Since introduced by Vuillemin (1911), aleuriospore has been used in various senses, see Mason (1933, 1937) and Barron (1968), and finally rejected as a confused term (Kendrick, *Taxonomy of Fungi imperfecti*, 1971).
- Aleurisma** Link (1809) = *Trichoderma* Pers. (1794) fide Hughes (*CJB* 36: 727, 1958), Carmichael (*CJB* 40: 1137, 1962; synonym of *Chrysosporium* in sense of Vuillemin (1911)).
- Aleurismataceae** Vuill. (1911) = Hypocreaceae.
- Aleurobotrys** Boidin (1986), Stereaceae. 10. See Boidin & Gilles (*BSMF* 102: 291, 1986) *Aleurodiscus* s.l.
- Aleurocorticium** P.A. Lemke (1964) = *Dendrothele* fide Lemke (*CJB* 42: 723, 1965).
- Aleurocystidiellum** P.A. Lemke (1964), Russulales. 2, widespread. See Lemke (*CJB* 42: 277, 1964), Larsson & Larsson (*Mycol.* 95: 1037, 2003; phylogeny).
- Aleurocystis** Lloyd ex G. Cunn. (1956), Stereaceae. Anamorph *Matula*. 3, widespread. See Cunningham (*Trans. & Proc. Roy. Soc. New Zealand* 84: 234, 1956), Rajchenberg & Robledo (*Mycotaxon* 92: 317, 2005; Argentina).
- Aleurodiscaceae** Jülich (1982) = Stereaceae.
- Aleurodiscus** Rabenh. ex J. Schröt. (1888) nom. cons., Stereaceae. 12, widespread. See Lemke (*CJB* 42: 213, 1964; key 26 amyloid-spored spp.), Núñez & Ryvarden (*Syn. Fung.* 12, 1997), Wu *et al.* (*Mycol.* 93: 720, 2001; phylogeny), Larsson & Larsson (*Mycol.* 95: 1037, 2003; phylogeny).
- Aleurodomyces** Buchner (1912), anamorphic *Pezizomycotina*. 1 (on *Insecta*), Europe.
- Aleuromyces** Boidin & Gilles (2002), Stereaceae. 1, Gabon. See Boidin & Gilles (*BSMF* 117: 176, 2001).
- Aleurophora** O. Magalh. (1916) ? = *Chrysosporium* fide Dodge (*Medical Mycology*, 1935).
- Aleurosporia** Grigoraki (1924) = *Trichophyton* fide Dodge (*Medical Mycology*, 1935).
- Alexopoulos** (Constantine John; 1907-1986; USA). University teacher, Michigan, Iowa, Texas. Wrote books on general mycology (see Literature) and *Mycetozoa* (q.v.) which became standard texts; pioneered modern recording of fungi in Greece. *Biogs, obits etc.* Brodie (*Mycol.* 79: 163, 1986); Blackwell (*TBMS* 90: 153, 1988) [portrait]; Grumann (1974: 201); Stafleu & Mennega (*TL-2, Suppl.* 1: 67, 1992).
- Alfvenia** J.I.R. Larsson (1983), Microsporidia. 1.
- Algacites** Schloth. (1825), Fossil Fungi, Algae.
- algae** (fungi as parasites and mutualists of), see Kohlmeyer (*Veröff. Inst. Meersforsch. Bremerh., Suppl.* 5: 339, 1974), Kohlmeyer & Kohlmeyer (*Marine mycology*, 1979), Lichens, mycophycobiosis, photobiont.
- algal-layer** (of lichen thalli), the photobiont-containing layer (usually between the upper cortex and the medulla) of the thallus.
- algaliculous**, living on algae; -fungi see van Donk & Brumsz (*in* Reisser (Ed.), *Algae and symbiosis*: 567, 1992; review), algae.
- Algincola** Velen. (1939), ? Helotiales. 1, former Czechoslovakia.
- Algonquinia** R.F. Castañeda & W.B. Kendr. (1991), anamorphic *Pezizomycotina*, Hsp.0eH.12. 1, Canada. See Castañeda Ruiz & Kendrick (*Univ. Waterloo Biol. Ser.* 35: 4, 1991).
- Algorichtera** Kuntze (1891) ≡ *Scorias*.
- aliform**, wing-like in form.
- Alina** Racib. (1909), Parodiopsidaceae. Anamorph *Septoidium*. 1, Java.
- Alinocarpon** Vain. (1928) = *Thelocarpon* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Aliquandostipitaceae** Inderb. (2001), Jahnulales. 6 gen., 25 spp.
Lit.: Hawksworth (*Sydowia* 37: 43, 1984), Inderbitzin *et al.* (*Am. J. Bot.* 88: 54, 2001), Pang *et al.* (*MR* 106: 1031, 2002), Raja *et al.* (*Mycotaxon* 91: 207, 2005), Raja & Shearer (*Mycol.* 98: 319, 2006), Campbell *et al.* (*CJB* 85: 873, 2007; phylogeny).
- Aliquandostipite** Inderb. (2001), Aliquandostipitaceae. 3 (on wood in freshwater), pantropical. See Inderbitzin *et al.* (*Am. J. Bot.* 88: 54, 2001), Pang *et al.* (*MR* 106: 1031, 2002; placement), Raja *et al.* (*Mycotaxon* 91: 207, 2005), Campbell *et al.* (*CJB* 85: 873,

2007; phylogeny).

aliquot part, a portion that is contained an exact number of times in the whole; not the equivalent of 'sample' in which the concepts of both uniformity and representation are implicit (Emmons, *Bact. News* 1960: 17).

alkaphilic, used or organisms growing well at high pH values; e.g. *Fusarium* sp. at pH 10 (Hiura & Tanimura, in Horrikoshi & Grant (Eds), *Superbugs: microorganisms in extreme environments*: 287, 1991).

allantoid (esp. of spores), slightly curved with rounded ends; sausage-like in form (Fig. 23.8).

Allantomyces M.C. Williams & Lichtw. (1993), Legeriomycetaceae. 2 (in *Ephemeroptera*), Australia; Mexico. See Williams & Lichtwardt (*CJB* 71: 1109, 1993), Valle *et al.* (*Mycol.* 100: 149, 2008; Mexico).

Allantonectella, see *Allonectella*.

Allantonectria Earle (1901) = *Nectria* fide Rossman *et al.* (*Mycol.* 85: 685, 1993), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).

Allantoparmelia (Vain.) Essl. (1978), Parmeliaceae (L). 1, Arctic. See Esslinger (*Mycotaxon* 7: 46, 1978), Feuerer (*Recollecting Edvard August Vainio*: 47, 1998), Thell *et al.* (*Symb. bot. upsal.* 34 no. 1: 429, 2004; biogeography).

Allantophoma Kleb. (1933) nom. inval., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).

Allantophomoides S.L. Wei & T.Y. Zhang (2003) ? = *Septoria* Sacc. fide Wei & Zhang (*Mycosystema* 22: 9, 2003).

Allantophomopsis Petr. (1925), anamorphic *Phacidium*, St.0eH.15. 7, widespread. See Carris (*CJB* 68: 2283, 1990; gen. revision).

Allantoportha Petr. (1921) = *Diaporthe*. Probably polyphyletic. fide Barr (*Mycol. Mem.* 7, 1978), Zang (*Acta Mycol. Sin. Suppl.* 1: 407, 1986; phylogeny).

Allantosphaeriaceae Höhn. (1918) = *Diatrypaceae*.

Allantospora Wakker (1895) = *Cylindrocarpon* fide Booth (*Mycol. Pap.* 104, 1966).

Allantozythia Höhn. (1923) = *Phlyctema* fide Petrak (*Annls mycol.* 27: 370, 1929), Sutton (*Mycol. Pap.* 141, 1977).

Allantozythiella Danilova (1951) = *Endothiella* fide Sutton (*Mycol. Pap.* 141, 1977).

Allantula Corner (1952), *Pterulaceae*. 1, Brazil. See Corner (*Ann. Bot., Lond. n.s.* 16: 270, 1952).

Allarthonia (Nyl.) Zahlbr. (1903) = *Arthonia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Allarthoniomyces E.A. Thomas (1939) nom. inval. ≡ *Arthonia*.

Allarthotheliomyces Cif. & Tomas. (1953) ≡ *Allarthothelium*.

Allarthothelium (Vain.) Zahlbr. (1908) = *Arthonia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Allelochaeta Petr. (1955) = *Seimatosporium* fide Sutton (*Mycol. Pap.* 141, 1977).

Alleppeysporonites Ramanujam & Rao (1979), Fossil Fungi, anamorphic *Pezizomycotina*. 1 (Miocene), India. Fossil *Grallomyces*.

Allergy. An acquired, specific, altered capacity to react. It is acquired by exposure to allergenic particles; the sensitivity acquired from a single exposure is specific to one or a few closely related species, although multiple exposures may result in multiple sensitivities; and subsequent re-exposure results in an altered capacity to react or allergic reaction. The

form of that reaction depends on the nature of the allergenic particle, for instance, its size and chemical characteristics, the immunological reactivity of the subject and the circumstances of exposure. The two forms of allergy of most concern in this context are an immediate reaction, characterized by rhinitis and hay fever-like symptoms and a late reaction, characterized by alveolitis or pneumonitis. Fungal spores have been implicated as causative agents of both types of allergic reaction. Rhinitis and asthma are caused by normal everyday exposure to airborne allergens in subjects who are constitutionally predisposed (atopic) and who produce specific IgE antibodies against the allergen. Symptoms occur within a few minutes of exposure and may be provoked by 10^4 spores/m³ air, or fewer, typically of fungi with spores larger than 10 µm. The spores may be components of the normal air spora, including *Alternaria*, *Cladosporium* and *Didymella*, or they may be associated with work environments, for instance cereal rusts and smuts, and *Verticillium lecanii* spores when harvesting *Agaricus bisporus* and *Boletus edulis* when preparing mushroom soup, and *Aspergillus flavus* and *A. awamori* from surface fermentations. Asthma may also be associated with exposure to fungal enzymes during their production. Allergic alveolitis occurs in non-atopic subjects after intense exposures to spores, typically 10^6 - 10^{10} spores/m³. At least 10^8 spores/m³ may be required for sensitization but species differ in their antigenicity. Symptoms occur about 4 h after exposure and persist for 24-36 h if there is no further exposure. They include influenza-like symptoms, feverishness, chills, a dry cough, breathlessness and weight loss. With repeated exposure, breathlessness becomes increasingly severe and eventually permanent lung damage may occur with fibrosis, and the increased load on the heart may lead to death. Specific IgG antibodies develop and may be an aid to diagnosis although implication of a fungus in the disease may require further tests. The disease is typically occupational and associated with poorly stored agricultural products. The classic form is farmer's lung, usually caused by thermophilic actinomycetes but sometimes by fungi, including *Aspergillus flavus*, *A. versicolor* and *Eurotium rubrum* (syn. *Aspergillus umbrosus*). Other forms of allergic alveolitis include cheese-washer's lung (*Penicillium casei*), malt-worker's lung (*Aspergillus clavatus*, *A. fumigatus*), maple-bark stripper's lung (*Cryptostroma corticale*), mushroom picker's lung (*Aspergillus fumigatus*, *Cephalotrichum stemonitis*, *Pholiota nameko*, *Pleurotus ostreatus*), sawmill worker's lung (*Rhizopus rhizopodiformis*, *Penicillium* spp., *Aspergillus fumigatus*, *Trichoderma viride*), sequoiosis (*Aureobasidium pullulans*, *Graphium* spp.), suberosis (*Penicillium frequentans*), and allergic alveolitis from citric acid fermentations (*Aspergillus fumigatus*, *A. niger*, *Penicillium* spp.). Mouldy lichens have also been reported to cause allergic alveolitis.

Allergic skin reactions may be caused by spores of the *Arthrinium arundinis* state of *Apiospora montagnei* in workers cutting the canes of *Arundo donax* in France, by contact with lichens in wood-cutters and people using lichens in decorations (Richardson, in Galun (Ed.), *CRC Handbook of lichenology* 3: 98, 1988; review), and secondary to dermatophyte infections (see mycid). Allergic reactions are also com-

- mon in response to certain fungal products, the best known example being allergy to antibiotics such as penicillin.
- For further information, see Pepys (*Hypersensitivity diseases of the lungs due to fungi and organic dusts*, 1969), Wilken-Jensen & Gravesen (*Atlas of moulds in Europe causing respiratory allergy*, 1984), Lacey (in Hawksworth (Ed.), *Frontiers in mycology*: 157, 1991), Lacey & Crook (*Ann. occup. Hyg.* 32: 515, 1988), Lacey & Dutkiewicz (*J. Aerosol Sci.*, 1994).
- Allescheria** R. Hartig (1899) $\equiv$ Hartigiella fide Vuillemin (*Annls mycol.* 3: 341, 1905).
- Allescheria** Sacc. & P. Syd. (1899) = Monascus fide Malloch (*Mycol.* 62: 727, 1970).
- Allescheriella** Henn. (1897), anamorphic *Botryobasidium*. 2, widespread. See Hughes (*Mycol. Pap.* 41, 1951), Petrak (*Sydowia* 23: 265, 1970).
- Allescherina** Berl. (1902) = Cryptovalsa fide Clements & Shear (*Gen. Fung.*, 1931).
- Allewia** E.G. Simmons (1990), Pleosporaceae. Anamorph *Embellisia*. 2, Australia. See Eriksson & Hawksworth (*SA* 9: 2, 1991; synonymy with *Lewia*), Berbee *et al.* (*MR* 107: 169, 2003; recombination), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- alliaceous**, having a taste or smell of onions or garlic; cepaceous.
- alliance**, see phytosociology.
- Alliospora** Pim (1883) ? = Aspergillus fide Bisby (*TBMS* 27: 101, 1944).
- Allocetraria** Kurok. & M.J. Lai (1991), Parmeliaceae (L). 11, widespread. See Kärnefelt *et al.* (*Acta Bot. Fenn.* 150: 79, 1994), Thell *et al.* in Daniels *et al.* (Eds) (*Flechten Follmann Contributions to Lichenology in Honour of Gerhard Follmann*: 353, 1995), Thell *et al.* (*Mycol. Progr.* 1: 335, 2002; phylogeny), Mattsson & Articus (*Symb. bot. upsal.* 34 no. 1: 237, 2004; phylogeny), Randle & Saag (*Symb. bot. upsal.* 34 no. 1: 359, 2004; chemistry), Thell *et al.* (*Mycol. Progr.* 3: 297, 2004; phylogeny), Randle & Saag (*Central European Lichens*: 75, 2006; key).
- allochronic**, occurring at different time periods, e.g. contemporary and fossil specimens.
- allochrous (allochroous)**, changing from one colour to another.
- allochthonous**, transported to the place where found; not indigenous; cf. autochthonous.
- Allochytridium** Salkin (1970), Endochytriaceae. 2, N. America. See Barr & Désaulniers (*Mycol.* 79: 193, 1987; morphol., physiol., ultrastr.).
- Alloclavaria** Dentinger & D.J. McLaughlin (2007), Agaricomycetes. 1, Europe. *Hymenochaetales* or *Agaricales* (*Rickenella* clade). See Dentinger & McLaughlin (*Mycol.* 98: 757, 2007; syst. posn).
- allocyst**, a chlamydospore-like structure in *Flammula gummosa* (Kühner, 1946).
- Allodium** Nyl. (1896) = Chaenotheca fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Allodus** Arthur (1906) = Puccinia fide Arthur (*Manual Rusts US & Canada*, 1934).
- Alloglugea** Paperna & Lainson (1995), Microsporidia. 1.
- Allographa** Chevall. (1824) ? = Graphina fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Allomyces** E.J. Butler (1911), Blastocladiaceae. 9 (in soil), widespread (esp. tropical). See Emerson (*Lloydia* 4: 77, 1941; life cycle, taxonomy), Teter (*Mycol.* 36: 194, 1944; sexuality), Emerson & Wilson (*Mycol.* 46: 393, 1954; cytogenetics and cyto taxonomy), Taylor *et al.* (*Nature* 367: 601, 1994; fossil from Devonian), Steciow & Eliades (*Darwiniana* 39: 15, 2001; Argentina).
- Allonecte** Syd. (1939), Tubeufiaceae. 1, Ecuador. See Rossman (*Mycotaxon* 8: 485, 1979), Crane *et al.* (*CJB* 76: 602, 1998), Kodsueb *et al.* (*Fungal Diversity* 21: 105, 2006; phylogeny).
- Allonectella** Petr. (1950), Nectriaceae. 2 (on stromata of *Phyllachora*), S. America. See Rossman (*Mycotaxon* 8: 485, 1979), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Allonema** Syd. (1934), anamorphic *Pezizomycotina*, Hso.0eH.?. 1, Europe. See Sartory & Meyer (*Annls mycol.* 33: 101, 1935).
- Alloneottiosporina** Nag Raj (1993), anamorphic *Pezizomycotina*, Cpd. $\equiv$ eH.19. 2, USA; Australia. See Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*: 121, 1993).
- allopatric**, occurring in different geographical regions. Cf. sympatric.
- Allophoron** Nádv. (1942), Lecanorales (L). 1, Colombia. See Tibell (*Recollecting Edvard August Vainio*: 95, 1998), Tibell *et al.* (*Mycotaxon* 87: 3, 2003).
- Allophylaria** (P. Karst.) P. Karst. (1870), Helotiaceae. c. 6, Europe. See Carpenter (*Mem. N. Y. bot. Gdn* 33: 17, 1981), Arendholz (*Mycotaxon* 36: 283, 1989; nomencl.), Huhtinen (*Karstenia* 29: 45, 1989).
- Allopsalliota** Nauta & Bas (1999), Agaricaceae. 1, Netherlands. See Nauta (*Belg. Jl Bot.* 131: 189, 1998), Vellinga (*MR* 108: 354, 2004; phylogeny).
- Allopuccinia** H.S. Jacks. (1931) = Sorataea fide Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983).
- Allosoma** Syd. (1926), Dothideomycetes. Anamorph *Periconiella*. 1, C. America. See *Acrodesmis*.
- Allosphaerium** Link (1826) nom. dub., Agaricomycotina. See Saccardo (*Syll. fung.* 15, 1901; syn. of *Rhizoctonia* s. lat.).
- Allotelium** Syd. (1939), Raveneliaceae. 1 (on *Calliandra* (*Leguminosae*)), S. America. May include *Diabolidium*.
- Allothyriella** Bat., Cif. & Nascim. (1959), anamorphic *Pezizomycotina*, Cpt. $\equiv$ eP.?. 2, C. America; Africa. See Batista *et al.* (*Mycopath. Mycol. appl.* 11: 11, 1959).
- Allothyriina** Bat. & J.L. Bezerra (1964), anamorphic *Pezizomycotina*, Cpt. $\equiv$ eH.?. 1, Brazil. See Batista & Bezerra (*Portugaliae Acta Biologica Série B* 7: 384, 1964).
- Allothyriopsis** Bat., Cif. & H. Maia (1959), anamorphic *Pezizomycotina*, Cpt. $\equiv$ eP.?. 1, Ghana. See Batista *et al.* (*Mycopath. Mycol. appl.* 11: 14, 1959).
- Allothyrium** Syd. (1939), Asterinaceae. 1, Ecuador.
- Albornia** Essl. (1981), Parmeliaceae (L). 2, S. Africa. See Brusse (*Mycotaxon* 40: 265, 1991), Thell *et al.* (*Mycol. Progr.* 3: 297, 2004; phylogeny), Crespo *et al.* (*Mol. Phylogen. Evol.* 44: 812, 2007; phylogeny).
- Almeidaea** Cif. & Bat. (1962) [non *Almeidaea* Post & Kuntze 1903, *Rutaceae*] = Chaetothyrium fide von Arx & Müller (*Stud. Mycol.* 9, 1975), Panwar & Jagtap (*Geobios New Rep.* 9: 121, 1990).
- Alnicola** Kühner (1926) = Naucoria fide Reid (*TBMS* 82: 191, 1984).
- Alocospora** J.C. Krug (1990) nom. inval., Xylariaceae. 1, Europe. See Krug (*Fourth International Mycological Congress Abstracts*: 30, 1990).

- Aloysiella** Mattir. & Sacc. (1908) = *Antennularia* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Alpakesa** Subram. & K. Ramakr. (1954), anamorphic *Pezizomycotina*, Hso.0eH.1. 4, India. See Morgan-Jones *et al.* (*CJB* 50: 877, 1972), Matsushima (*Matsush. Mycol. Mem.* 5, 1987), Punithalingam (*Stud. Mycol.* 31: 113, 1989; appendages), Abbas *et al.* (*Pakist. J. Bot.* 35: 249, 2003).
- Alpakesiopsis** Abbas, B. Sutton, Ghaffar & A. Abbas (2003), anamorphic *Pezizomycotina*. 1, Pakistan. See Abbas *et al.* (*Pakist. J. Bot.* 35: 249, 2003).
- alpha-spore** (A-spore, α -spore), a fertile, fusoid to oblong, biguttulate spore of an anamorph of the *Valsaceae* (*Phomopsis*). Cf. beta-spore.
- Alphitomorpha** Wallr. (1819) nom. superf. = *Erysiphe* fide Fries (*Syst. mycol.* 3: 234, 1829).
- Alphitomorphaceae** Corda (1842) = *Erysiphaceae*.
- Alphitomyces** Reissek (1856) ? = *Isaria* fide Samson (*Stud. Mycol.* 6, 1974).
- alpine mycology**, see Polar and alpine mycology.
- Alpova** C.W. Dodge (1931), *Paxillaceae*. 20, widespread (esp. north temperate). See Trappe (*Beih. Nova Hedwigia* 51: 279, 1975), Bruns *et al.* (*Mol. Ecol.* 7: 257, 1998; phylogeny), Grubisha *et al.* (*Mycol.* 93: 82, 2001; genus probably polyphyletic), Nouhra *et al.* (*Mycol.* 97: 598, 2005).
- Alternaria** Nees (1816), anamorphic *Lewia*, Hso.#eP.26. 299, widespread. *A. brassicae* (leaf spot of crucifers), *A. cucumerina* (cucurbit leaf spot), *A. longipes*, and others, on tobacco, *A. solani* (early blight of potato) which produces the highly phytotoxic antibiotic alternaric acid (q.v.). A number are common cosmop. Saprobes. See Neergard (*Danish Species of Alternaria and Stemphylium*, 1945; Denmark), Joly (*Le Genre Alternaria*, 1964; monogr.), Simmons (*Mycol.* 59: 73, 1967; typification), Rao (*Nova Hedwigia* 17: 219, 1969; India), Simmons (*Mycol.* 61: 1, 1969; teleomorphs), Ellis (*Dematiaceous Hyphomycetes*, 1971; descriptions), Ellis (*More Dematiaceous Hyphomycetes*, 1976; descriptions), Ando & Takatori (*Mycopathologia* 100: 17, 1987; keratomycosis), Samson & Frisvad (*Proc. Jap. Assoc. Mycotoxic.* 32: 3, 1990; mycotoxins), Simmons (*Mycotaxon* 38: 251, 1990; teleomorphs), Chelkowski & Visconti (*Alternaria. Biology, Plant Diseases and Metabolites Topics in Secondary Metabolism* vol. 3, 1992), Simmons (*Alternaria. Biology, Plant Diseases and Metabolites Topics in Secondary Metabolism* vol. 3, 1992; review), McCartney *et al.* (*Pl. Path.* 42: 280, 1993; dispersal of conidia), Lopes & Boiteux (*Pl. Dis.* 78: 1107, 1994; *Ipomoea*), Rotem (*The genus Alternaria*, 1994; biology, epidemiology, pathogenicity), Verma & Saharan (*Technical Bulletin, Saskatoon Research Centre, Research Branch, Agriculture and Agri-Food Canada* 1994-6E, 1994; *Cruciferae*), Visconti & Sibia (*Mycotoxins in Grain. Compounds Other Than Aflatoxin*: 315, 1994; toxins), Jasalavich *et al.* (*MR* 99: 604, 1995; *Cruciferae*), Kusaba & Tsuge (*Curr. Genet.* 28: 491, 1995; toxigenic spp.), Andersen & Thrane (*Mycotoxin Research* 12: 54, 1996; metabolites), Zhang & David (*Mycosystema* 8-9: 109, 1995; *Euphorbiaceae*), Kusaba & Tsuge (*Ann. phytopath. Soc. Japan* 63: 463, 1997; mt DNA), Mims *et al.* (*CJB* 75: 252, 1997; ultrastructure), Bottalico & Logrieco in Sinha & Bhatnagar (eds), (*Mycotoxins in Agriculture and Food Safety*: 65, 1998; mycotoxins, toxigenic spp.), McKay *et al.* (*Eur. J. Pl. Path.* 105: 157, 1999; *Linum*), Peever *et al.* (*Phytopathology* 89: 851, 1999; population biology), Simmons (*Mycotaxon* 70: 325, 1999; toxigenic spp.), Simmons (*Mycotaxon* 70: 263, 1999; *Citrus*), Inoue & Nasu (*J. Gen. Pl. Path.* 66: 18, 2000; *Prunus*), Magan & Evans (*Journal of Stored Products Research* 36: 319, 2000; volatile metabolites), Morris (*MR* 104: 286, 2000; *Lycopersicon*), Pryor & Gilbertson (*MR* 104: 1312, 2000; phylogeny), Simmons (*Mycotaxon* 75: 1, 2000; *Solanaceae*; 101556; small-spored spp.), Andersen *et al.* (*MR* 105: 291, 2001; *A. gaisen* and similar spp.), Halaby *et al.* (*J. Clin. Microbiol.* 39: 1952, 2001; phaeohyphomycosis), Romano *et al.* (*Mycoses* 44: 73, 2001; onychomycoses), Andersen *et al.* (*MR* 106: 170, 2002; phylogeny, chemistry), Bock *et al.* (*MR* 106: 428, 2002; *A. brassicicola*), Chou & Wu (*MR* 106: 164, 2002; phylogeny, morphology), Dugan & Peever (*Mycotaxon* 83: 229, 2002; *Gramineae*), Hoog & Horré (*Mycoses* 45: 259, 2002; clinical strains), Peever *et al.* (*Phytopathology* 92: 794, 2002; *Citrus*), Pryor & Gilbertson (*Mycol.* 94: 49, 2002; *A. radicina* group), Serdani *et al.* (*MR* 106: 561, 2002; *Malus*), Simmons (*Mycotaxon* 83: 127, 2002; teleomorphs), Simmons (*Mycotaxon* 82: 1, 2002; *Caryophyllaceae*), Strandberg (*Phytoparasitica* 30: 269, 2002; selective media), Akimitsu *et al.* (*Molecular Plant Pathology* 4: 435, 2003; *Citrus*), Berbee *et al.* (*MR* 107: 169, 2003; recombination), Kang *et al.* (*Pl. Path. J.* 19: 221, 2003; phylogeny, toxins), Kwasna & Kosiak (*MR* 107: 371, 2003; *Avena*), Pryor & Bigelow (*Mycol.* 95: 1141, 2003; phylogeny), Simmons (*Mycotaxon* 88: 163, 2003; *Malvaceae*), Guo *et al.* (*Fungal Diversity* 16: 53, 2004; endophytes), Hong & Pryor (*Can. J. Microbiol.* 50: 461, 2004; selective media), Peever *et al.* (*Mycol.* 96: 119, 2004; *Citrus*), Pérez Martínez *et al.* (*Eur. J. Pl. Path.* 110: 399, 2004; *A. solani*), Waals *et al.* (*Pl. Dis.* 88: 959, 2004; *Solanum* in S Africa), Andersen *et al.* (*Phytopathology* 95: 1021, 2005; image analysis), Bock *et al.* (*MR* 109: 227, 2005; recombination in *A. brassicicola*), Dubois *et al.* (*Mycopathologia* 160: 117, 2005; phaeohyphomycosis), Hong *et al.* (*Fungal Genetics Biol.* 42: 119, 2005; allergenics), Hong *et al.* (*MR* 109: 87, 2005; IGS polymorphism), Peever *et al.* (*Phytopathology* 95: 512, 2005; *Citrus*), Quayyum *et al.* (*CJB* 83: 1133, 2005; *Panax*), Goetz & Dugan (*Pacific Northwest Fungi* 1: 1, 2006; *A. malorum*), Hong *et al.* (*MR* 110: 1290, 2006; *Corylus*, *Juglans*), Mercado Vergnes *et al.* (*Pl. Path.* 55: 485, 2006; *Triticum*), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny), Simmons (*CBS Diversity Ser.* 6, 2007; revision, nomenclator).
- Alternariaceae** Earle (1934) = *Pleosporaceae*.
- Alternariaster** E.G. Simmons (2007), *Pleosporaceae*.
1. See Simmons (*Alternaria: an Identification Manual*, 2007).
- alternaric acid**, a metabolite produced by *Alternaria solani* which inhibits spore germination in some fungi and causes wilting and necrosis in higher plants.
- alternate host**, one or other of the two unlike hosts of an heteroecious rust. See *Teliomycetes*.
- alternation of generations**, the succession of gametophyte and sporophyte or sexual and asexual phases in a life cycle: **homologous** when the two generations are like in form; **antithetic** if unlike, when the gametophyte is named the **protophyte** and the sporophyte the **antiphyte** (Celakovsky).

Alutaceodontia (Parmasto) Hjortstam & Ryvar den (2002), Schizoporaceae. 1. See Hjortstam & Ryvar den (*Syn. Fung.* 15: 8, 2002).

alutaceous, the colour of buff leather.

alveola (1) a small surface cavity or hollow; (2) a pore of a polypore (obsol.).

Alveolaria Lagerh. (1892), Pucciniosiraceae. 2 (on *Cordia* (Boraginaceae)), America (tropical). See Buriticá & Hennen (*Fl. Neotrop.* 24: 22, 1980).

alveolate, marked with $\pm$ 6-sided (honey-comb-like) hollows; faveolate.

Alveolinus Raf. (1815) nom. dub., Fungi. No spp. included.

Alveomyces Bubák (1914) = *Uromyces* fide Nattrass (*First list Cyprus fungi*, 1937).

Alveophoma Alcalde (1952), anamorphic *Pezizomycotina*, Cpd.0eH.10. 1, Spain. See Sutton (*TBMS* 47: 497, 1964).

Alysia Cavalc. & A.A. Silva (1972) = *Vouauxiella* fide Sutton (*The Coelomycetes*, 1980), Lücking *et al.* (*Lichenologist* 30: 121, 1998).

Alysidiella Crous (2006), *Pezizomycotina*. 1 (on *Eucalyptus* leaves), S. Africa. See Crous (*Fungal Diversity* 23: 325, 2006).

Alysidiopsis B. Sutton (1973), anamorphic *Pezizomycotina*, Hso.0-1eP.3. 4, widespread. See Sutton (*Mycol. Pap.* 132: 5, 1973), Currah (*CJB* 65: 1957, 1987; Mexico), Kendrick (*CJB* 81: 75, 2003; morphogenesis).

Alysidium Kunze (1817), anamorphic *Botryobasidium*. 4, Europe. See Ellis (*Dematiaceous Hyphomycetes*, 1971), Partridge & Morgan-Jones (*Mycotaxon* 83: 335, 2002).

Alysisporium Peyronel (1922) = *Phragmotrichum* fide Sutton & Pirozynski (*TBMS* 48: 349, 1965).

Alysphaeria Turpin (1827) nom. dub., ? Fungi (L).

Alytosporium Link (1824) nom. dub., Fungi. See Donk (*Taxon* 12: 156, 1963) See also, Stalpers (*Rev. Mycol.* 39: 99, 1975).

Alyxoria Gray (1821) = *Opegrapha* Ach. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

AM, arbuscular mycorrhiza; see Mycorrhiza.

amadou, the context of *Fomes fomentarius* or *Phellinus igniarius* after the addition of saltpetre (NaNO_3); tinder; touchwood; punk.

Amallospora Penz. (1897), anamorphic *Pezizomycotina*, Hsp.1bH.?. 1, Java. See Ho *et al.* (*Mycol.* 92: 582, 2000), Descals (*MR* 109: 545, 2005).

Amandinea M. Choisy (1950) = *Amandinea* M. Choisy ex Scheid. & M. Mayrhofer.

Amandinea M. Choisy ex Scheid. & M. Mayrhofer (1993), Caliciaceae (L). 34, widespread. See Sheard & May (*Bryologist* 100: 159, 1997; N. Am.), Grube & Arup (*Lichenologist* 33: 63, 2001; polyphyly), Nordin & Mattsson (*Lichenologist* 33: 3, 2001; morphology, phylogeny), Helms *et al.* (*Mycol.* 95: 1078, 2003; phylogeny), Peršoh *et al.* (*Mycol. Progr.* 3: 103, 2004; asci), Simon *et al.* (*J. Mol. Evol.* 60: 434, 2005; introns), Miądlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).

Amanita Adans. (1763) nom. dub., Agaricales. See Donk (*Beih. Nova Hedwigia* 5, 1962).

Amanita Dill. ex Boehm. (1760) nom. rej. $\equiv$ *Agaricus* L.

amanita factor B, see pantherine; -- C, see ibotenic acid.

Amanita Pers. (1797), Amanitaceae. c. 500, widespread. Many species ectomycorrhizal, but members

of subgen. *Lepidella* partly saprobic. Both edible (e.g. *A. caesarea* and poisonous (e.g. *A. phalloides*) species. See Malençon (*Rev. Mycol.* 20: 81, 1955; development), Bas (*Persoonia* 5: 285, 1969; key sect. *Lepidella*), Bas (*Beih. Nova Hedwigia* 51: 53, 1975; relationship to *Amanita*), Campbell & Petersen (*Mycotaxon* 1: 239, 1975; culture), Horak (*Mycol.* 84: 64, 1992), Pegler & Shah-Smith (*Mycotaxon* 61: 389, 1997; key eastern Africa), Wood (*Aust. Syst. Bot.* 10: 723, 1997; key Australia), Yang (*Bibliotheca Mycol.* 170: 1, 1997; key Southwest China), Weiß *et al.* (*CJB* 76: 1070, 1998; phylogeny), Drehmel *et al.* (*Mycol.* 91: 610, 1999; phylogeny), Yang *et al.* (*Amanita – Ectomycorrhizal fungi, key genera in profile*, 1999; ecology), Miller & Lodge (*Mycotaxon* 79: 289, 2001; Dominican Republic), Tulloss *et al.* (*Mycotaxon* 77: 455, 2001; Pakistan), Bougher & Lebel (*Aust. Syst. Bot.* 15: 514, 2002), Moncalvo *et al.* (*Mol. Phylog. Evol.* 23: 357, 2002; nesting within *Amanita*), Oda *et al.* (*Mycoscience* 43: 351, 2002; Japan), Simmons *et al.* (*Persoonia* 17: 563, 2002; Guyana), Bhatt *et al.* (*Mycotaxon* 88: 249, 2003; India), Neville & Hemmes (*Fungi Europaei* 9: 1120 pp., 2004; Eur.), Yang (*Frontiers in Basidiomycote Mycology*: 315, 2004; Chile), Tulloss (*Mycotaxon* 93: 189, 2005; distribution).

Amanitaceae R. Heim ex Pouzar (1983), Agaricales. 3 gen. (+ 23 syn.), 521 spp.
Lit.: Hibbett *et al.* (*Nature* 407: 506, 2000), Moncalvo *et al.* (*Syst. Biol.* 49: 278, 2000) not supported by other data; see.

Amanitaria E.-J. Gilbert (1941) = *Amanita* Pers. fide Singer (*Agaric. mod. Tax.* edn 3, 1975).

Amanitella Earle (1909) = *Amanita* Pers. fide Singer (*Agaric. mod. Tax.* edn 3, 1975).

Amanitella Maire (1913) = *Limacella* fide Singer (*Agaric. mod. Tax.* edn 3, 1975).

amanitin, see amatoxins.

Amanitina E.-J. Gilbert (1940) = *Amanita* Pers. fide Singer (*Agaric. mod. Tax.* edn 3, 1975).

Amanitopsis Roze (1876) nom. cons. = *Amanita* Pers. fide Singer (*Agaric. mod. Tax.* edn 3, 1975) not conserved against *Amanita*.

Amarenographium O.E. Erikss. (1982), anamorphic *Amarenomyces*, St.#eP.15. 1, Europe. See Nag Raj (*CJB* 67: 3169, 1989; redescr.).

Amarenomyces O.E. Erikss. (1981), Pleosporales. Anamorph *Amarenographium*. 1 (on *Ammophila*), Europe. See Shoemaker & Babcock (*CJB* 67: 1500, 1989).

Amarrendia Bougher & T. Lebel (2002) = *Amanita*. The gastroid form has been previously recognised as a separate genus. fide Kuyper (*in litt.*).

Amastigis Clem. & Shear (1931) = *Amastigosporium*.

Amastigomycètes Clem. & Shear (1931) = *Amastigosporium*.

Amastigomycota, the zygo-, asco-, and basidiomycetes (Whittaker, 1969).

Amastigosporium Bond.-Mont. (1921) = *Mastigosporium* fide Hughes (*Mycol. Pap.* 36, 1951).

amatoxins, cyclic octopeptides (including α -amanitin and β -amanitin, amanin, and the non-toxic amanillin) toxic to humans from *Amanita phalloides*, etc. See Wieland (*Science* 159: 951, 1968), Wieland (*Peptides of poisonous Amanita mushrooms*, 1986). Cf. phallotoxins.

Amaurascopsis Guarro, Gené & De Vroey (1992), Gymnoascaceae. 2, Burundi; Honduras. See Guarro

- et al.* (*Mycotaxon* 45: 171, 1992), Hentic (*BSMF* 116: 173, 2000; phylogeny), Sugiyama *et al.* (*Stud. Mycol.* 47: 5, 2002; phylogeny).
- Amauroscaceae** Arx (1987) ? = Onygenaceae.
- Amauroascus** J. Schröt. (1893), ? Onygenaceae. Anamorph *Chrysosporium*. 14, widespread. See von Arx (*Persoonia* 6: 374, 1971), Currah in Hawksworth (Ed.) (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. 269 269: 370, 1994), Sugiyama *et al.* (*Mycoscience* 40: 251, 1999; DNA), Udagawa & Uchiyama (*Mycoscience* 40: 277, 1999), Udagawa & Uchiyama (*Mycoscience* 40: 291, 1999), Hentic (*BSMF* 116: 173, 2000; phylogeny), Sugiyama *et al.* (*Stud. Mycol.* 47: 5, 2002; phylogeny).
- Amauroderma** (Pat.) Torrend (1920) = *Amauroderma* Murrill fide Donk (*Persoonia* 1: 184, 1960).
- Amauroderma** Murrill (1905), Ganodermataceae. c. 30, widespread (tropical). See Furtado (*Mem. N. Y. bot. Gdn* 34: 1, 1980), Ryvarden & Johansen (*Prelim. Polyp. Fl. E. Afr.*: 315, 1980; key 11 Afr. spp.), Corner (*Beih. Nova Hedwigia* 75: 45, 1983; keys S. Am. & Malaysian spp.), Ryvarden (*Syn. Fung.* 18: 57, 2004), Decock & Herrera Figueroa (*Cryptog. Mycol.* 27: 3, 2006; neotropical spp.).
- Amaurodon** J. Schröt. (1888), Thelephoraceae. 9, widespread. See Kõljalg (*Syn. Fung.* 9: 32, 1996; key), Agerer & Bougher (*Aust. Syst. Bot.* 14: 599, 2001; blue-spored sp.).
- Amaurohydnum** Jülich (1978), Meruliaceae. 1, Australia. See Jülich (*Persoonia* 9: 455, 1978).
- Amauromyces** Jülich (1978), Meruliaceae. 2, Australia; Japan; Réunion. See Jülich (*Persoonia* 9: 455, 1978), Chen & Oberwinkler (*Mycol.* 96: 418, 2004; Japan).
- Amazonia** Theiss. (1913), Meliolaceae. 29 (from leaves), widespread (pantropical). See Hosagoudar (*Nova Hedwigia* 52: 81, 1991; ascospore germination), Hosagoudar (*Meliolales of India*: 363 pp., 1996; India), Hu *et al.* (*Flora Fungorum Sinicorum* 4. Meliolales: 270 pp., 1996; China), Hu *et al.* (*Flora Fungorum Sinicorum* 11, 1999; China), Hosagoudar (*Zoos' Print Journal* 18: 1243, 2003; endemism), Hosagoudar (*Sydowia* 55: 168, 2003; diagnostic formulae).
- Amazoniella** Bat. & H. Maia (1960) = *Amazonia* fide Hughes (*in litt.*).
- Amazonomyces** Bat. & Cavalc. (1964), Arthoniaceae (L). 2, neotropics. See Lücking *et al.* (*Lichenologist* 30: 121, 1998), Grube & Lücking (*MR* 105: 1007, 2001; ascogenous hyphae).
- Amazonotheca** Bat. & H. Maia (1959), Schizothyriaceae. 1, Philippines. See Batista & Maia (*Publicações Inst. Micol. Recife* 56: 408, 1959).
- Amazonspora** C. Azevedo & E. Matos (2003), Microsporidia. 1. See Azevedo & Matos (*J. Parasit.* 89: 336, 2003).
- Amber**. This is an important medium for the study of fossil fungi because soft structures may be retained which are generally lost in rock-preserved fossils. Hyphomycetes and coelomycetes associated with spruce seedlings have been found preserved in Baltic amber (Dörfelt & Schmidt, *Bot. J. Linn. Soc.* 155: 449, 2007), and coelomycetes have been found preserved in Dominican amber (Poinar, *MR* 107: 117, 2003). Basidiomycetes (including basidiomycete parasites on other basidiomycetes) have been reported from early Cretaceous Burmese amber (Poinar & Buckley, *MR* 111: 503, 2007). For reports of fungi on arthropods in amber, including *Entomophthora* sp. on c. 25 million year old winged termite from Oligocene-Miocene (Dominican Republic), and for reports on carnivorous fungi in amber, see Fossil fungi. See Poinar & Thomas (*Mycol.* 74: 332, 1982; lichens), Rikkinen & Poinar (*MR* 104: 7, 2000; lichens), Waggoner & Poinar (*J. Protozool.* 39: 639, 1992; myxomycete). See also Fossil fungi.
- ambimobile**, systemic fungicides which can move upward in the xylem or downward in the phloem.
- ambiregnal** (of organisms), ones that can be classified in more than one kingdom according to different systematic viewpoints; esp. of those which can potentially be treated under different Codes. See Nomenclature, Corliss (*BioSystems* 28: 1, 1993), Patterson & Larsen (*Regnum veg.* 123: 197, 1991).
- Ambispora** C. Walker, Vestberg & A. Schüssler (2007), Ambisporaceae. 4, widespread. See Walker *et al.* (*MR* 111: 147, 2007).
- Ambisporaceae** C. Walker, Vestberg & A. Schüssler (2007), Archaeosporales. 1 gen., 4 spp.
- Ambivina** Katz (1974), Corticiaceae. 1, USA. See Katz (*Nova Hedwigia* 25: 811, 1974).
- Amblyospora** E.I. Hazard & Oldacre (1975), Microsporidia. 19.
- Amblyosporiopsis** Fairm. (1922) = *Oedocephalum* fide Clements & Shear (*Gen. Fung.*, 1931).
- Amblyosporium** Fresen. (1863), anamorphic *Pezizomycotina*, Hso.0eH.40. 3, Europe. *A. botrytis* (on agarics, esp. *Lactarius*). See Nicot & Durand (*BSMF* 81: 623, 1966), Pirozynski (*CJB* 47: 325, 1969), Kendrick (*CJB* 81: 75, 2003; morphogenesis).
- Ambrodiscus** S.E. Carp. (1988), Helotiales. 1 (bark beetle galleries), USA. See Carpenter (*Mycol.* 80: 320, 1988).
- ambrosia fungi**, Fungi, often yeasts (e.g. *Ambrosiozyma*, *Ascoidea* and *Dipodascus* spp., etc.) or yeast-like (conidial *Ophiostomatales*), that grow mutualistically in tunnels of ambrosia beetles (wood-boring *Scolytidae*) and serve as food for larvae and adults; many are specific for the particular insect (Batra, *Trans. Kansas Acad. Sci.* 66: 213, 1963; *Mycol.* 59: 981, 1968; key gen.); some are associated with devastating tree diseases.
Lit.: Mueller & Gerardo (*Ann. Rev. Entom.* 36: 563, 2005), Wingfield *et al.* [Eds] (*Ceratocystis and Ophiostoma: taxonomy, ecology and pathology*, 1993). - **gall**, see gall.
- Ambrosiaemyces** Trotter (1934), *Pezizomycotina*. 1 (on wood damaged by ambrosia beetles), Sri Lanka.
- Ambrosiella** Brader (1964), anamorphic *Ceratocystidaceae*, Hsy.0eH.1/38. 9 (in bark beetle galleries), widespread. Polyphyletic; some species belong to the *Ophiostomataceae*. See Batra (*Mycol.* 59: 986, 1968; key), Cassar & Blackwell (*Mycol.* 88: 596, 1996; convergent evolution), Blackwell & Jones (*Biodiv. Cons.* 6: 689, 1997; biology), Rollins *et al.* (*Mycol.* 93: 991, 2001; phylogeny), Spatafora (*Cellular Origin and Life in Extreme Habitats* 4: 591, 2002; symbiosis), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Ambrosiozyma** Van der Walt (1972), ? *Saccharomycetales*. 6, widespread. Perhaps allied to the *Saccharomycopsidaceae*. See Goto & Takami (*J. gen. appl. Microbiol.* Tokyo 32: 271, 1986), Jones & Blackwell (*MR* 102: 661, 1998), Smith in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 129,

- 1998), Suh *et al.* (*Mycol.* **98**: 1006, 2006; phylogeny).
- Ameghiniella** Speg. (1888), Helotiaceae. 2, N. & S. America. See also *Ionomidotis*. See Zhuang (*Mycotaxon* **31**: 261, 1988; key), Gamundí (*MR* **95**: 1131, 1991), Gamundí & Romero (*Fl. criptog. Tierra del Fuego* **10**, 1998).
- amend**, the act and result of making an alteration, not necessarily to correct a fault or error. Cf. emend.
- Ampiospora** Locq. & Sal.-Cheb. (1980), Fossil Fungi. 5, Cameroon.
- Ameris** Arthur (1906) = *Phragmidium* fide Arthur (*Manual Rusts US & Canada*, 1934).
- Amerobotryum** Subram. & Natarajan (1976) = *Agaricostilbum* fide Subramanian & Natarajan (*Mycol.* **69**: 1224, 1977).
- Amerodiscosiella** M.L. Farr (1961), anamorphic *Pezizomycotina*, Cpt.0eH.15. 1, Cambodia; Brazil. See Sutton (*TBMS* **60**: 525, 1973), Nag Raj (*CJB* **53**: 2435, 1975), Farr (*Taxon* **26**: 580, 1977; typification), Patil (*Geobios New Rep.* **9**: 173, 1990; India).
- Amerodiscosiellina** Bat. & Cavalc. (1966), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, Brazil. See Batista & Cavalcanti (*Atas Inst. Micol. Univ. Pernambuco* **3**: 185, 1966).
- Amerodothis** Theiss. & Syd. (1915) = *Botryosphaeria* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* **11** no. 1, 1954).
- Ameromassaria** Hara (1918), *Pezizomycotina*. 1, Japan.
- Ameropeltomyces** Bat. & H. Maia (1967) = *Arthonia* fide Lücking *et al.* (*Lichenologist* **30**: 121, 1998).
- amerspore**, a 1-celled (i.e. non-septate) spore with a length/width ratio < 15:1 (cf. scolecospore); if elongated, axis single and not curved through more than 180° (cf. helicospore); any protuberances < 1/4 spore body length (cf. staurospore). See Anamorphic fungi.
- Amerosporiella** Höhn. (1916) nom. illegit., anamorphic *Pezizomycotina*, Hso.0eH/1eP.?. 1, Europe.
- Amerosporina** (Petr.) Petr. (1965) = *Amerosporium* fide Sutton (*The Coelomycetes*, 1980).
- Amerosporiopsis** Petr. (1941), anamorphic *Pezizomycotina*, Cpd.0eH.15. 1, Iran. See Sutton (*The Coelomycetes*, 1980), Nag Raj & DiCosmo (*Univ. Waterloo Biol. Ser.* **20**, 1982).
- Amerosporis** Clem. & Shear (1931) = *Amerosporiella*.
- Amerosporium** Speg. (1882), anamorphic *Zoellneria*, St.0eP.15. 2, widespread. See Sutton (*The Coelomycetes*, 1980), Johnston & Gamundí (*N.Z. Jl Bot.* **38**: 493, 2000).
- Amerostege** Theiss. (1916) nom. dub., ? Fungi. See von Arx & Müller (*Beitr. Kryptfl. Schweiz* **11** no. 1, 1954).
- Amerosympodula** Matsush. (1996), anamorphic *Pezizomycotina*, Hso.?.?. 1, Peninsular Malaysia. See Matsushima (*Matsush. Mycol. Mem.* **9**: 1, 1996).
- Ameson** Sprague (1977), Microsporidia. 4.
- Amethicium** Hjortstam (1983), Phanerochaetaceae. 1, Tanzania. See Hjortstam (*Mycotaxon* **17**: 557, 1983).
- ametoecious**, see autoecious (q.v.; de Bary).
- Amicodisca** Svrček (1987), Hyaloscyphaceae. 5, Europe. See Svrček (*Česká Mykol.* **41**: 16, 1987), Huhtinen (*Karstenia* **29**: 45, 1990), Raitviir (*Czech Mycol.* **52**: 289, 2001; key), Raitviir (*Mycotaxon* **87**: 359, 2003), Raitviir (*Scripta Mycologica Tartu* **20**, 2004).
- Amidella** E.-J. Gilbert (1940) = *Amanita* Pers. fide Singer (*Agaric. mod. Tax.* edn 3, 1975).
- amixis**, see heterothallism.
- ammonia fungi**, a chemoecological group in which reproductive structures develop after the addition of ammonia, urea, etc. or alkalis to the soil (Sagara, *Contrib. biol. Lab. Kyoto Univ.* **24**: 205, 1975).
- Amoebochytrium** Zopf (1884), Cladochytriaceae. 1, Europe.
- amoeboid**, not having a cell wall and changing in form, like an amoeba.
- amoeboid cell** (of *Ameobidiales*), uninucleate cells, formed by protoplasmic cleavage within the fungal thallus, which lack a rigid wall and when released usually encyst, the cysts, in time, producing cystospores.
- Amoebomyces** Bat. & H. Maia (1965) = *Strigula* fide Lücking *et al.* (*Lichenologist* **30**: 121, 1998).
- Amoebophilus** P.A. Dang. (1910), Cochlonemataceae. 4, Europe; N. America. See Drechsler (*Mycol.* **27**: 33, 1935), Drechsler (*Mycol.* **51**: 787, 1959), Barron (*CJB* **61**: 3091, 1983).
- Amoenodochium** Peláez & R.F. Castañeda (1996), anamorphic *Pezizomycotina*, Hso.?.?. 1, Goa. See Peláez & Castañeda Ruíz (*Mycotaxon* **60**: 258, 1996).
- Amoenomyces** R.F. Castañeda, Saikawa & Hennebert (1996), anamorphic *Pezizomycotina*, Hso.?.?. 1, Cuba. See Castañeda Ruíz *et al.* (*Mycotaxon* **59**: 453, 1996), Castañeda Ruíz *et al.* (*MR* **104**: 107, 2000; comp. with *Bulbocatenospora*).
- Amogaster** Castellano (1995), Agaricales. 1, USA. Perhaps *Boletales*. See Castellano (*Mycotaxon* **55**: 186, 1995).
- Amorosa** Mantle & D. Hawksw. (2006), ? Sporormiaceae. 1 (from intertidal sediment), Bahamas. See Mantle & Hawksworth (*MR* **110**: 1373, 2006).
- Amorphomyces** Thaxt. (1893), Laboulbeniaceae. 13 (on insect exoskeleton), widespread. See Santamaría (*MR* **104**: 1389, 2000; key), Santamaría (*Fl. Mycol. Iberica* **5**, 2003; Iberian spp.).
- Amorphotheca** Parbery (1969), Amorphothecaceae. Anamorph *Hormoconis*. 1 (on resin, hydrocarbon products etc.), widespread. *A. resinae* (putative anamorph *Hormoconis resinae*; kerosene fungus, q.v.). See Parbery (*Aust. J. Bot.* **17**: 331, 1969), Sheridan *et al.* (*Tuatara* **19**: 130, 1972), Braun *et al.* (*Mycol. Progr.* **2**: 3, 2003; phylogeny), Seifert *et al.* (*Stud. Mycol.* **58**: 235, 2007; phylogeny, nomenclature).
- Amorphothecaceae** Parbery (1969), Eurotiomycetidae (inc. sed.). 2 gen. (+ 1 syn.), 2 spp. Possibly allied with *Myxotrichaceae*, but molecular data are contradictory.
Lit.: Parbery (*Aust. J. Bot.* **17**: 331, 1969), Braun *et al.* (*Mycol. Progr.* **2**: 8, 2003), Abliz *et al.* (*FEMS Immunol. Med. Microbiol.* **40**: 41, 2004), Stchigel & Guarro (*MR* **111**: 1100, 2007).
- Amparoina** Singer (1958), ? Tricholomataceae. 2, S. America. See Singer (*Mycol.* **50**: 110, 1958).
- Amparoinaceae** Singer (1976) nom. rej. = Tricholomataceae.
- Ampelomyces** Ces. ex Schldl. (1852), anamorphic *Phaeosphaeriaceae*, Cpd.0eP.15. 1 or 2 (on *Erysiphales*), widespread. See Foitzik & Triebel (*Arnoldia* **6**: 15, 1993; typification), Kiss (*MR* **101**: 1073, 1997), Kiss & Nakasone (*Curr. Genet.* **33**: 362, 1998), Nischwitz *et al.* (*MR* **109**: 421, 2005; rel. with *Eudarluca*), Szentiványi *et al.* (*MR* **109**: 429, 2005; speciation), Liang *et al.* (*Fungal Diversity* **24**: 225, 2007; phylogeny).
- amphi-** (prefix), the two (sorts, sides).

- Amphiacantha** Caullery & Mesnil (1914), Microsporidia. 3.
- Amphiamblys** Caullery & Mesnil (1914), Microsporidia. 3.
- Amphiblistrum** Corda (1837) = *Oidium* Link (1824) fide Linder (*Lloydia* 5: 165, 1942).
- Amphichaeta** McAlpine (1904) = *Seimatosporium* fide Shoemaker (*CJB* 42: 411, 1964).
- Amphichaete** Kleb. (1914) = *Amphichaetella*.
- Amphichaetella** Höhn. (1916), anamorphic *Pezizomycotina*, Hsp.0eH.?. 1, Europe; Australia. See Morgan-Jones (*CJB* 51: 1431, 1973), Alcorn (*Australas. Mycol.* 21: 111, 2002; Australia).
- Amphichorda** Fr. (1825) = *Isaria* fide Fries (*Syst. mycol.* 3: 1, 1832).
- Amphiciliella** Höhn. (1919) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Amphiconium** Nees (1816) nom. dub., Algae. Based on algae fide Fries (*Syst. mycol.* 3 (index): 51, 1832).
- Amphicypellus** Ingold (1944) = *Chytriomycetes* fide Dogma (*Kalikasan* 5: 136, 1976), Letcher & Powell (*Mycotaxon* 84: 447, 2002).
- Amphicytostroma** Petr. (1921), anamorphic *Amphiporthes*, St.0eH.15. 2, Europe.
- Amphididymella** Petr. (1928) = *Acrocordia* fide Yue & Eriksson (*Mycotaxon* 24: 293, 1985).
- Amphidium** Nyl. (1891) [non *Amphidium* Schimp. 1856, *Musci*] = *Epiphloea* fide Gyelnik (*Rabenh. Krypt.-Fl.* 9 2.2, 1940).
- Amphiernia** Grüss (1926) = *Sporobolomyces* fide Derx (*Annls mycol.* 28: 1, 1930).
- amphigenous**, making growth all round or on two sides.
- amphigynous** (of *Pythiaceae*), having an antheridium through which the oogonial inept grows.
- Amphilogia** Gryzenh., H.F. Glen & M.J. Wingf. (2005), *Cryphonectriaceae*. 2 (on *Elaeocarpus*), Sri Lanka; New Zealand. See Gryzenhout *et al.* (*Taxon* 54: 1017, 2005), Gryzenhout *et al.* (*FEMS Microbiol. Letters* 258: 161, 2006).
- Amphiloma** Körb. (1855) = *Gasparrinia*.
- Amphiloma** Nyl. (1855) = *Lepraria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Amphilomopsis** Jatta (1905) = *Chrysothrix* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- amphimixis**, copulation of two cells and nuclei which are not near relations, e.g. egg and sperm; cf. apomixis, automixis and pseudomixis.
- Amphimyces** Thaxt. (1931), *Laboulbeniaceae*. 1, W. Africa; Europe. See Hindley (*Wiltshire Archaeological and Natural History Magazine* 79: 214, 1985; monogr.), Santamaria *et al.* (*Treb. Inst. Bot. Barcelona* 14: 1, 1991; Europe).
- Amphinectria** Speg. (1924) nom. dub., ? *Tubeufiaceae*. See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Amphinema** P. Karst. (1892), *Atheliaceae*. 6 (mycorrhizal), widespread. See Sutton & Crous (*MR* 101: 215, 1997).
- Amphinomium** Nyl. (1888) = *Pannaria* fide Galloway & Jørgensen (*Lichenologist* 19: 345, 1987).
- Amphiporthes** Petr. (1971), *Gnomoniaceae*. Anamorph *Amphicytostroma*. 3, Europe; N. America. See Barr (*Mycol. Mem.* 7, 1978), Zhang & Blackwell (*Mycol.* 93: 355, 2001; phylogeny).
- Amphirosellinia** Y.M. Ju, J.D. Rogers, H.M. Hsieh & Vasilyeva (2004), *Xylariaceae*. 5 (saprobic in bark), north temperate. See Læssøe & Spooner (*Kew Bull.* 49: 1, 1994; as *Rosellinia*), Ju *et al.* (*Mycol.* 96: 1393, 2004).
- Amphischizonia** Mont. (1856) nom. inval. = *Cryptodictyon* fide Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952).
- Amphisphaerella** (Sacc.) Kirschst. (1934), *Xylariales*. 8 (from bark), Europe. See Eriksson (*Svensk bot. Tidskr.* 60: 315, 1966), Kang *et al.* (*Fungal Diversity* 2: 135, 1999; posn), Wang *et al.* (*Fungal Diversity Res. Ser.* 13, 2004).
- Amphisphaerellula** Gucevič (1952), *Pezizomycotina*. 1, former USSR. See Gucevič (*Bot. Mater. Otd. Sporov. Rast. Bot. Inst. Komarova Akad. Nauk S.S.S.R.* 8: 142, 1952).
- Amphisphaeria** Ces. & De Not. (1863) nom. cons., *Amphisphaeriaceae*. Anamorph *Bleptosporium*. 85 (from wood and bark), widespread. See Kang *et al.* (*Fungal Diversity* 1: 147, 1998; DNA), Kang *et al.* (*MR* 103: 53, 1999), Kang *et al.* (*Mycotaxon* 81: 321, 2002; phylogeny), Jeewon *et al.* (*MR* 107: 1392, 2003; posn).
- Amphisphaeriaceae** G. Winter (1885), *Xylariales*. 32 gen. (+ 47 syn.), 499 spp.
Lit.: Samuels *et al.* (*Mycotaxon* 28: 473, 1987; anamorphs), Barr (*Mycotaxon* 51: 191, 1994; family rels), Nag Raj & Mel'nik (*Mycotaxon* 50: 435, 1994), Okane *et al.* (*CJB* 74: 1338, 1996), Goh & Hyde (*MR* 101: 85, 1997), Hyde (*MR* 101: 609, 1997), Graniti (*Ann. Rev. Phytopath.* 36: 91, 1998), Kang *et al.* (*Fungal Diversity* 1: 147, 1998; DNA), Kang *et al.* (*Fungal Diversity* 2: 135, 1999; excluded genera), Kang *et al.* (*MR* 103: 53, 1999; genera), Strobel *et al.* (*Syst. Appl. Microbiol.* 22: 432, 1999), Jeewon *et al.* (*Mol. Phylogen. Evol.* 25: 378, 2002), Jeewon *et al.* (*Fungal Diversity* 17: 39, 2004).
- Amphisphaerina** Höhn. (1919), *Pezizomycotina*. 3, Europe; N. America.
- amphispor**, a second, special type of urediniospore; see *Pucciniales*.
- amphithallism**, see homothallism.
- amphithecium**, the thalline margin of an apothecium (L).
- Amphitiarospora** Agnihothr. (1963) = *Dinemasporium* fide Sutton (*Mycol. Pap.* 141, 1977).
- amphitrichous** (amphitrichiate), having one flagellum at each pole.
- Amphitrichum** T. Nees (1818) nom. dub., *Pezizomycotina*. See Hughes (*CJB* 36: 727, 1958).
- Amphobotrys** Hennebert (1973), anamorphic *Botryotinia*, Hso.0eH/1eP.7. 1, USA. See Hennebert (*Per-soonia* 7: 192, 1973), Holcomb *et al.* (*Pl. Dis.* 73: 74, 1989), Hong *et al.* (*Pl. Path. J.* 17: 357, 2001), Kendrick (*CJB* 81: 75, 2003; morphogenesis).
- Amphophialis** R.F. Castañeda, W.B. Kendr. & Guarro (1998), anamorphic *Pezizomycotina*, Hso.???. 1, Cuba. See Castañeda Ruiz *et al.* (*Mycotaxon* 68: 12, 1998).
- Amphopsis** (Nyl.) Hue (1892) = *Pyrenopsis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Amphoridium** A. Massal. (1852) = *Verrucaria* Schrad. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Amphoridium**, see *Amphoridium* A. Massal.
- Amphoroblastia** Servít (1953) = *Polyblastia*. p.p., *Thelidium* (*Verrucar.*) p.p. and *Verrucaria* (*Verrucar.*) p.p. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

- Amphoromorpha** Thaxt. (1914) = *Basidiobolus* fide Blackwell & Malloch (*Mycol.* 81: 735, 1989).
- Amphoropsis** Speg. (1918) ? = *Pyxidiophora* fide Blackwell & Malloch (*Mycol.* 81: 735, 1989), Blackwell (*Mycol.* 86: 1, 1994).
- Amphoropycnium** Bat. (1963), anamorphic *Pezizomycotina*, Cpd.0eH.15. 2, Brazil; Philippines. See Batista (*Quad. Lab. crittogam., Pavia* 31: 19, 1963).
- Amphorothecium** P.M. McCarthy, Kantvilas & Elix (2001), ? *Myeloconidiaceae* (L). 1, Australia. See McCarthy *et al.* (*Lichenologist* 33: 292, 2001).
- Amphorula** Grove (1922) = *Chaetoconis* fide Petrak (*Sydowia* 13: 180, 1959), Sutton (*CJB* 46: 183, 1968).
- Amphorulopsis** Petr. (1959), *Pezizomycotina*. 1, former Yugoslavia. See Petrak (*Sydowia* 13: 181, 1959).
- amphotericin, A and B**, polyene antibiotics from actinomycetes (*Streptomyces* spp.); antifungal; -B (fungizone) is used in the therapy of systemic mycoses of humans.
- Amplariella** E.-J. Gilbert (1940) = *Amanita* Pers. fide Singer (*Agaric. mod. Tax.* edn 3, 1975).
- amplectant**, covering; embracing.
- ampliate**, made greater; enlarged.
- Ampliotrema** Kalb (2004) ≡ *Ampliotrema* Kalb ex Kalb fide Kalb (*Biblthca Lichenol.* 88: 302, 2004).
- Ampliotrema** Kalb ex Kalb (2006), *Thelotremataceae* (L). 5, pantropical. See Frisch (*Biblthca Lichenol.* 92: 3, 2006), Frisch *et al.* (*Biblthca Lichenol.* 92: 517, 2006; phylogeny, links with *Ocellularia*).
- ampoule effect**, Corner's (*New Phytol.* 47: 48, 1948) term for the normal working of a basidium which is compared to an ampoule from which the contents are discharged into the basidiospores by the enlargement of a basal vesicle.
- ampoule hypha**, see hypha.
- ampulla** (1) the swollen tip of a conidiogenous cell which produces synchronous blastic conidia (as in *Gonatobotrytum*); (2) a conidiophore which develops a number of short branches or discrete conidiogenous cells (as in *Aspergillus*).
- Ampullaria** A.L. Sm. (1903) [non *Ampullaria* Couch 1963, *Actinomycetes*] = *Melanospora* Corda fide Cannon & Hawksworth (*J. Linn. Soc. Bot.* 84: 115, 1982).
- Ampullariella** Couch (1964), *Actinobacteria*. q.v.
- Ampullifera** Deighton (1960), anamorphic *Pezizomycotina*, Hso.0eH.4. 7 (on foliicolous lichens), pantropical. See Hawksworth (*Bull. Br. Mus. nat. hist. Bot.* 6: 183, 1979), Hawksworth & Cole (*Mycosystema* 22: 359, 2003; China).
- Ampulliferella** Bat. & Cavalc. (1964) = *Ampullifera* fide Hawksworth (*Bull. Br. Mus. nat. hist. Bot.* 6: 183, 1979).
- Ampulliferina** B. Sutton (1969), anamorphic *Pezizomycotina*, Hso.1eP.38. 2, Canada; British Isles. See Sutton (*CJB* 47: 609, 1969).
- Ampulliferinites** Kalgutkar & Sigler (1995), Fossil Fungi, anamorphic *Pezizomycotina*. 1 (Eocene), Canada. See Kalgutkar & Sigler (*MR* 99: 515, 1995).
- Ampulliferopsis** Bat. & Cavalc. (1964) = *Ampullifera* fide Hawksworth (*Bull. Br. Mus. nat. hist. Bot.* 6: 183, 1979).
- ampulliform**, flask-like in form (Fig. 23.30).
- Ampullina** Qué. (1875) = *Leptosphaeria* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Ampullocitocybe** Redhead, Lutzoni, Moncalvo & Vilgalys (2002), *Hygrophoraceae*. 3, widespread. See Redhead *et al.* (*Mycotaxon* 83: 36, 2002), Harmaja (*Ann. bot. fenn.* 40: 213, 2003).
- Amygdalaria** Norman (1852) ? = *Porpidia* fide Inoue (*J. Hattori bot. Lab.* 56: 321, 1984; key), Brodo & Hertel (*Herzogia* 7: 493, 1987; key 8 spp.), Esnault & Roux (*An. Jard. bot. Madr.* 44: 211, 1987), Purvis *et al.* (*Lichen Flora of Great Britain and Ireland*, 1992), Buschbom & Mueller (*Mol. Phylogen. Evol.* 32: 66, 2004; phylogeny), Fryday (*Lichenologist* 37: 1, 2005; placement).
- Amylaria** Corner (1955), *Bondarzewiaceae*. 1, Bhutan. See Stalpers (*Stud. Mycol.* 40: 48, 1996).
- Amylariaceae** Corner (1970) = *Bondarzewiaceae*.
- Amylascus** Trappe (1971), *Pezizaceae*. 2 (hypogeous), Australasia. See Trappe (*TBMS* 65: 496, 1975; key), Hansen *et al.* (*Mycol.* 93: 958, 2001; phylogeny), Hansen *et al.* (*Mol. Phylogen. Evol.* 36: 1, 2005; phylogeny), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Amylirosa** Speg. (1920) nom. dub., *Dothideales*. See von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Amylis** Speg. (1922), *Pezizomycotina*. 1, S. America.
- Amylo process** (*Amylomyces process*). A method for the commercial production of alcohol by the saccharification of starchy materials by *Amylomyces rouxii* or *Rhizopus* spp. The amylo process is used in preparation of ragi, sufu and tempeh (see Fermented food and drinks). Ragi and ragi-like products from different countries of Asia contain a more or less stable mycota of *Amylomyces*, *Mucor* and *Rhizopus* species as well as various yeasts and bacteria (Hesseltine *et al.*, *Mycopathologia* 101: 141, 1988). *Amylomyces rouxii*, used in Asia to ferment cassava and rice, has the enzyme glucoamylase which occurs in only one form (Wang *et al.*, *Journal of Food Science* 49: 1210-1211, 1984). *Rhizopus formosaensis* is a powerful glucoamylase-producing fungus, with one strain suitable for fermentation of a highly concentrated starchy broth (Ling *et al.*, [*Hok Fermentation Engineering Magazine*, Society for Bioscience and Engineering, Japan] 49: 101, 1971). See Erb & Hildebrandt (*Industr. engin. Chem.* 38: 792, 1946), Hesseltine (*Mycol.* 57: 149, 1965; 1991; *Mycologist* 5: 166, 1991), Johnson (*Ann. Rev. Microbiology* 1: 159, 1947), Panda (*The complete technology book on starch and its derivatives*, 540 pp., 2004).
- Amyloathelia** Hjortstam & Ryvarden (1979), ? *Amylocorticiaceae*. 3, Europe; S. America. See Hjortstam & Ryvarden (*Mycotaxon* 10: 201, 1979).
- Amylobasidium** Ginns (1988), *Corticiaceae*. 1, USA. See Ginns (*Mycol.* 80: 63, 1988), Ginns (*Mycol.* 90: 1, 1997).
- Amylocarpus** Curr. (1859), ? *Leotiomyces*. 1 (on wood, marine), Europe. Affinities are unclear. See Crumlish & Curran (*Mycologist* 8: 83, 1994), Landvik *et al.* (*Mycoscience* 37: 237, 1996; phylogeny), Landvik *et al.* (*Mycoscience* 39: 49, 1998; phylogeny), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Amylocorticiaceae** Jülich (1982), *Agaricales*. 10 gen., 45 spp.
- Amylocorticiellum** Spirin & Zmitr. (2002), *Amylocorticiaceae*. 4, widespread. See Zmitrovich & Spirin (*Mikol. Fitopatol.* 36: 22, 2002).
- Amylocorticium** Pouzar (1959), *Amylocorticiaceae*. 11, widespread. See Zmitrovich (*Novosti Sistematiki Nizshikh Nov. sist. Niz. Rast.* 36: 31, 2002; Russian spp.), Gilbertson & Hemmes (*Mem. N. Y. bot. Gdn*

- 89:** 81, 2004; Hawaii).
- Amylocystis** Bondartsev & Singer (1944), Fomitopsidaceae. 1, Europe.
- Amylodontia** M.I. Nikol. (1967) = *Dentipellis* fide Stalpers (*Stud. Mycol.* **40**: 54, 1996; key).
- Amyloflagellula** Singer (1966), Marasmiaceae. 4, America (tropical); Asia. See Singer (*Darwiniana* **14**: 14, 1966), Antonín (*Czech Mycol.* **54**: 235, 2003), Bodensteiner *et al.* (*Mol. Phylogen. Evol.* **33**: 501, 2004; phylogeny).
- Amylofungus** Sheng H. Wu (1996), ? Peniophoraceae. 2, New Zealand; Japan. See Wu (*Mycol.* **87**: 886, 1995).
- Amylohyphus** Ryvarden (1978), Stereaceae. 1, Rwanda. See Ryvarden (*Bulletin du Jardin Botanique National de Belgique* **48**: 81, 1978).
- amyloid** (of asci, spores, etc.), stained blue by iodine (see Iodine, Stains); cf. dextrinoid. See Dodd & McCracken (*Mycol.* **64**: 1341, 1972; nature of fungal starch), amylomycan.
- Amylolepiota** Harmaja (2002), Agaricaceae. 1, Europe. See Harmaja (*Karstenia* **42**: 39, 2002).
- amylomycan**, a name proposed for the I+ blue or red compounds associated with asci (Common, *Mycotaxon* **41**: 67, 1991).
- Amylomyces** Calmette (1892), Mucoraceae. 1, Asia. See Ellis *et al.* (*Mycol.* **68**: 131, 1976), Voigt & Wöstemeyer (*Gene* **270**: 113, 2001; phylogeny), Abe *et al.* (*Biosc., Biotechn., Biochem.* **70**: 2387, 2006; phylogeny).
- Amylonotus** Ryvarden (1975), Auriscalpiaceae. 3, widespread (tropical). See Ryvarden (*Norw. J. Bot.* **22**: 26, 1975) = *Wrightoporia* fide, Stalpers (*Stud. Mycol.* **40**: 129, 1996).
- Amylophagus** Scherff. (1925), Monad. q.v.
- Amyloporia** Singer (1944), Polyporaceae. 5, widespread. See Vampola & Pouzar (*Česká Mykol.* **46**: 213, 1993).
- Amyloporiella** A. David & Tortiĉ (1984), Polyporaceae. 5, Europe; N. America. See David & Tortiĉ (*TBMS* **83**: 659, 1984; key).
- Amylora** Rambold (1994), ? Trapeliaceae (L.). 1, widespread. See Rambold (*Bull. Soc. linn. Provence* **45**: 344, 1994), Lumbsch & Heibel (*Lichenologist* **30**: 95, 1998), Rambold & Hagedorn (*Lichenologist* **30**: 473, 1998), Lumbsch *et al.* (*MR* **111**: 1133, 2007).
- Amylosporaceae** Jülich (1982) = Bondarzewiaceae.
- Amylosporomyces** S.S. Rattan (1977), Stereaceae. 2, widespread. See Rattan (*Bibliotheca Mycol.* **60**: 244, 1977).
- Amylosporus** Ryvarden (1973), Bondarzewiaceae. 6, widespread (tropical). See Stalpers (*Stud. Mycol.* **40**: 129, 1996; key).
- Amylostereaceae** Boidin, Mugnier & Canales (1998), Russulales. 1 gen. (+ 2 syn.), 4 spp.
- Amylostereum** Boidin (1958), Amylostereaceae. 4, widespread. See Boidin (*Revue Mycol. Paris* **23**: 345, 1958), Legon & Pegler (*Mycologist* **16**: 124, 2002; *Amylostereum areolatum*), Larsson & Larsson (*Mycol.* **95**: 1037, 2003; phylogeny), Slippers *et al.* (*South African Journal of Science* **99**: 70, 2003; association with woodwasps).
- Amyloxenasma** (Oberw.) Hjortstam & Ryvarden (2005), Amylocorticiaceae. 5, widespread. See Hjortstam & Ryvarden (*Syn. Fung.* **20**: 34, 2005).
- an-**, see a-.
- anaerobe**, an organism able to grow without free oxygen. An **obligate** - grows only without free oxygen; a **facultative** - grows with or without free oxygen. See Zehnder (Ed.) (*Biology of anaerobic microorganisms*, 1988).
- Anaerobic fungi**. Most fungi grow only aerobically (obligate aerobes), some prefer oxygen, but can grow anaerobically and others are oxygen indifferent (facultative anaerobes) (Emerson & Held, *Amer. J. Bot.* **56**: 1103, 1969). Anaerobic fungi occur widely in association with large herbivores, in both the foregut of ruminant-like animals and the hindgut of hindgut fermenters. A well-illustrated account of these fungi is provided by Mountfort (*Anaerobic Fungi (Mycology Series)* **12**: 1, 1994). Rumen fungi specifically colonise and grow on plant vascular tissues, produce active cellulases and xylanases (Bauchop, *Biosystems* **23**: 53, 1989). The flagellate gut fungi (Neocallimastigales) are the sole group which lack mitochondria and grow only without oxygen (obligate anaerobes), although they are tolerant of oxygen during transfer between hosts. They use diverse substrata and produce formate, acetate, lactate, ethanol, succinate, CO₂ and H₂. See Li & Heath (*Can. J. Microbiol.* **39**: 1003, 1993), Trinci *et al.* (*MR* **98**: 129, 1994; review, bibliogr.). Tetronasin and cycloheximide can reduce populations of anaerobic fungi in the rumen of sheep (Gordon & Phillips, 1993).
- Lit.*: Bauchop (*Biosystems* **23**: 53, 1989), Gordon & Phillips (*Letters in Applied Microbiology* **17**: 220, 1993), Mountfort *Anaerobic Fungi* Mycology Series, vol. 12. CRC, 1994).
- Anaeromyces** Breton, Bernalier, Dusser, Fonty, B. Gaillard & J. Guillot (1990), Neocallimastigaceae. 2, France; Australia. See Breton *et al.* (*FEMS Microbiol. Lett.* **70**: 181, 1990).
- analogous**, showing a resemblance in form, structure, or function which is not considered to be evidence of evolutionary relatedness; cf. homologous.
- Anamika** K.A. Thomas, Peintner, M.M. Moser & Manim. (2002), Cortinariaceae. 1, China; India; Japan. See Thomas *et al.* (*MR* **106**: 246, 2002), Yang *et al.* (*MR* **109**: 1259, 2005).
- anamorph** (1) (of shapes), a deformed figure appearing in proportion when correctly viewed; (2) (of fungi), see States of fungi.
- Anamorphic fungi** (Deuteromycotina, Deuteromycetes, Fungi Imperfecti, asexual fungi, conidial fungi, mitosporic fungi) (a few L.). These are fungi that are disseminated by propagules not formed from cells where (by inference from a small number of studied examples) meiosis has occurred. Most of these propagules can be referred to as conidia (q.v.) but some are derived from unspecialized vegetative mycelium. Many are correlated with fungal states that produce spores derived from cells where meiosis has, or is inferred to have, occurred (i.e. the teleomorph). These are, where known, members of the ascomycetes or basidiomycetes however, in many cases, they are still undescribed, unrecognized ('unconnected') or poorly known. Some anamorphs have appeared to have lost sexuality and its functions are sometimes replaced by such mechanisms as the parasexual cycle. These fungi have taken independent evolutionary paths from the related holomorphs (holomorphic anamorphs of Hennebert, 1993). See Kendrick (*Sydowia* **41**: 6, 1989), Sutton (*in* Reynolds & Taylor, *The fungal holomorph*: 27, 1993), Hennebert (*in* Reynolds & Taylor, *The fungal holomorph*: 283, 1993).

TABLE 1. Mitosporic fungi coding for conidiomata and conidia (for conidiogenous events see text).

Conidiomata				
Hyphomycetes (H)		Coelomycetes (C)	Other	
Hso solitary (hyphal)		Cpd pycnidial	St stromatic	
Hsy synnematal		Cpt pycnothyrial	Sc sclerotial	
Hsp sporodochial		Cac acervular		
		Ccu cupulate		
Conidial shape and septation				
			H	P
shape	septation		conidia hyaline or bright (hyalo-)	conidia pig- mented or dark (phaeo-)
e ellipsoid	0 aseptate	amerosporae	hyalosporae	phaeosporae
f filiform	1 1-septate	didymosporae	hyalodidymae	phaeodidymae
h helical	≡ 2-multiseptate	phragmosporae	hyalophragmae	phaeophragmae
b branched	# muriform	dictyosporae	hyalodictyae	phaeodictyae
		scoleosporae		
		helicosporae		
		staurosporae		

Although more teleomorph/anamorph state connexions are being established, a permanent residue of unconnected conidial fungi is likely to remain. DNA sequencing makes it possible now to place these remaining taxa within the groups of teleomorphic fungi from which they are or were once derived. On morphological grounds this has already been done for some groups. It is traditional to treat anamorphs of the zygomycetes, *Erysiphales*, and *Pucciniales*, for example, in association with their teleomorphic states. The *Code* (see Nomenclature) provides for the use of separate names for the different states of pleomorphic fungi, but rules that the name of the holomorph (the whole fungus in all its correlated states) is that of the teleomorph. The *Code* also recommends that new names for anamorphs are not introduced when the teleomorphic connection is firmly established and there is no practical need for separate names. Anamorphic fungi are some of the most frequently encountered fungi and many of them are of considerable economic significance.

Three morphological groups have been recognized that have in the past been named as classes:

(1) **Hyphomycetes** - mycelial forms which bear conidia on separate hyphae or aggregations of hyphae (as synnematous or sporodochial conidiomata) but not inside discrete conidiomata.

(2) **Agonomycetes** - mycelial forms which are sterile, but may produce chlamydospores, sclerotia and/or related vegetative structures.

(3) **Coelomycetes** - forms producing conidia in pycnidial, pycnothyrial, acervular, cupulate or stro-

matic conidiomata.

To recognize or delimit a taxonomic entity for the anamorphic fungi, such as subdivision Deuteromycotina, while convenient for practical purposes, is meaningless in terms of natural or phylogenetic classification. Therefore entries for anamorphic genera in this *Dictionary* assign them to the appropriate known level in the teleomorphic hierarchy. Informally, well-known groups of anamorphic genera, e.g. ‘hyphomycetes’ and ‘coelomycetes’, are likely to continue to be used but their adoption as formal taxa should be avoided. Integrated systems for Mitosporic fungi as a whole were suggested by Höhnelt (1923) and Sutton (1980); see also Luttrell *in* Kendrick (1977). Arrangement of correlated anamorphs with ascomycete systematics has been reviewed by Kendrick & DiCosmo (*in* Kendrick (Ed.), *The whole fungus*: 283, 1979) and Sutton & Hennebert (*in* Hawksworth (Ed.), *Ascomycete systematics*: 77, 1994). For more information on the various approaches to the classification of anamorphic fungi see Sutton (*in* Sutton (Ed.), *A Century of Mycology*: 135, 1996).

Coding system in entries for anamorphic genera. Three categories of information are coded:

(i) **Conidiomatal types** listed in Table 1, e.g. Hso, indicates hyphal, Hsy, synnematal etc.

(ii) **Saccardo’s spore groups.** Saccardo arranged ‘imperfect’ fungi (and also many ascomycetes, particularly those of the Sphaeriales) according to the septation or form of the spores and their colour – whether dark or hyaline – and the coined Latin names for these different groupings are set out in Table 1,

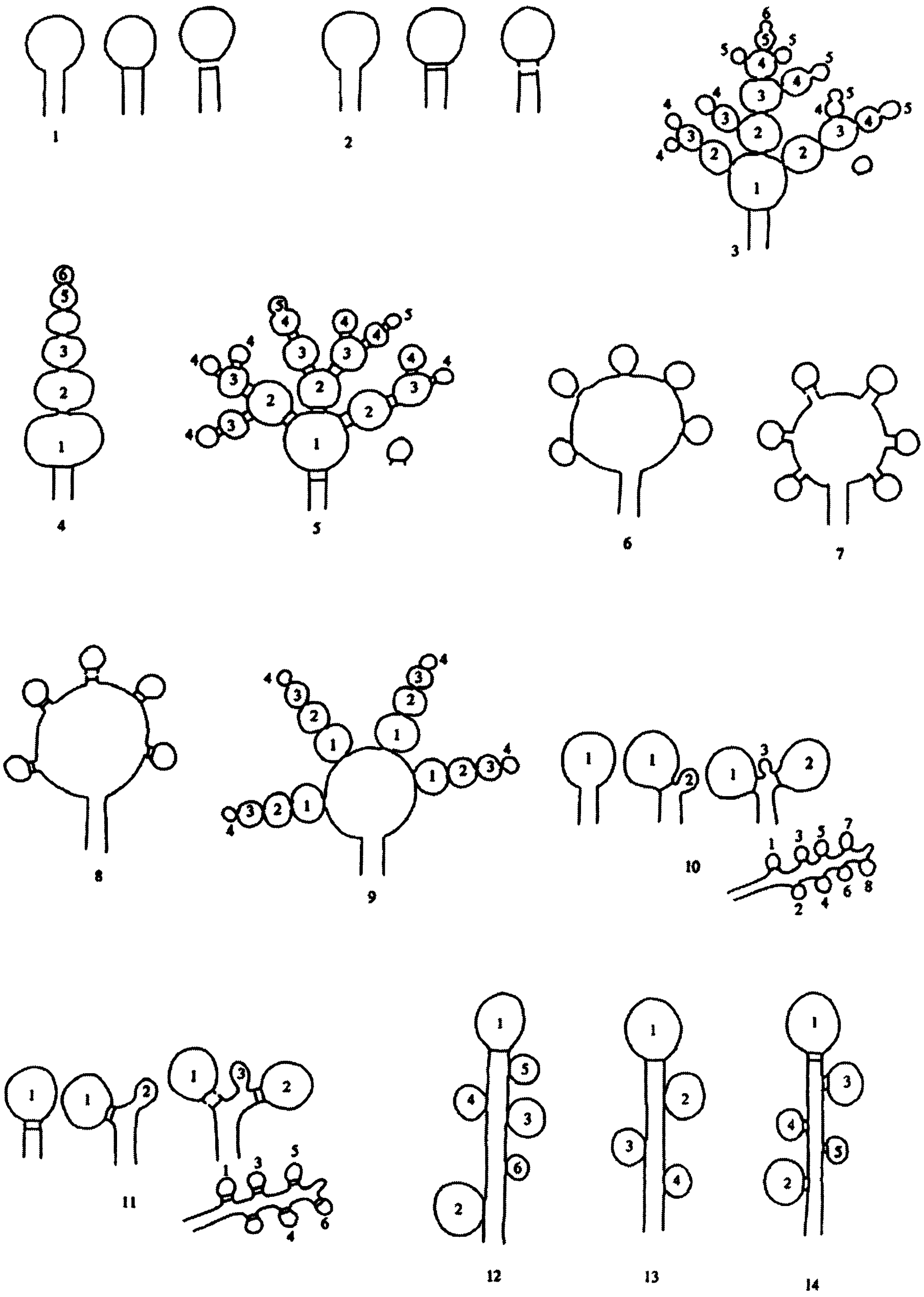


Fig. 1. Conidiogenous events (cc - conidiogenous cell). 1, conidial ontogeny holoblastic, 1 locus per cc, solitary conidia, delimited by 1 septum, maturation by diffuse wall-building, secession schizolytic, no proliferation of cc; 2, conidial ontogeny holoblastic, 1 locus per cc, solitary conidia, delimitation by 2 septa (or a separating cell), secession rhexolytic or by fracture of the cc, maturation by diffuse wall-building, no proliferation of cc; 3, conidial ontogeny holoblastic, apical wall-building random at more than one locus per cc and conidia becoming conidiogenous to form connected branched chains, each conidium delimited by 1 septum, maturation by diffuse wall-building, secession schizolytic, no cc proliferation; 4, conidial ontogeny holoblastic, apical wall-building at 1 locus per cc and each conidium with 1 locus to form a connected unbranched chain, each conidium delimited by 1 septum, maturation by diffuse wall-building, secession schizolytic, no proliferation of cc; 5, conidial ontogeny holoblastic, apical wall-building randomly at more than 1 locus per cc and conidia becoming conidiogenous to form connected branched chains, each conidium delimited by 2 septa (or a separating cell), secession rhexolytic or by fracture of the cc, maturation by diffuse wall-building, no cc proliferation; 6, conidial ontogeny holoblastic, with localized apical wall-building simultaneously at different loci over the whole cc, each locus forming 1 conidium, delimited by 1 septum, maturation by diffuse wall-building, secession schizolytic, no cc proliferation; 7, conidial ontogeny holoblastic, with localized apical wall-building simultaneously at different loci on denticles over the whole cc, each locus forming 1 conidium, delimited by 1 septum, maturation by diffuse wall-building, secession by rupture of denticle, no cc proliferation; 8, conidial ontogeny holoblastic, with localized apical wall-building simultaneously at different loci over the whole cc, each conidium delimited by 2 septa (or a separating cell), secession rhexolytic or by fracture of the cc, each locus forming 1 conidium, maturation by diffuse wall-building, no cc proliferation; 9, conidial ontogeny holoblastic, apical wall-building simultaneously at several loci per cc and conidia becoming conidiogenous to form connected branched chains, each conidium delimited by 1 septum, maturation by diffuse wall-building, secession schizolytic, no cc proliferation; 10, conidial ontogeny holoblastic, regularly alternating with holoblastic sympodial cc proliferation, maturation by diffuse wall-building, each conidium delimited by 1 septum, secession schizolytic; 11, conidial ontogeny holoblastic, regularly alternating with holoblastic sympodial cc proliferation, maturation by diffuse wall-building, each conidium delimited by 2 septa (or a separating cell), secession rhexolytic or by fracture of the cc; 12, conidial ontogeny holoblastic, each from apical or lateral loci, delimited by 1 septum, secession schizolytic, holoblastic cc proliferation sympodial or irregular, maturation by diffuse wall-building; 13, conidial ontogeny holoblastic, first from an apical locus, delimited by 1 septum, secession schizolytic, other conidia from lateral loci proceeding down the cc, maturation by diffuse wall-building; 14, conidial ontogeny holoblastic, first from an apical locus, each conidium delimited by 2 septa (or a separating cell), secession rhexolytic or by fracture of the cc, other conidia from lateral loci proceeding down the cc, maturation by diffuse wall-building.

e.g. e $\equiv$ H, indicates multiseptate hyaline conidia, hP, helical brown etc.

(iii) **Conidiogenous events.** The matrix system used is based on Minter *et al.* (*TBMS* 79: 75, 1982; *TBMS* 80: 38, 1983; *TBMS* 81: 109, 1983) who showed a continuum of developmental processes associated with conidial production, including ontogeny, delimitation and secession of conidia and proliferation and regeneration of the cells bearing them (see conidiogenesis). For the 43 combinations of events so far recognized see Figs 24-26, e.g. 15, indicates a succession of holoblastic conidial ontogeny, delimitation by a transverse septum, schizolytic secession, percurrent enteroblastic conidiogenous cell proliferation followed by holoblastic conidial ontogeny, successive conidia seceding at the same level.

Use of '?' means that insufficient information is available for the feature to be coded, and '-', that the feature is absent, e.g. 'Sc.-.' indicates presence of sclerotia but no conidia, and 'Cpd.e1P.?', that pycnidial conidiomata produce 1-septate brown conidia but their genesis is not known.

Lit.: General works on the anamorphic fungi include: Saccardo (*Syll. Fung.* 3, 4, 10, 11, 14, 16, 18, 22, 25, 26, 1884-1972), Lindau (*Naturlichen Pflanzenfam.*, 1900), Jaczewski (*Key to Fungi* 2, *Fungi Imperfecti*, 1917), v. Höhnelt (*Mykol. Unters.* 3: 301-369, 1923), Clements & Shear (1931), Kendrick (Ed.) (*Taxonomy of Fungi Imperfecti*, 1971), Barnett & Hunter (*Illustrated genera of imperfect fungi*, 3 edn, 1972), Ainsworth *et al.* (Eds) (*The Fungi* 4, 1973), Cole & Kendrick (*Biology of conidial fungi*, 1981), Minter *et al.* (*TBMS* 79: 75, 1982; 80: 39, 1983; 81: 109, 1983), Stewart *et al.* (*Deuteromy-*

cotina and selected Ascomycotina from wood and wood products, 1988; bibliogr. and guide to taxonomic lit.), Wilken-Jensen & Gravesen (*Atlas of moulds in Europe causing respiratory allergy*, 1984), Matsumoto & Ajello (*Handb. Appl. Mycol.: Humans, animals & insects* 2: 117, 1991; dematiaceous fungi pathogenic to humans and lower animals), Campbell (*Handb. Appl. Mycol.: Humans, animals & insects* 2: 395, 1991; conidiogenesis in fungi pathogenic to man and animals), McGinnis *et al.* (*Jl Med. Vet. Mycol.* 30(Suppl. 1): 261, 1992), Howard (Ed.) (*Fungi pathogenic for humans and animals* A, 1993), Reynolds & Taylor (Eds), *The fungal holomorph*, 1993), Kiffer & Morelet (*The Deuteromycetes*, 2000), Seifert & Gams (*in* MacLaughlin *et al.* (Eds), *The Mycota VIIA*: 307, 2001). See also under *Coelomycetes* and *Hyphomycetes*.

Anamylopsora Timdal (1991), Anamylopsoraceae (L). 1, widespread. See Timdal (*Mycotaxon* 42: 250, 1991), Lumbsch *et al.* (*Pl. Syst. Evol.* 198: 275, 1995; fam.), Döring & Lumbsch (*Lichenologist* 30: 489, 1998; ontogeny), Lumbsch *et al.* (*MR* 105: 16, 2001; phylogeny), Lumbsch *et al.* (*MR* 105: 265, 2001; asci), Peršoh *et al.* (*Mycol. Progr.* 3: 103, 2004; asci). **Anamylopsoraceae** Lumbsch & Lunke (1995), Ostropomycetidae (inc. sed.) (L). 1 gen., 1 spp.

Lit.: Timdal (*Mycotaxon* 42: 250, 1991), Huneck & Elix (*Herzogia* 9: 647, 1993), Lumbsch *et al.* (*Pl. Syst. Evol.* 198: 275, 1995), Lumbsch (*J. Hattori bot. Lab.* 83: 1, 1997), Döring & Lumbsch (*Lichenologist* 30: 489, 1998), Lumbsch *et al.* (*MR* 105: 16, 2001), Lumbsch *et al.* (*MR* 105: 265, 2001), Lumbsch *et al.* (*MR* 111: 1133, 2007).

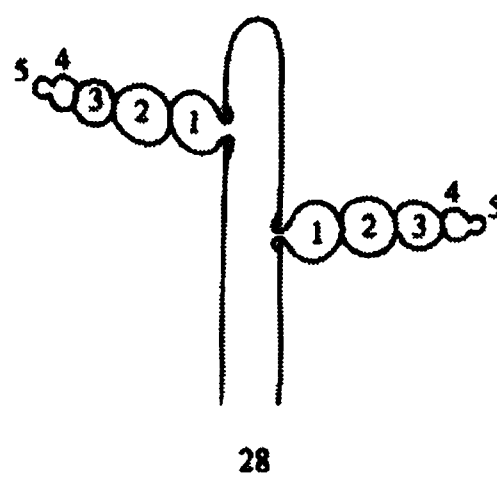
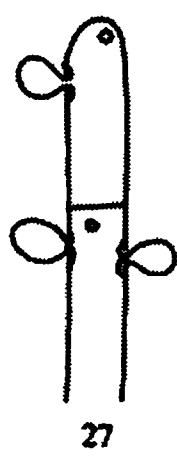
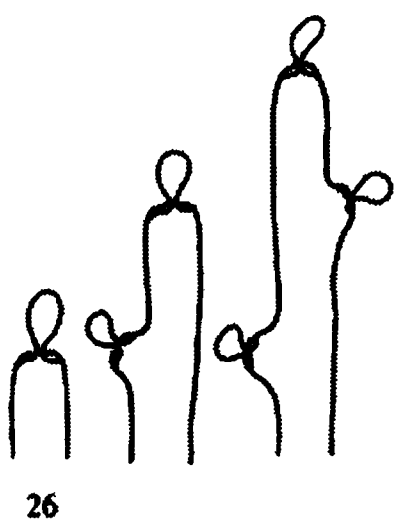
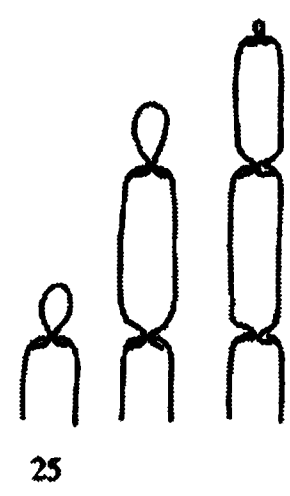
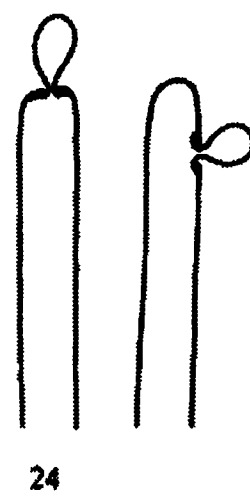
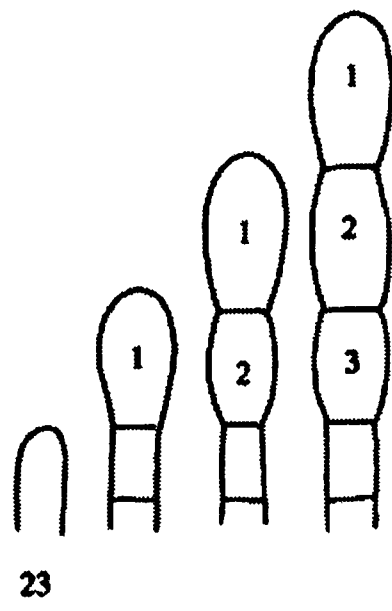
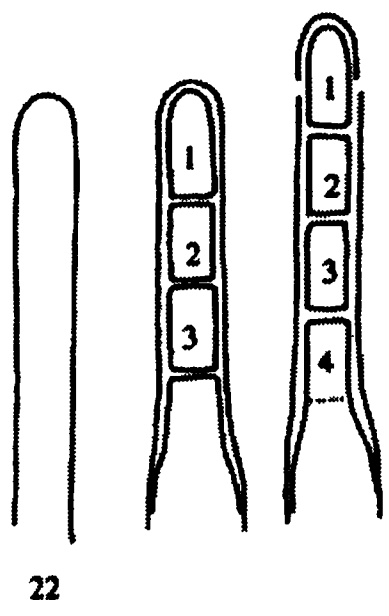
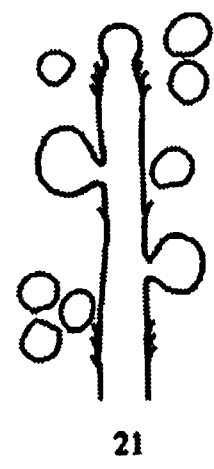
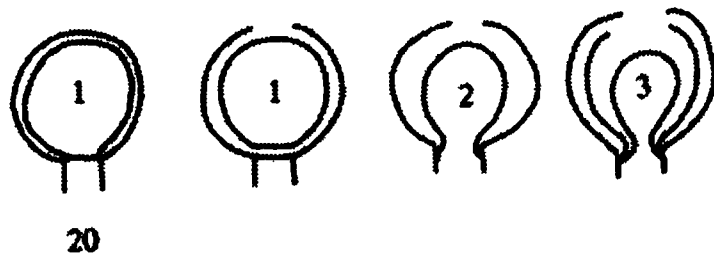
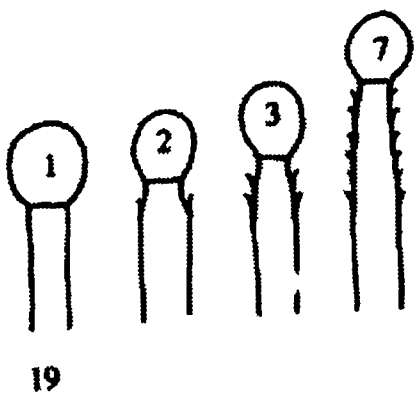
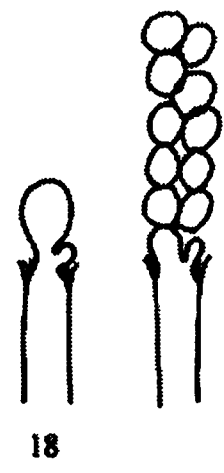
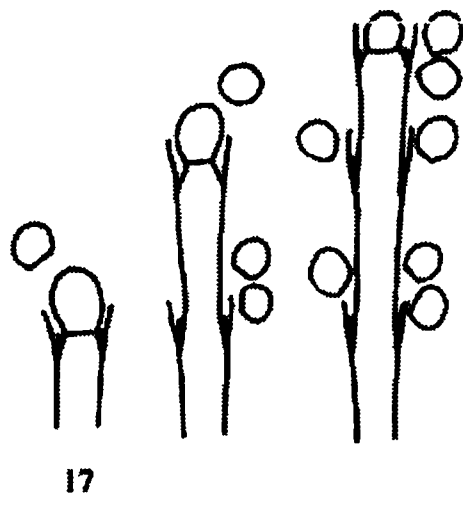
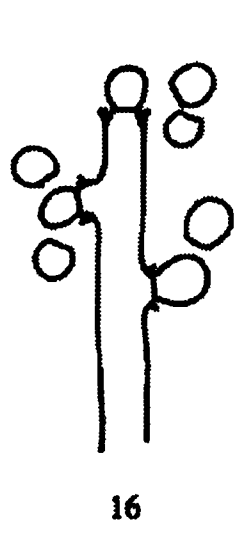
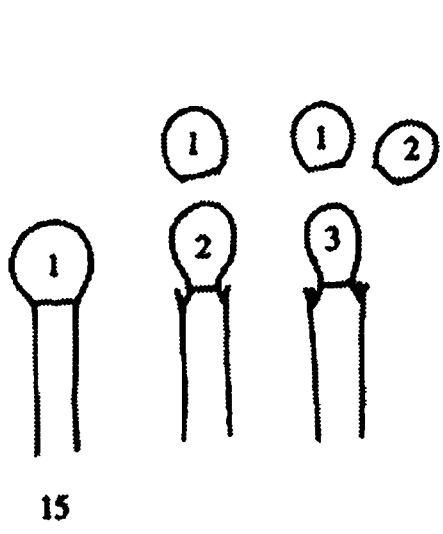


Fig. 2. Conidiogenous events (cc - conidiogenous cell). 15, conidial ontogeny holoblastic, delimitation by 1 septum, schizolytic secession, maturation by diffuse wall-building, percurrent enteroblastic cc proliferation followed by conidial ontogeny by replacement apical wall-building, successive conidia seceding at the same level, sometimes in unconnected chains, collarette variable; 16, same as 15 but with several random or irregular conidiogenous loci to each cc; 17, conidial ontogeny holoblastic, delimitation by 1 septum, schizolytic secession, maturation by diffuse wall-building, percurrent enteroblastic cc proliferation followed by conidial ontogeny by replacement apical wall-building, successive conidia seceding at the same level, collarette variable, conidiogenous activity interspersed periodically with percurrent vegetative proliferation; 18, conidial ontogeny holoblastic, delimitation by 1 septum, schizolytic secession, maturation by diffuse wall-building, percurrent and sympodial enteroblastic cc proliferation followed by conidial ontogeny by replacement apical wall-building, successive conidia seceding at the same level, collarette variable; 19, conidial ontogeny holoblastic, delimitation by 1 septum, schizolytic secession, maturation by diffuse wall-building, percurrent enteroblastic cc proliferation followed by conidial ontogeny by replacement apical wall-building, successive conidia seceding at progressively higher levels, sometimes in unconnected chains, collarette variable; 20, conidial ontogeny enteroblastic, delimitation by 1 septum, schizolytic secession, maturation by diffuse wall-building, outer wall of the cc remaining as a conspicuous collarette, percurrent enteroblastic cc proliferation followed by conidial enteroblastic ontogeny by replacement apical wall-building, successive conidia seceding at the same level, a succession of collarettes formed; 21, combination of 10, 12 and 19, where the sequences occur at random, irregularly or interchangeably; 22, conidial ontogeny holoblastic with new inner walls constituting the conidia laid down retrogressively by diffuse wall-building, delimitation retrogressive, loss of apical wall-building followed by replacement ring wall-building at the base of the cc adding more retrogressively delimited conidia, the outer (original) cc wall breaks as a connected chain of conidia is formed, collarette variable, 1 locus per cc, secession schizolytic; 23, conidial ontogeny holoblastic, 1 locus per cc, first conidium delimited by 1 septum, maturation by diffuse wall-building, loss of apical wall-building, replaced by ring wall-building below the delimiting septum which produces conidia in a connected unbranched chain, secession schizolytic, no proliferation of cc; 24, conidial ontogeny holoblastic, simultaneous with minimal enteroblastic percurrent proliferation at the preformed pore in the outer cc wall, conidia solitary, delimited by 1 septum, secession schizolytic, maturation by diffuse wall-building, 1 locus per cc; 25, conidial ontogeny holoblastic, simultaneous with minimal enteroblastic percurrent proliferation at the preformed pore in the outer cc wall, conidia solitary, delimited by 1 septum, secession schizolytic, maturation by diffuse wall-building, after one conidium formed extensive enteroblastic percurrent proliferation by apical wall-building occurs until the next apical locus is formed; 26, same as 24 but with holoblastic sympodial proliferation of the cc with conidiogenesis occurring between loci; 27, same as 24 but with several conidiogenous loci produced in the apical cc and laterally below septa in other ccs constituting the conidiophore; 28, same as 24 but several loci to each cc and first and subsequent conidia becoming conidiogenous by apical wall-building to form unbranched connected chains; more than one locus to a conidium will produce branched chains; 29, same as 24 but first conidium becoming conidiogenous by apical wall-building to form an unbranched connected chain.

anaphylaxis, manifestation of a change (immediate hypersensitivity) in a living animal from the uniting of an antibody with its antigen which may result in the death of the animal; cf. allergy.

anaphysis, a thread-like conidiophore persisting in apothecia of *Ephebe*.

Anaphysmene Bubák (1906), anamorphic *Pezizomycotina*, Cac.1eH.19. 2, Europe; Guatemala. See Sutton (*TBMS* 59: 285, 1972), Sutton & Hodges (*Mycol.* 82: 313, 1990), Mel'nik (*Opredelitel' Gribov Rossii* Klass Coelomycetes Byp. 1. Redkie i Maloizvestnye Rody, 1997).

Anaptychia Körb. (1848), Physciaceae (L.). c 11, widespread. See also *Heterodermia*. See Kurokawa (*Beih. Nova Hedwigia* 6, 1962), Poelt (*Nova Hedwigia* 9: 21, 1965), Kurokawa (*J. Hattori bot. Lab.* 37: 563, 1973), Swinscow & Krog (*Lichenologist* 8: 103, 1976; Africa), Kashiwadani *et al.* (*Bull. natn. Sci. Mus. Tokyo*, B 16: 147, 1990; chemistry, 23 spp., Peru), Heibel *et al.* (*Schriftenreihe der Landesanstalt für Ökologie, Bodenordnung und Forsten/Landesamt für Agrarordnung* 17: 225, 1999; conservation, Germany), Lohtander *et al.* (*Mycol.* 92: 728, 2000; Fennoscandia), Dahlkild *et al.* (*Bryologist* 104: 527, 2001; photobionts), Grube & Arup (*Lichenologist* 33: 63, 2001; phylogeny), Nordin & Mattsson (*Lichenologist* 33: 3, 2001; phylogeny), Scheidegger *et al.* (*Lichenologist* 33: 25, 2001; evolution), Helms *et al.* (*Mycol.* 95: 1078, 2003; phylogeny), Peršoh *et al.* (*Mycol. Progr.* 3: 103, 2004; asci),

Miądlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Esslinger (*Bryologist* 110: 788, 2007; N America), Honegger & Zippler (*MR* 111: 424, 2007; mating systems), Lohtander *et al.* (*Ann. bot. fenn.* 45: 55, 2008; phylogeny).

Anaptychiaceae Körb. (1859) = Physciaceae.

Anaptychiomyces E.A. Thomas (1939) nom. inval. = Anaptychia.

Anapyrenium Müll. Arg. (1880) nom. conf. = Buellia. p.p. fide Eriksson (*Op. Bot.* 60, 1981).

Anarhyma M.H. Pei & Z.W. Yuan (1986), anamorphic *Pezizomycotina*, St.#eP.1. 1, China. See Pei & Yuan (*Bull. bot. Res. Harbin* 6: 119, 1986).

Anariste Syd. (1927), Asterinaceae. 1, C. America. See Hosagoudar *et al.* (*Journal of Mycopathological Research* 39: 61, 2001).

Anastomaria Raf. (1820) nom. rej. = Gyrodon fide Kuyper (*in litt.*).

anastomosing, joining irregularly to give a vein-like network.

anastomosis (pl. **anastomoses**), the fusion between branches of the same or different hyphae (or other structures) to make a network.

Anastomyces W.P. Wu, B. Sutton & Gange (1997), anamorphic *Basidiomycota*. 1 (fungicolous), China. See Wu *et al.* (*MR* 101: 1318, 1997).

Anastrophella E. Horak & Desjardin (1994), Marasmiaceae. 3, New Zealand; Hawaii; Japan. See Horak & Desjardin (*Aust. Syst. Bot.* 7: 162, 1994), Tanaka & Hongo (*Mycoscience* 42: 433, 2001).

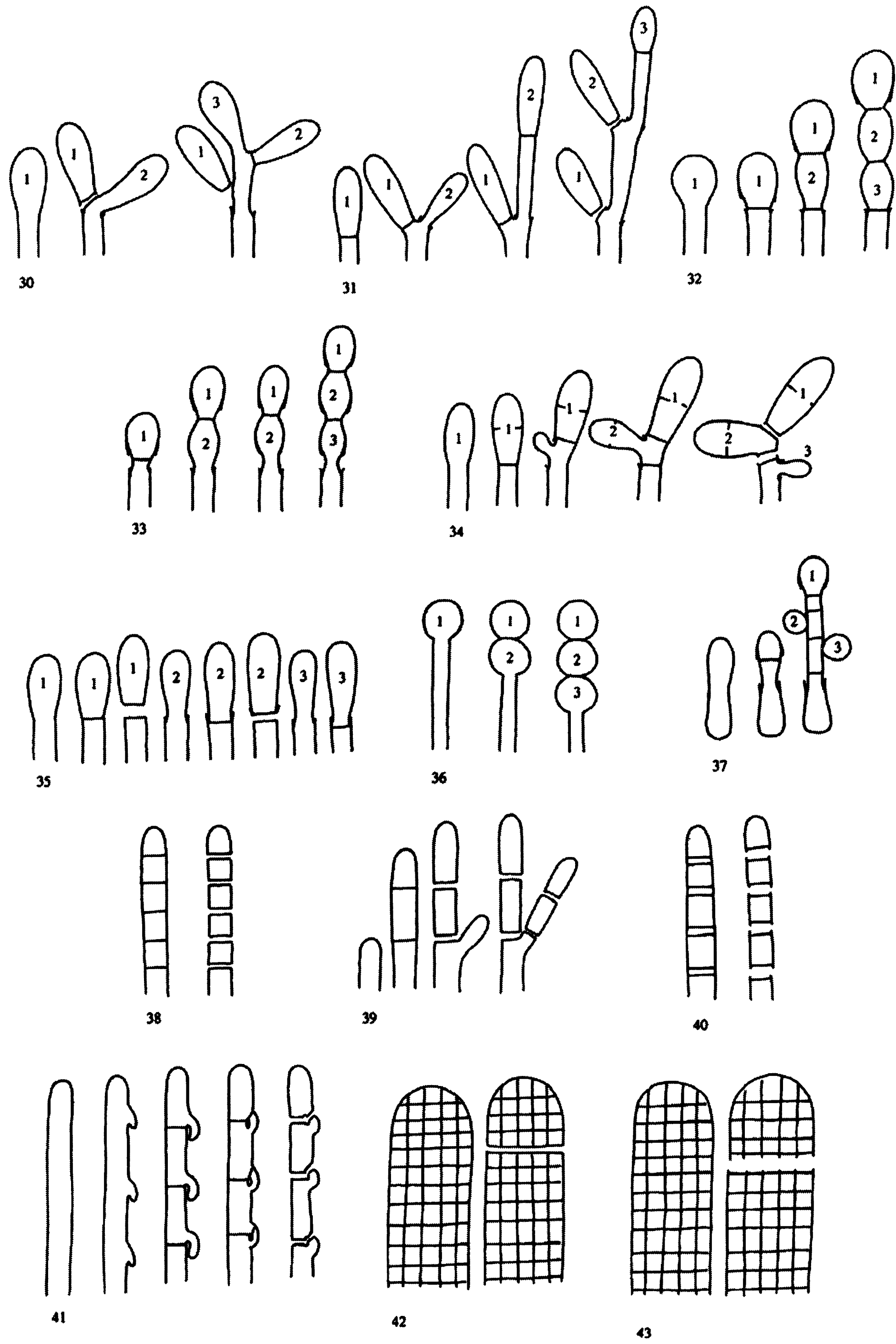


Fig. 3. Conidiogenous events (cc - conidiogenous cell). 30, conidal ontogeny holoblastic, delimitation by 1 septum, maturation by apical and diffuse wall-building, secession schizolytic and coincident with enteroblastic sympodial cc proliferation below the previous locus; subsequent conidia formed similarly but with holoblastic sympodial cc proliferation; 31, conidal ontogeny holoblastic, delimitation by 1 septum, maturation by apical and diffuse wall-building, secession schizolytic and coincident with enteroblastic sympodial cc proliferation below the previous conidiogenous locus, the sequence giving geniculate conidiophores; 32, conidal ontogeny holoblastic, with new inner walls continuous with all conidia laid down by diffuse wall-building, delimitation by 1 septum, loss of apical wall building followed by replacement continuous ring wall-building immediately below delimiting septum, the outer cc wall breaks between the first conidium and the cc to produce a variable collarete, followed by alternation of holoblastic conidal ontogeny by ring wall-building giving connected chains of conidia, maturation by diffuse wall-building, retrogressive delimitation, secession schizolytic; 33, conidal ontogeny holoblastic with new inner walls laid down by diffuse wall-building, delimitation by 1 septum, loss of apical wall-building followed by replacement ring wall-building immediately below delimiting septum, the outer cc wall breaks between the first conidium and the cc to produce a variable collarete, subsequent conidia formed by new inner walls for each conidium by ring wall-building giving connected chains of conidia, maturation by diffuse wall-building, retrogressive delimitation, secession schizolytic; 34, conidal ontogeny holoblastic, delimitation by 1 septum, secession schizolytic, enteroblastic sympodial cc proliferation below the previous locus and delimiting septum, the second and subsequent conidia formed from proliferations and delimited retrogressively, cc reduced in length with each conidium formed; 35, conidal ontogeny holoblastic, maturation by diffuse wall-building, delimitation by 1 septum, secession schizolytic, enteroblastic percurrent cc proliferation with retrogressive delimitation of next conidium, producing unconnected chains of conidia, the cc reduced in length with each conidium formed; 36, conidal ontogeny holoblastic, delimitation by 1 septum with loss of apical wall-building but replaced by diffuse wall-building below the previous conidium to form the next conidium which is retrogressively delimited giving an unconnected chain of conidia, secession schizolytic, cc reduced in length with each conidium formed; 37, conidal ontogeny holoblastic, delimitation by 1 septum with loss of apical wall-building, replaced by ring wall-building below the delimiting septum, outer wall of first conidium and cc breaks, followed by enteroblastic percurrent proliferation by ring wall-building, succeeding conidia holoblastic, delimited laterally and retrogressively, secession schizolytic, several loci per cc; 38, conidal ontogeny holothallic, ccs formed by apical wall-building coincident with conidal ontogeny, random delimitation by 1 septum at each end, no maturation during conidiogenesis, secession randomly schizolytic; 39, conidal ontogeny holothallic, ccs formed by apical wall-building coincident with conidal ontogeny, random delimitation by 1 septum at each end, no maturation during conidiogenesis, secession randomly schizolytic, cc proliferation holoblastic, irregular or sympodial, constituent cells conidiogenous; 40, same as 38 but conidal delimitation by 2 septa or separating cells at each end, secession rhexolytic; 41, conidal ontogeny holothallic, ccs formed in association with clamp connexions, random delimitation by septa in cc and the backwardly directed branch in the clamp connexion, maturation by diffuse and localized apical wall-building, secession randomly schizolytic, individual conidia comprised of part of the preceding and following clamp connexions; 42, conidal ontogeny holoblastic by simultaneous apical wall-building in adjacent cells, delimitation by septa in each of these cells, maturation by diffuse wall-building, secession simultaneous, multicellular, schizolytic, no cc proliferation; 43, conidal ontogeny holoblastic by simultaneous apical wall-building in adjacent cells, delimitation by septa in each of these cells, maturation by diffuse wall-building, followed by replacement apical wall-building in conidia to form additional conidia in connected chains, secession simultaneous, multicellular, rhexolytic, no cc proliferation

Anatexis Syd. (1928) = *Englerula* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).

Anatolinites Elsik, V.S. Ediger & Bati (1990), Fossil Fungi. 7 (Eocene – Holocene), widespread. See Elsik *et al.* (*Palynology* 14: 92, 1990).

Anavirga B. Sutton (1975), anamorphic *Vibrisea*, Hso.0bP.1/10. 3, Europe. See Hamad & Webster (*Sydowia* 40: 60, 1988), Descals (*MR* 109: 545, 2005; conidia).

anbury, see club root.

Ancistrosporella G. Thor (1995), Roccellaceae (L.). 3, Australia. See Thor (*Op. Bot.* 103, 1990; as *Ancistrospora*), Egea *et al.* (*Mycotaxon* 59: 47, 1996; New Guinea), Grube (*Bryologist* 101: 377, 1998; phylogeny), Komposch *et al.* (*Lichenologist* 34: 223, 2002; Venezuela, orthography).

Ancistrospora G. Thor (1991) [non *Ancistrospora* C.A. Menéndez & Azcuy 1972, fossil spore-dispersae] = *Ancistrosporella*.

Anconomyces Cavalc. & A.A. Silva (1972) = *Lyromma* fide Lücking *et al.* (*Lichenologist* 30: 121, 1998).

Ancoraspora Mig. Rodr. (1982), anamorphic *Pezizo-*

mycotina, Hso. = eP.1. 1, Cuba. See Rodríguez Hernández (*Revta Jardín bot. Nac. Univ. Habana* 2: 20, 1981), Mena Portales *et al.* (*MR* 102: 736, 1998).

Ancoraspora J. Mena, Mercado & Heredia (1998), anamorphic *Pezizomycotina*, Hso.???. 1, Mexico. See Mena Portales *et al.* (*MR* 102: 736, 1998).

Ancylistaceae J. Schröt. (1893), Entomophthorales. 3 gen. (+ 2 syn.), 45 spp.

Lit.: Wolf (*Nova Hedwigia* 46: 121, 1988), Humber (*Mycotaxon* 34: 441, 1989; emend.), Voigt *et al.* (*J. Clin. Microbiol.* 37: 3957, 1999), Tanabe *et al.* (*Mol. Phylogen. Evol.* 30: 438, 2004), Keller & Petrini (*Sydowia* 57: 23, 2005), Tadano *et al.* (*Revta Soc. Bras. Med. Trop.* 38: 188, 2005), Kędra & Boguś (*J. Invert. Path.* 91: 50, 2006).

Ancylistales J. Schröt. (1893) = Entomophthorales.

Ancylistes Pfitzer (1872), Ancylistaceae. 5 (on *Closterium*), widespread (north temperate). See Berdan (*Mycol.* 30: 396, 1938), Sparrow (*Aquatic Phycomycetes* Edn 2: 1065, 1960; key), Tucker (*Mycotaxon* 13: 481, 1981; key).

Ancylospora Sawada (1944) = *Pseudocercospora* fide Deighton (*Mycol. Pap.* 140, 1976), Crous & Braun

- (*CBS Diversity Ser.* 1: 571 pp., 2003).
- Andebbia** Trappe, Castellano & Amar. (1996), Mesophelliaceae. 1, Australia. See Trappe *et al.* (*Aust. Syst. Bot.* 9: 808, 1996).
- Andreaea** Palm & Jochems (1923) [non *Andreaea* Hedw. 1801, *Musci*] = *Andreaeana*.
- Andreaeana** Palm & Jochems (1924) = *Acremonium*. *fide* Gams (*in litt.*).
- Andreanszkyia** Tóth (1968) = *Podospora* *fide* Lundqvist (*Symb. bot. upsal.* 20 no. 1, 1972).
- androgynous**, having the antheridium and its oogonium on one hypha; in de Bary's original sense (*Bot. Zeit.* 46: 597, 1888) covers hypogynous, etc. Cf. monoclinal.
- androphore**, a branch forming antheridia, as in *Pyronema*.
- Androsaceus** (Pers.) Pat. (1887) = *Marasmius* *fide* Saccardo (*Syll. fung.* 5: 1, 1887).
- Anekabeeja** Udaiyan & V.S. Hosag. (1992) ? = *Pycnidophora* *fide* Eriksson & Hawksworth (*SA* 12: 24, 1993), Korf (*Mycotaxon* 54: 413, 1995; nomencl.).
- Anellaria** P. Karst. (1879) = *Panaeolus* *fide* Dennis *et al.* (*TBMS* 43, 1960).
- Anema** Nyl. ex Forssell (1885) nom. cons., Lichinaceae (L). 13, widespread. See Moreno & Egea (*Acta Bot. Barcinon.* 91: 1, 1992; key), McCune *et al.* (*Conservation and Management of Native Plants and Fungi* Proceedings of an Oregon Conference. Corvallis, Oregon, November 15-17, 1995: 234, 1997; conservation, Oregon), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key).
- Anematidium** Gronchi (1931) = *Zasmidium* *fide* Ciferri & Montemartini (*Atti Ist. bot. Univ. Lab. crittog. Pavia* sér. 5 17: 274, 1959).
- anemophilous** (of spores), taken about by air currents.
- aneuploid**, having a chromosome number which is not a multiple of the haploid set.
- Angatia** Syd. (1914), Saccardiaceae. 4 or 5, widespread (tropical).
- Angelina** Fr. (1849), Dermateaceae. 1, N. America. See Durand (*J. Mycol.* 8: 108, 1906).
- angio-** (of a sporocarp), closed at least till the spores are mature. Cf. endo-, gymno-, hemi-angiocarpous, and cleistocarp.
- angiocarpous** (of a basidiome), hymenial surface at first exposed but later covered by an incurving pileus margin and/or excrescences from the stipe (Singer, 1975: 26); also used in a parallel way for *Ascomycota*.
- Angiococcus** E. Jahn (1924) nom. dub., ? Fungi. See Peterson & McDonald (*Mycol.* 58: 962, 1967).
- Angiophaeum** Sacc. (1898) = *Phaeangium* Pat.
- Angiopoma** Lév. (1841) nom. rej. = *Drechslera* *fide* Sutton (*Mycotaxon* 3: 377, 1976).
- Angiopomopsis** Höhn. (1912), anamorphic *Pezizomycotina*, Cpd. = eP.19. 1, Java. See Sutton (*Česká Mykol.* 29: 97, 1975), Farr *et al.* (*Mycol.* 90: 290, 1998).
- Angiopsora** Mains (1934) = *Phakopsora* *fide* Ono *et al.* (*MR* 96: 825, 1992) See.
- Angiosorus** Thirum. & M.J. O'Brien (1974) = *Thecaphora* *fide* Mordue (*Mycopathologia* 103: 177, 1988).
- Angiotheca** Syd. (1939) = *Dictyonella* *fide* von Arx (*Persoonia* 2: 421, 1963).
- angium** (-ange, suffix), a structure having no opening; a cavity.
- ang-kak** (red rice), an Oriental food colouring obtained by growing *Monascus purpureus* on polished rice; see Fermented food and drinks.
- Anguillomyces** Marvanová & Bärlocher (2000), anamorphic *Basidiomycota*. 1 (freshwater), Canada. See Marvanová & Bärlocher (*Mycotaxon* 75: 411, 2000).
- Anguillospora** Ingold (1942), anamorphic *Pleosporales*, Hso. = eH.2. 11 (aquatic), widespread. See Petersen (*Mycol.* 54: 117, 1962; key), Jooste & van der Merwe (*S. Afr. J. Bot.* 56: 319, 1990; ultrastr.), Marvanová (*Tropical Mycology*: 169, 1997; tropical spp.), Kendrick (*CJB* 81: 75, 2003; morphogenesis), Belliveau & Bärlocher (*MR* 109: 1407, 2005; phylogeny), Descals (*MR* 109: 545, 2005; diagnostic characters), Baschien *et al.* (*Nova Hedwigia* 83: 311, 2006; phylogeny, morphology).
- Anguillosporella** U. Braun (1995), anamorphic *Mycosphaerellaceae*, Hso.???. 2 (on living leaves), USA. See Redhead & White (*CJB* 63: 1429, 1985; as *Anguillospora*), Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 1: 233, 1995).
- anguilluliform**, worm-like or eel-like in form.
- angular septum**, see septum.
- Angulimaya** Subram. & Lodha (1964), anamorphic *Bombardioidea*, Hso.0eH.19. 1 (coprophilous), India. See Subramanian & Lodha (*Antonie van Leeuwenhoek Ned. Tijdschr. Hyg.* 30: 329, 1964), Krug & Scott (*CJB* 72: 1302, 1994; connexion).
- Angulospora** Sv. Nilsson (1962), anamorphic *Pezizomycotina*, Hso.0fH.2. 1 (aquatic), Venezuela. See Nilsson (*Svensk bot. Tidskr.* 56: 354, 1962), Goh (*Biodiversity of Tropical Microfungi*: 189, 1997), Marvanová (*Tropical Mycology*: 169, 1997).
- Angusia** G.F. Laundon (1964) = *Maravalia* *fide* Ono (*Mycol.* 76: 892, 1984).
- angustate**, narrowed.
- anheliophilous**, preferring diffuse light. Cf. heliophilous.
- Anhellia** Racib. (1900), ? Myriangiaceae. 7, widespread (tropical). See von Arx (*Persoonia* 2: 421, 1963), Barreto & Evans (*MR* 98: 1107, 1994), Inácio & Dianese (*MR* 102: 695, 1998), Pereira & Barreto (*Fungal Diversity* 12: 155, 2003).
- Animal mycophagists**. Fungi, particularly basidiomycetes and larger ascomycetes, can form an important part of the diet of various mammals, including deer, pigs, rabbits, squirrels and various other rodents (Buller, *TBMS* 6: 355, 1920; *Researches* 2: 195, 1922; Hastings & Mottram, *TBMS* 5: 364, 1916; Minter, *IMI Descriptions of Fungi and Bacteria*, Set 172, 2007). In the case of hypogeous fungi, this has evolved as mutualism, the feeding animal benefiting the fungus by dispersing its spores; the resulting digging and soil aeration carried out by mycophagist mammals in search of fruitbodies can contribute significantly to the dynamics of woodland and forest soils. Animal mycophagists and fungi may also have a role as mutualists in seed dispersal (Pirozynski & Malloch, in Pirozynski & Hawksworth (Eds), 1988: 227). Conservation studies in North Am. on the northern spotted owl demonstrated that fungi form a key element in the food chain supporting that highly endangered bird (Minter, *IMI Descriptions of Fungi and Bacteria*, Set 172, 2007). Some fungi accumulate radioactive pollutants sufficiently strongly to impact on the food chains they support (Hughman & Huchschlag, *European J. of Wildlife Res.* 51: 263,

- 2005; Iceland moss). Lichens may form an important component of food for reindeer (see Reindeer lichen). Fungi are also consumed by invertebrates, particularly slugs (Elliott, *TBMS* 8: 84, 1922), snails (*Polygyra thyroides*) (Wolf & Wolf, *Bull. Torrey bot. Cl.* 66: 1, 1939) and arthropods (see Ambrosia fungi, Insects and fungi, Termite fungi). See also Coevolution; Fungi and radiation; Hypogeous fungi; Iceland moss.
- Aniptodera** Shearer & M.A. Mill. (1977), Halosphaeriaceae. 9 (aquatic and marine), widespread. See Shearer (*Mycol.* 81: 139, 1989), Volkmann-Kohlmeyer & Kohlmeyer (*Bot. Mar.* 37: 109, 1994; table chars 9 spp.), Chen *et al.* (*Mycol.* 91: 84, 1999; DNA), Hyde *et al.* (*Mycoscience* 40: 165, 1999), Kong *et al.* (*MR* 104: 35, 2000; DNA), Hyde (*Cryptog. Mycol.* 23: 5, 2002), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- aniso-** (prefix), unequal.
- Anisochora** Theiss. & Syd. (1915) = *Apiosphaeria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Anisochytridiales** Karling (1943) = *Hyphochytriales*.
- anisogamy**, the copulation of gametes of unlike form or physiology, i.e. of **-gametes**; heterogamy; cf. isogamy.
- Anisogramma** Theiss. & Syd. (1917), Valsaceae. 3 (from bark), Europe; N. America. See Osterbauer *et al.* (*Phytopathology* 84: 1150, 1994; DNA).
- anisokont**, having flagella of unequal length; heterokont.
- Anisomeridium** (Müll. Arg.) M. Choisy (1928) nom. cons., Monoblastiaceae (L). c. 100, widespread (esp. tropical). See Harris (*More Florida Lichens*, 1995; key 75 spp.), Harada (*Hikobia* 13: 411, 2001), Komposch (*Lichenologist* 37: 519, 2005), Aptroot *et al.* (*Bibliotheca Lichenol.* 97, 2008; Costa Rica).
- Anisomyces** Pilát (1940) = *Gloeophyllum* fide Donk (*Persoonia* 1: 173, 1960).
- Anisomyces** Theiss. & Syd. (1914), ? Valsaceae. 1, America (tropical). See Cannon (*Fungal Diversity* 7: 17, 2001).
- Anisomycopsis** I. Hino & Katum. (1964), Diaporthales. 1, Japan. See Hino & Katumoto (*J. Jap. Bot.* 39: 325, 1964).
- anisospory**, having spores of more than one kind.
- Anisostagma** K.R.L. Petersen & Jørg. Koch (1996), Halosphaeriaceae. 1 (marine), Denmark. See Petersen & Koch (*MR* 100: 209, 1996).
- Anisostomula** Höhn. (1919) = *Hyponectria* fide Barr (*Mycol.* 68: 611, 1976).
- anisotomic dichotomic branching**, branching where one dichotomy becomes stouter and forms a main stem so that the other branch of the dichotomy appears to be lateral, as in *Alectoria ochroleuca*; cf. isotomic dichotomic branching.
- Anixia** Fr. (1819) nom. dub., Agaricomycetidae. ? 'gasteromycetes' fide Demoulin (*in litt.*).
- Anixia** H. Hoffm. (1862) = *Orbicula* fide Hughes (*Mycol. Pap.* 42, 1951).
- Anxiella** Saito & Minoura ex Cain (1961) = *Neurospora* fide von Arx (*Persoonia* 7: 367, 1973), García *et al.* (*MR* 108: 1119, 2004; phylogeny).
- Anxiopsis** E.C. Hansen (1897) = *Aphanoascus* fide Vries (*Mykosen* 12: 111, 1969), Guého & de Vroey (*CJB* 64: 2207, 1986; SEM ascospores), Cano & Guarro (*MR* 94, 1990).
- Ankistrocladium** Perrott (1960) = *Casaresia* fide Ellis (*Dematiaceous Hyphomycetes*, 1971).
- Ankultur**, see Normkultur.
- Annajenkinsia** Thirum. & Naras. (1955) = *Puttemansia* fide Pirozynski (*Kew Bull.* 31: 595, 1977).
- Anncaliia** I.V. Issi, S.V. Krylova & V.M. Nikolaeva (1993), Microsporidia. 4.
- Annella** S.K. Srivast. (1976), Fossil Fungi. 2 (Jurassic), British Isles.
- annellate** (of asci), ones with a thickened apical pore (e.g. *Leotiales*); see ascus; **annellations**; see annellidic.
- annellidic** (of conidiogenesis), holoblastic conidiogenesis in which the conidiogenous cell (**annellide**, annellophore) by repeated enteroblastic percurrent proliferation produces a basipetal sequence of conidia (**annelloconidia**, annellospores) leaving the distal end marked by transverse bands (**annellations**). See Conidial nomenclature.
- Annellodentimyces** Matsush. (1985), anamorphic *Pezizomycotina*, Hso.≡ eP.19. 1, Japan. See Matsushima (*Matsush. Mycol. Mem.* 4: 2, 1985), Ho *et al.* (*Mycol.* 97: 238, 2005).
- Annellodochium** Deighton (1969), anamorphic *Pezizomycotina*, Cpd.1eP.19. 1 (on *Diatrype*), Sierra Leone. See Deighton (*Mycol. Pap.* 118: 28, 1969).
- Annellolacinia** B. Sutton (1964), anamorphic *Pezizomycotina*, Cac.0eP.19. 2, widespread (tropical). See Frölich *et al.* (*MR* 97: 1433, 1993).
- Annellophora** S. Hughes (1952), anamorphic *Pezizomycotina*, Hso.≡ eP.19. 11, widespread (tropical). See Ellis (*Mycol. Pap.* 70, 1958; key), Manoharachary *et al.* (*Indian Phytopath.* 58: 454, 2005), Castañeda Ruiz *et al.* (*Mycotaxon* 96: 151, 2006).
- annellophore**, see annellidic.
- Annellophorella** Subram. (1962), anamorphic *Pezizomycotina*, Hso.#eP.19. 1, S. Africa. See Subramanian (*Proc. Indian Acad. Sci. series B* 55: 6, 1962).
- Annellophragmia** Subram. (1963), anamorphic *Pezizomycotina*, Hsy.≡ eP.19. 1, India. See Subramanian (*Proc. Indian Acad. Sci. series B* 58: 349, 1963).
- Annellospormosporella** P.R. Johnst. (1999), anamorphic *Pezizomycotina*, Hso.???. 1, New Zealand. Probably synonymous with *Spermosporella*. See Johnston (*N.Z. J. Bot.* 37: 290, 1999).
- Annellosympodia** McTaggart, R.G. Shivas & U. Braun (2007), *Pezizomycotina*. 1, Australia. See McTaggart *et al.* (*Australas. Pl. Path.* 36: 573, 2007).
- annular**, ring-like; ring-like arrangement.
- Annularia** (Schulzer) Gillet (1876) [non *Annularia* Sternb. 1825, fossil *Pteridophyta*] = *Chamaeota* fide Stalpers (*in litt.*).
- Annularia** Raf. (1815) nom. dub., Fungi. No spp. included.
- Annularius** Roussel (1806) = *Coprinus* fide Redhead *et al.* (*Mycotaxon* 50: 203, 2001).
- Annulatascaceae** S.W. Wong, K.D. Hyde & E.B.G. Jones (1998), Sordariomycetidae (inc. sed.). 21 gen. (+ 5 syn.), 75 spp.
Lit.: Wong *et al.* (*SA* 16: 17, 1998), Ho *et al.* (*Mycol.* 91: 885, 1999), Ho *et al.* (*Fungal Diversity* 3: 87, 1999), Ranghoo *et al.* (*Fungal Diversity* 2: 159, 1999), Ho & Hyde (*Fungal Diversity* 4: 21, 2000), Inderbitzin (*Mycoscience* 41: 167, 2000), Campbell & Shearer (*Mycol.* 96: 822, 2004), Réblová (*Mycol.* 98: 68, 2006).
- Annulatascus** K.D. Hyde (1992), Annulatascaceae. 14 (wood, aquatic), Australia. See Hyde (*Aust. Syst. Bot.* 5: 117, 1992), Wong *et al.* (*SA* 16: 17, 1998), Wong

- et al.* (MR 103: 561, 1999; ultrastr.), Tsui *et al.* (Mycoscience 43: 383, 2002), Campbell & Shearer (Mycol. 96: 822, 2004), Huhndorf *et al.* (Mycol. 96: 368, 2004; phylogeny).
- Annulohypoxyton** Y.M. Ju, J.D. Rogers & H.M. Hsieh (2005), Xylariaceae. 27, widespread. See Ju & Rogers (Mycol. Mem. 20: 365 pp., 1996; as *Hypoxyton* sect. *Annulata*), Ju *et al.* (Mycol. 97: 855, 2005), Bitzer *et al.* (MR 112: 251, 2008; phylogeny, chemistry).
- annulus** (1) (of basidiomata), a ring-like partial veil, or part of it, round the stipe after expansion of the pileus (Fig. 4C); hymenial veil; apical veil; ring; an - near the top of the stipe is **superior** (an **armilla**, fide Gäumann & Dodge, 1928: 453), one lower down, **inferior**; (2) (in *Papulospora*), the ring of cells around a bulbil; (3) (of asci), the apical ring; anneau apicale; (4) (in *Alternaria*), thickening in apices of conidiogenous cells, fide Campbell (Arch. Mikrobiol. 69: 60, 1970).
- Annulusmagnus** J. Campb. & Shearer (2004), Annulatascaceae. 1 (on submerged wood), Australia; N. America; Venezuela. See Campbell & Shearer (Mycol. 96: 826, 2004), Zhang *et al.* (Mycol. 98: 1076, 2006; phylogeny).
- anoderm**, having no skin.
- Anodotrichum** (Corda) Rabenh. (1844) = Blastotrichum fide Saccardo (Syll. fung. 4: 1, 1886).
- Anomalemma** Sivan. (1983), ? Melanommataceae. Anamorph *Exosporiella*. 1, Europe. See Sivanesan (TBMS 81: 313, 1983).
- Anomalographis** Kalb (1992), Graphidaceae (L). 1, Madeira. See Kalb & Hafellner (Herzogia 9: 49, 1992), Staiger (Biblthca Lichenol. 85, 2002).
- Anomalomyces** Vánky, M. Lutz & R.G. Shivas (2006), ? Ustilaginaceae. 1 (on *Panicum trachyrhachis* (Poaceae)), Australia. See Vánky *et al.* (Mycol. Balcanica 3: 120, 2006).
- Anomoloma** Niemelä & K.H. Larss. (2007), Fomitopsidaceae. 4, widespread. See Niemelä & Larsson (Mycotaxon 100: 312, 2007).
- Anomomorpha** Nyl. ex Hue (1891), Graphidaceae (L). 5, pantropical. See Hawksworth *et al.* (Dictionary of the Fungi edn 8, 1995), Archer (Systematics & Biodiversity 5: 9, 2007; Solomon Is).
- Anomomyces** Höhn. (1928) nom. dub., anamorphic *Pezizomycotina*. See Sutton (Mycol. Pap. 138, 1975).
- Anomoporia** Pouzar (1966), ? Fomitopsidaceae. 8, north temperate. See Pouzar (Česká Mykol. 20: 172, 1966).
- Anomothallus** F. Stevens (1925) nom. dub., Fungi. See Petrak (Sydowia 5: 328, 1951).
- Anopeltis** Bat. & Peres (1960), ? Capnodiaceae. 1, Venezuela. See Batista & Peres (Nova Hedwigia 2: 472, 1960).
- Anopodium** N. Lundq. (1964), Lasiosphaeriaceae. 2, Europe (northern). See Mirza & Cain (CJB 47: 1999, 1969; ? = *Podospora*).
- Ansatospora** A.G. Newhall (1944) nom. inval. = Mycocentrospora fide Deighton (Taxon 21: 716, 1972).
- Anserina** Velen. (1934) [non *Anserina* Dumort. 1827, *Chenopodiaceae*] = *Ascobolus* fide Eckblad (Nytt Mag. Bot. 15: 1, 1968).
- antabuse**, tetraethylthiuramdisulphate (disulfiram); after ingestion reacts with alcohol to give unpleasant symptoms; used in the treatment of chronic alcoholism; see coprine.
- antagonism**, a general name for associations of organisms damaging to one or more of the associates (cf. antibiosis, symbiosis). Though parasitism is an example of antagonism, the term is used esp. for the effects of toxic metabolic products (see Staling substances) or of undetermined causes on fungi and bacteria in competition. Much experimental work has been done on the antagonism between bacteria, bacteria and fungi, and fungi; and esp. on the competition between microorganisms in the soil; for example, on the effect of saprobic soil fungi on pathogenic species, e.g. *Trichoderma viride* on *Rhizoctonia*, *Pythium*, and other damping-off fungi.
- Lit.: Waksman (Soil Sci. 43: 51, 1937; Bact. Rev. 5: 231, 1941); Porter & Carter, and Weindling (Bot. Rev. 4: 165, 475, 1938) give long reference lists, and Hawksworth (in Cole & Kendrick, *Biology of conidial fungi* 1: 171, 1981) more recent ones; Moreau & Moreau (BSMF 72: 250, 1956) (types of association and antagonism). Cf. antibiotic substances.
- antarctic mycology**, see Polar and alpine mycology.
- Antarctomia** D.C. Linds. (1975) = *Placynthium* fide Henssen (Lichenologist 13: 307, 1981).
- Antarctomyces** Stchigel & Guarro (2001), Thelebolaceae. Anamorph *Sporothrix*-like. 1, Antarctica. See Stchigel *et al.* (MR 105: 377, 2001), Hoog *et al.* (Stud. Mycol. 51: 33, 2005).
- Antenagium** F.C. Albuquerque (1969) = *Gliocephalotrichum* fide Carmichael *et al.* (Genera of Hyphomycetes, 1980).
- Antennaria** Link (1809) [non *Antennaria* Gaertn. 1791, *Compositae*] = *Antennularia* fide Hawksworth *et al.* (Dictionary of the Fungi edn 8, 1995).
- Antennariella** Bat. & Cif. (1963), anamorphic *Antennulariella*, Cpd.0eH.?. c. 5, widespread (tropical). See Hughes (Mycol. 68: 693, 1976), Sutton (Mycol. Pap. 141, 1977), Hughes (CJB 78: 1215, 2000).
- Antennataria** Rchb. (1841) = *Antennularia*.
- Antennatula** Fr. ex F. Strauss (1850), anamorphic *Euantennaria*, Hso. = eP.1. 8, widespread. See Hughes (N.Z. Jl Bot. 12: 299, 1974), Hughes & Arnold (Mem. N. Y. bot. Gdn 49: 198, 1989).
- Antennella** Theiss. & Syd. (1918) = *Scorias* fide von Arx & Müller (Stud. Mycol. 9, 1975).
- Antennellina** J.M. Mend. (1925) ? = *Scorias* fide von Arx & Müller (Stud. Mycol. 9, 1975).
- Antennellopsis** J.M. Mend. (1930) = *Phragmocapnias* fide Reynolds (Mycotaxon 8: 917, 1979).
- Antennina** Fr. (1849) = *Antennularia*.
- Antennopsis** R. Heim (1952), anamorphic *Pezizomycotina*, Hso. = eP.1. 1 (on termites), Europe (southern); Florida. See *Gloeohaustoriales*. See Rossi & Blackwell (Mycol. 82: 138, 1990).
- Antennospora** Meyers (1957), Halosphaeriaceae. 2 (marine), widespread. See Jones *et al.* (Bot. Mar. 27: 129, 1984), Yusoff *et al.* (MR 98: 997, 1994; ultrastr.).
- Antennula**, see *Antennatula*.
- Antennularia** Rchb. (1828), Venturiaceae. c. 30, widespread. See also *Protoventuria*. See Müller & von Arx (Beitr. Kryptfl. Schweiz 11 no. 2, 1962), Hughes (N.Z. Jl Bot. 8: 156, 1970; as nom. dub.), Hughes & Seifert (Sydowia 50: 192, 1998).
- Antennulariaceae** Locq. (1984) = Venturiaceae.
- Antennulariella** Woron. (1915), Antennulariellaceae. Anamorphs *Antennariella*, *Capnodendron*. 4, widespread. See Hughes (Mycol. 68: 693, 1976), Reynolds (Mycotaxon 27: 377, 1986), Hughes (CJB 78: 1215, 2000), Hughes (Mycol. 99: 628, 2007).

Antennulariellaceae Woron. (1925), Capnodiales. 6 gen. (+ 3 syn.), 27 spp.

Lit.: Hughes (*Mycol.* 68: 693, 1976; gen. names, anamorphs), Reynolds (*Mycotaxon* 27: 377, 1986; status), Reynolds (*CJB* 76: 2125, 1998; phylogeny), Barr & Rogerson (*Mycotaxon* 71: 473, 1999), Hughes (*CJB* 78: 1215, 2000).

anterior (1) at or in the direction of the front; (2) (of lamellae), the end at the edge of the pileus.

Anthasthoopa Subram. & K. Ramakr. (1956) = *Corniella* fide Sutton (*CJB* 47: 603, 1969).

antheridiol, a sex hormone (sterol) of *Achlya bisexualis* which induces antheridial formation in male strains of *Achlya* (McMorris & Barksdale, *Nature* 215: 320, 1967; Barksdale, *Science* 166: 831, 1969).

antheridium (pl. -a, **antherid**), the male gametangium, either formed from a haplophase thallus, or in which meiosis occurs after delimitation.

antherozoid, a motile male cell; a sperm.

Anthina Fr. (1832), anamorphic *Pezizomycotina*, sterile. 5, widespread (temperate). *A. citri* and *A. brunnea* ('leaf felt' in *Citrus*). See Treu & Rambold (*Mycotaxon* 45: 71, 1992; possible link with *Cordyceps*).

Anthoblastomyces Verona & Zardetta (1954) nom. inval., anamorphic *Pezizomycotina*.

Anthomyces Dietel (1899), Raveneliaceae. 1 (on *Leguminosae*), Brazil. See Araujo *et al.* (*Fitopatol. Brasil* 30: 510, 2005; Brazil).

Anthomyces Grüss (1918) = *Metschnikowia* fide von Arx *et al.* (*Stud. Mycol.* 14: 1, 1977).

Anthomycetella Syd. & P. Syd. (1916), ? Raveneliaceae. 1 (on *Canarium* (*Burseraceae*)), Philippines.

Anthopeziza Wettst. (1885) = *Microstoma* Bernstein fide Eckblad (*Nytt Mag. Bot.* 15: 1, 1968).

Anthopsis Fil. March., A. Fontana & Luppi Mosca (1977), anamorphic *Pezizomycotina*, Hso.0eP.15. 3, Europe; Japan. See Bonfante-Fasolo & Marchisio (*Allionia* 23: 13, 1970; ultrastr. phialide), Ando & Tubaki (*TMSJ* 26: 151, 1985; Japan).

Anthoseptobasidium Rick (1943) nom. dub., Agaricomycotina.

Anthostoma Nitschke (1867) = *Cryptosphaeria* Ces. & De Not. fide Eriksson (*Svensk bot. Tidskr.* 60: 315, 1966), Rappaz (*Mycol. Helv.* 5: 21, 1992), Læssøe & Spooner (*Kew Bull.* 49: 1, 1994).

Anthostomaria (Sacc.) Theiss. & Syd. (1918), *Pezizomycotina*. 1 (on *Umbilicaria*), former USSR.

Anthostomella Sacc. (1875), ? Xylariaceae. 133, widespread. See Eriksson (*Svensk bot. Tidskr.* 60: 315, 1966), Francis (*Mycol. Pap.* 139, 1975; key 30 Eur. spp.), Rappaz (*Mycol. Helv.* 7: 99, 1995; on hardwoods, Eur., N. Am.), Hyde (*Nova Hedwigia* 62: 273, 1996; on palms), Lu *et al.* (*Fungal Diversity* 3: 99, 1999; Australia), Lu & Hyde (*Mycotaxon* 74: 379, 2000; Portugal), Lu & Hyde (*Mycoscience* 41: 223, 2000; Brunei), Lu & Hyde (*Fungal Diversity Res. Ser.* 4, 2000; monogr.), Lu *et al.* (*MR* 104: 742, 2000; S. Afr.), Davis *et al.* (*Am. J. Bot.* 90: 1661, 2003; endophytes), Lee & Crous (*MR* 107: 360, 2003; S Africa), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).

Anthostomellina L.A. Kantsch. (1928), *Pezizomycotina*. 1, former USSR.

anthracnose, a plant disease having characteristic limited lesions, necrosis, and hypoplasia, generally caused by one of the acervular coelomycetes. See Jenkins (*Phytopathology* 23: 389, 1933); **spot** -, a

disease caused by *Elsinoë* or its anamorph *Sphaceloma* (Jenkins; see *RAM* 26: 255, 1947).

Anthracobia Boud. (1885), Pyronemataceae. Anamorph *Scytalidium*-like. c. 15, widespread (north temperate). See Delattre-Durand & Parguey-Leduc (*BSMF* 95: 355, 1979; ontogeny), Hohmeyer & Schnacketz (*Beitr. Kenntn. Pilze Mitteleur.* 3: 427, 1987; key 9 spp.), Yao & Spooner (*MR* 99: 1519, 1995; Brit. spp.), Yao *et al.* (*Mycologist* 12: 32, 1998; key Brit. spp.), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).

anthracobiontic, obligately inhabiting burnt areas; **anthracophilous**, sporulation favoured by burnt areas (see Pyrophilous fungi); **anthracophobic**, sporulation suppressed or checked on burnt areas; **anthracoxenous**, incidence and growth not affected by burnt areas (Moser, 1949).

Anthracocarpon Breuss (1996), Verrucariaceae (L). 2, Europe. See Breuss (*Annln naturh. Mus. Wien Ser. B, Bot. Zool.* 98: 40, 1996).

Anthracocystis Bref. (1912) = *Sporisorium* fide Vánky (*in litt.*).

Anthracoderma Speg. (1888), anamorphic *Pezizomycotina*, St.0eH.?. 3, S. America. See Petrak & Sydow (*Annls mycol.* 33: 188, 1935).

Anthracoidea Bref. (1895), Anthracoideaceae. Anamorph *Crotalia*. c. 75 (in seeds of *Cyperaceae*), widespread (esp. northern hemisphere). See Kukkonen (*Ann. bot. Soc. Zool.-Bot. Fenn. Vanamo* 34 no. 3, 1963), Kukkonen (*Ann. bot. fenn.* 1: 161, 1964; keys), Kukkonen (*TBMS* 47: 273, 1964; spore germination), Kukkonen (*Ann. bot. fenn.* 1: 257, 1964; homothallism), Braun & Hirsch (*Feddes Repert.* 89: 43, 1978; keys), Nannfeldt (*Symb. bot. upsal.* 22 no. 3: 1, 1979; 34 Nordic spp.), Vánky (*Bot. Notiser* 132: 221, 1979; species concepts, 1987), Ingold (*MR* 92: 245, 1989; spore germination, posn), Salo & Sen (*CJB* 71: 1406, 1993; isoenzyme analysis), Hendrichs *et al.* (*MR* 109: 31, 2005; molecular phylogenetic approach).

Anthracoideaceae Denchev (1997), Ustilaginales. 20 gen. (+ 7 syn.), 198 spp.

Lit.: Vánky (*TBMS* 89: 61, 1987), Vánky (*Cryptog. Stud.* 1: 159 pp., 1987), Ingold (*MR* 92: 245, 1989), Vánky (*Europ. Smut Fungi*: 570 pp., 1994), Vánky & Oberwinkler (*Nova Hedwigia Beih.* 107: 96 pp., 1994), Ingold (*MR* 99: 140, 1995), Piepenbring (*CJB* 73: 1089, 1995), Vánky (*Mycotaxon* 54: 215, 1995), Vánky & Websdane (*Mycotaxon* 56: 217, 1995), Bauer *et al.* (*CJB* 75: 1273, 1997), Denchev (*Mycotaxon* 65: 411, 1997), Vánky (*Mycotaxon* 63: 143, 1997), Begerow *et al.* (*CJB* 75: 2045, 1998), Ingold (*MR* 103: 1071, 1999), Piepenbring *et al.* (*Mycol.* 91: 485, 1999), Vánky (*Mycotaxon* 70: 17, 1999), Piepenbring (*Nova Hedwigia* 70: 289, 2000), Vánky (*Mycotaxon* 74: 343, 2000), Piepenbring (*Bot. Jb.* 24: 241, 2003), Begerow *et al.* (*MR* 108: 1257, 2004), Vánky (*Mycol. Balcanica* 1: 175, 2004), Hendrichs *et al.* (*MR* 109: 31, 2005), Stoll *et al.* (*MR* 109: 342, 2005).

Anthracomycetes Renault (1898), Fossil Fungi (mycel.) Fungi. 2 (Carboniferous), France.

Anthracophilous Mattir. ex Lloyd (1913) = *Rhizopogon* fide Stalpers (*in litt.*).

Anthracophyllum Ces. (1879), Marasmiaceae. 10, widespread (tropical). See Pegler & Young (*MR* 93: 352, 1989; key).

Anthracostroma Petr. (1954), Dothideomycetes. Anamorph *Camarosporula*. 1, Australia. See Petrak (*Sydowia* 8: 96, 1954).

Anthracotheceum Hampe ex A. Massal. (1860), Pyrenulaceae (L.) c. 29, widespread (esp. tropical). See Johnson (*Ann. Mo. bot. Gdn* 27: 1, 1940), Singh (*Feddes Repert.* 93: 67, 1982), Singh & Raychaudhury (*New Botanist* 9: 32, 1983; India), Singh (*Geophytology* 14: 69, 1984), Singh (*Geophytology* 15: 98, 1985), Harris (*Mem. N. Y. bot. Gdn* 49: 74, 1989; key 5 N. Am. spp.), Aptroot (*Australasian Lichenology* 60: 34, 2007; key Australian spp.), Aptroot *et al.* (*Bibliotheca Lichenol.* 97, 2008; Costa Rica).

Anthracotheomyces Cif. & Tomas. (1953) = *Pyrenula* Ach. (1814) fide Harris (*Mem. N. Y. bot. Gdn* 49, 1989).

Anthropomorphus Seger (1745) nom. inval. = *Geastrum* fide Stalpers (*in litt.*) Used by Lloyd but see, Donk (*Reinwardtia* 1: 205, 1951).

anthropophilic (of dermatophytes, etc.), preferentially pathogenic for man. Cf. zoophilic.

Anthurus Kalchbr. & MacOwan (1880) = *Clathrus* fide Dring (*Kew Bull.* 35: 1, 1980).

anti- (in combination), against.

antiamoebin, an antibiotic from *Emericellopsis poonensis*, *E. synnematicola*, and '*Cephalosporium*' *pimprinum*; anti-protozoa and helminths (*Hindustan Antibiot. Bull.* 11: 27, 1968).

antibiosis, antagonism (q.v.) between two organisms resulting in one overcoming the other.

antibiotic (1) (adj.) damaging to life; esp. of substances produced by microorganisms which are damaging to other microorganisms; (2) (n.) any antibiotic substance, esp. one used as a therapeutant, cf. toxin. See Waksman (*Mycol.* 39: 565, 1947) for a discussion on the use of this term. -**substances** are produced by fungi (esp. *Penicillium* and *Aspergillus*), actinomycetes (esp. *Streptomyces*; see amphotericin, blastidin, cycloheximide, streptomycin), and other microorganisms.

Lit.: Grayon (Ed.) (*Antibiotics, chemotherapeutics and antibacterial agents for disease control*, 1982), Chadwick & Whelan (Eds) (*Secondary metabolites: their function and evolution*, 1992), Demain *et al.* (Eds) (*Novel microbial products for medicine and agriculture*, 1989), Jong *et al.* (Eds) (*ATCC names of industrial fungi*, 1994).

Antibiotics. Substances antagonistic to and inhibiting growth of fungi, bacteria and other micro-organisms, even at high dilutions. Fleming (q.v.) is usually credited with their discovery, but several people (e.g. Duchesne, q.v.) made similar observations earlier. Penicillin, discovered by Fleming (q.v.) and exploited by Chain (q.v.), Florey (q.v.) and others, is a fungal product, and many fungi when grown under appropriate conditions are now known to produce antibiotics; see the reviews by Brian (*Bot. Rev.* 17: 357, 1951) and Broadbent (*PANS B* 14: 120, 1968). Important or interesting antibiotics from fungi include antiamoebin, alternaric acid, calvacin, cephalosporins, dendrochin, flammulin, fumigillin, fumigatin, fusidic acid, gliotoxin, griseofulvin, helenin, lepiochlorin, patulin, penatin, penicillic acid, penicillin, phomin, poricin, proliferin, sparassol, statolin, trichomycin, trichothecin, tryptacidin, ustilagic acids, variecolin, viridin, wortmannin (q.v.).

The market for antibiotic drugs has been estimated as exceeding US\$25 billion annually. In addition to

their use in human health, antibiotics are very widely and sometimes indiscriminately used in animal feeds (see Mellon *et al.*, *Hogging it! Estimates of antimicrobial abuse in livestock*, 2001). Misuse of antibiotics has caused a rise in numbers of strains resistant to them.

Fungicolous fungi (e.g. *Trichoderma*) produce a complex range of antibiotics including peptaibols and isonitriles. See Howell (in Harman & Kubicek, *Trichoderma and Gliocladium* 2: 173, 1998).

Some lichen products (q.v.) are antibiotics. In general they are most effective against gram-positive bacteria. Usnic acid is used commercially ('Usno', 'Binan', 'Usniplant') and strongly inhibits *Mycobacterium*. Sodium usnate is effective against tomato canker (*Corynebacterium michiganense*) and several lichen acids are active against *Trichosporon*. Usnic acid inhibits *Neurospora crassa* and this and lichen extracts inhibit wood-rotting fungi (Henningsson & Lundström, *Mater. Organ.* 5: 19, 1970). Hale (*Biology of lichens*, 1967; edn 2, 1974; review), Virtanen *et al.* (*Suomen Kem.* B27-B30, 1954-7; many papers on 'Usno'), Vartia (in Ahmadjian & Hale (Eds), *The lichens*: 547, 1974; review), Lowe & Elander (*Mycol.* 75: 361, 1983; antibiotic industry in USA).

antibody, see antigen.

anticlinal, perpendicular to the surface; cf. periclinal.

antigen, a substance which when introduced into the tissues of a living animal induces the development in the blood serum (see -**serum**) of another substance (see Drouhet *et al.* (Eds), *Fungal antigens*, 1988). (the -**body**) with which it reacts specifically; antibodies may be classified according to whether they cause lysis (**lysins**), agglutination (**agglutinins**), or precipitation (**precipitins**) of the antigen; see anaphylaxis, complement-fixation, ELISA, Serology.

Antilyssa Haller ex M. Choisy (1929) = *Peltigera* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Antimanoa Syd. (1930), Pezizomycotina. 1, S. America.

Antimanopsis Petr. (1948) = *Monostichella* fide von Arx (*Verh. K. ned. Akad. Wet. Amst.* C 51: 1, 1957).

antimetabolite, a substance which resembles in chemical structure some naturally occurring compound essential in a living process and which specifically antagonizes the biological action of such an essential compound. See Woolley (*Science*, NY 129: 615, 1959; review).

Antinoa Velen. (1934) ? = *Pezizella* Fuckel fide Lizoň (*Mycotaxon* 45: 1, 1992).

antiphyte, see alternation of generations.

Antipodium Piroz. (1974), anamorphic *Ophionectria*, Hso.≡ eH.15. 1, C. America. See Pirozynski (*CJB* 52: 1143, 1974), Samuels (*Mycol.* 81: 347, 1989), Bartoshevich *et al.* (*Journal of Basic Microbiology* 30: 313, 1990), Castañeda Ruiz *et al.* (*Mycotaxon* 100: 327, 2007).

antiserum, blood serum (the fluid fraction of coagulated blood) containing antibodies to one or more antigens (q.v.).

antithetic, see alternation of generations.

Antlea P.A. Dang. (1890) nom. dub., ? Fungi. or Protozoa.

Antonospora I. Fries, R.J. Paxton, J. Tengö, J.A. da Silva, S.B. Slemenda, N.J. Pieniazek (1999), Microsporidia. 2. See Fries *et al.* (*Eur. J. Protist.* 35: 183, 1999).

- Antrocarpon** A. Massal. (1856) = *Ocellularia*. p.p. and *Thelotrema* (*Thelotremat.*) p.p. fide Hale (*Bull. Br. Mus. nat. hist. Bot.* 8: 227, 1981).
- Antrocarpum** G. Mey. (1825) = *Thelotrema*.
- Antrodia** P. Karst. (1879), *Fomitopsidaceae*. 46, Europe; N. America. See Donk (*Persoonia* 4: 339, 1966), Niemelä & Ryvarden (*TBMS* 65: 427, 1975; typification), Lombard (*Mycol.* 82: 185, 1990; culture).
- Antrodiella** Ryvarden & I. Johans. (1980), *Phanerochaetaceae*. c. 50, USA. See Niemelä (*Karstenia* 22: 11, 1982), Gilbertson & Ryvarden (*Europ. Polyp.* 1: 147, 1993), Kim *et al.* (*Antonie van Leeuwenhoek* 83: 81, 2003; phylogeny), Spirin & Zmitrovich (*Karstenia* 43: 67, 2003; Russia), Dai (*Mycotaxon* 89: 389, 2004; China).
- Antromyces** Fresen. (1850), anamorphic *Pezizomycotina*, Hsy.0eH.3/39. 2 (fimicolous), Europe; S. America. See Seifert *et al.* (*Univ. Waterloo Biol. Ser.* 27, 1983).
- Antromycopsis** Pat. & Trab. (1897), anamorphic *Pleurotus*. 3, widespread. See Pollack & Miller (*Mem. N. Y. bot. Gdn* 28: 174, 1976; teleomorph), Moore (*CJB* 55: 1251, 1977), Moore (*TBMS* 82: 377, 1984), Stalpers *et al.* (*CJB* 69: 6, 1991; gen. revision, key), Capelari & Fungaro (*MR* 107: 1050, 2003; RAPD).
- antorse**, directed upwards or forwards.
- Anulohypha** Cif. (1962), anamorphic *Pezizomycotina*, Hso.-.-. 1, Dominican Republic. See Ciferri (*Atti Ist. bot. Univ. Lab. crittog. Pavia sér. 5* 19: 88, 1962).
- Anulomyces** Bydgosz (1932) nom. dub., Fungi.
- Anulosporium** Sherb. (1933) nom. dub., Fungi. See Drechsler (*Mycol.* 26: 135, 1934), Rubner (*Stud. Mycol.* 39, 1996; = *Arthrobotrys* or *Monacrosporium* (*Orbiliaceae*)).
- Anungitea** B. Sutton (1973), anamorphic *Venturiaceae*, Hso.1eP.3/9. 15, widespread. See Sutton (*Mycol. Pap.* 132: 10, 1973), Crous *et al.* (*CJB* 73: 224, 1995; S Africa), Castañeda Ruiz *et al.* (*Mycotaxon* 65: 93, 1997; Cuba), Crous *et al.* (*Stud. Mycol.* 58: 185, 2007; phylogeny).
- Anungitopsis** R.F. Castañeda & W.B. Kendr. (1990), anamorphic *Venturiaceae*, Hso.≡ eP.?28. 7, widespread. See Castañeda Ruiz & Kendrick (*Univ. Waterloo Biol. Ser.* 33: 6, 1990), Castañeda Ruiz *et al.* (*Mycotaxon* 59: 203, 1996; Cuba), Jørgensen (*Symb. bot. upsal.* 32 no. 1: 113, 1997; S Africa), Ho *et al.* (*Mycotaxon* 72: 115, 1999; key), Crous *et al.* (*Stud. Mycol.* 58: 185, 2007; phylogeny).
- Anzia** Garov. (1868) = *Lichenothelia*.
- Anzia** Stizenb. (1861) nom. cons., *Parmeliaceae* (L). 35, widespread. See Culberson (*Brittonia* 13: 381, 1961), Kurokawa & Jinzenji (*Bull. natn. Sci. Mus. Tokyo, B* 8: 369, 1965), Yoshimura & Elix (*J. Hattori bot. Lab.* 74: 287, 1993), Yoshimura *et al.* (*Biblthca Lichenol.* 58: 439, 1995; New Guinea), Calvelo (*Mycotaxon* 58: 147, 1996; S. Am.), Yoshimura *et al.* (*J. Hattori bot. Lab.* 82: 343, 1997; Indian spp.), Kärnefelt *et al.* (*Nova Hedwigia* 67: 71, 1998), Yoshimura in Marcelli & Seaward (Eds) (*Lichenology in Latin America. History, Current Knowledge and Applications* [Proceedings of GLAL-3, Terceiro Encontro do Grupo Latino-Americano de Liqueñólogos, São Paulo, Brazil, 24-28 September, 1997]: 117, 1998; Am.), Rikkinen & Poinar (*MR* 106: 984, 2002; fossil taxa), Thell *et al.* (*Mycol. Progr.* 3: 297, 2004; phylogeny), Arup *et al.* (*Mycol.* 99: 42, 2007; phylogeny), Crespo *et al.* (*Mol. Phylogen. Evol.* 44: 812, 2007; morphology and phylogeny).
- Anziaceae** M. Satô (1939) = *Parmeliaceae*.
- Anziella** Gyeln. (1940) = *Placynthium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Anzina** Scheid. (1982), ? *Arthrorhaphidaceae* (L). 1, Europe. See Scheidegger (*Nova Hedwigia* 41: 191, 1985), Lumbsch (*J. Hattori bot. Lab.* 83: 1, 1997), Lumbsch *et al.* (*MR* 105: 265, 2001; asci), Lumbsch *et al.* (*Mol. Phylogen. Evol.* 31: 822, 2004; phylogeny), Wedin *et al.* (*MR* 109: 159, 2005; phylogeny), Lumbsch *et al.* (*MR* 111: 1133, 2007).
- Aorate** Syd. (1929) = *Titaea* fide Boedijn (*Sydowia* 5: 211, 1951).
- Aoria** Cif. (1962), anamorphic *Pezizomycotina*, St.0eH.10. 1, Dominican Republic. See Ciferri (*Atti Ist. bot. Univ. Lab. crittog. Pavia sér. 5* 19: 89, 1962), Nag Raj & DiCosmo (*Univ. Waterloo Biol. Ser.* 20, 1982).
- apandrous**, forming oospores when no antheridia are present.
- Aparaphysaria** Speg. (1922), *Pyronemataceae*. 2, India; Tierra del Fuego. See Kimbrough (*Mem. N. Y. bot. Gdn* 49: 326, 1989).
- Apatelomyces** Thaxt. (1931), *Laboulbeniaceae*. 1, W. Africa. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- Apatomyces** Thaxt. (1931), *Laboulbeniaceae*. 1, Philippines. See Tavares (*Mycol. Mem.* 9: 627 pp., 1985), Santamaría (*MR* 99: 1071, 1995).
- Apatoplaca** Poelt & Hafellner (1980), *Teloschistaceae* (L). 1, N. America. See Bellemère *et al.* (*Cryptog. Bryol.-Lichénol.* 7: 189, 1986; ultrastr.), Kantvilas & McCarthy (*Lichenologist* 35: 397, 2003).
- Aphanandromyces** W. Rossi (1982), *Laboulbeniaceae*. 1, Europe. See Rossi (*Mycol.* 74: 520, 1982), Tavares (*Mycol. Mem.* 9: 627 pp., 1985), Santamaría *et al.* (*Treb. Inst. Bot. Barcelona* 14: 1, 1991; Europe), Santamaría (*Fl. Mycol. Iberica* 5, 2003; Iberian peninsula).
- Aphanistis** Sorokīn (1889), ? *Chytridiales*. 1 or 2, former USSR.
- Aphanoascus** Zukal (1890), *Onygenaceae*. Anamorph *Chrysosporium*. 12, widespread. See Cano & Guarro (*MR* 94: 455, 1990; key), Sugiyama *et al.* (*Mycoscience* 40: 251, 1999; DNA), Cano *et al.* (*Stud. Mycol.* 47: 153, 2002; phylogeny), Pivkin & Khudyakova (*Mycotaxon* 81: 7, 2002), Sugiyama *et al.* (*Stud. Mycol.* 47: 5, 2002).
- Aphanobasidium** Jülich (1979), *Pterulaceae*. 15, widespread. See Jülich (*Persoonia* 10: 326, 1979), Boidin *et al.* (*BSMF* 119: 333, 2003; subgen. *Aphano-basidium*).
- Aphanocladium** W. Gams (1971), anamorphic *Nectriaceae*, Hso.0eH.15. 2 (on myxomycetes), widespread. Several species are now placed in *Lecanicillium*. See Gams *et al.* (*CJB* 76: 1570, 1998), Sung *et al.* (*Nova Hedwigia* 72: 311, 2001; phylogeny), Zare & Gams (*Rostaniha Supplement* 3, 2004).
- Aphanofalx** B. Sutton (1986), anamorphic *Pezizomycotina*, St.0eH.1. 2, Zambia; Pakistan. See Sutton & Abbas (*TBMS* 87: 640, 1987).
- Aphanopeltis** Syd. (1927), *Asterinaceae*. Anamorph *Elachopeltis*. 7, America (tropical); Indonesia. See Hosagoudar *et al.* (*Journal of Mycopathological Research* 39: 61, 2001).
- aphanoplasmodium**, see plasmodium.
- Aphanopsidaceae** Printzen & Rambold (1995), *Lecanorales* (L). 2 gen. (+ 2 syn.), 3 spp.

- Lit.*: Eriksson (SA 9: 24, 1990) places it outside of the *Lecanoromycetidae*, Printzen & Rambold (*Lichenologist* 27: 99, 1995), Kantvilas & McCarthy (*Lichenologist* 31: 555, 1999).
- Aphanopsis** Nyl. ex P. Syd. (1887), Aphanopsidaceae (L). 1, Europe. See Coppins & James (*Lichenologist* 16: 241, 1984), Printzen & Rambold (*Lichenologist* 27: 91, 1995).
- Aphanostigme** Syd. (1926), ? Pseudoperisporiaceae. c. 12, widespread. See Hansford (*Mycol. Pap.* 15, 1946), Müller (*Sydowia* 18: 86, 1965), Rossman (*Mycol. Pap.* 157, 1987), Verma & Kamal (*Indian Phytopath.* 42: 561, 1990).
- Aphanotria** Döbbeler (2007), Bionectriaceae. 1, S. America (tropical). See Döbbeler (*MR* 111: 1406, 2007).
- Apharia** Bonord. (1864), Pezizomycotina. 1, Europe.
- Aphelaria** Corner (1950), Aphelariaceae. 20, widespread. See Roberts (*Kew Bull.* 54: 517, 1999; Cameroon).
- Aphelariaceae** Corner (1970), Cantharellales. 3 gen., 22 spp. Basidioma ramarioid.
- Lit.*: Corner (*Ann. Bot. Mem.* [A monograph of Clavaria and allied genera] 1: 1, 1950), Corner (*TBMS* 49: 205, 1966), Petersen & Zang (*Acta Bot. Yunn.* 8: 281, 1986), Roberts (*Kew Bull.* 54: 517, 1999).
- Aphelariopsis** Jülich (1982), ? Septobasidiaceae. 2, Sarawak; S. America. See Jülich (*Persoonia* 11: 402, 1982).
- Aphelidium** Zopf (1885) nom. dub., Fungi. Protozoa or fungi in algal cells).
- Aphidomyces** Brain (1923), ? Saccharomycetales. 5 (in *Insecta*), widespread.
- Aphotistus** Humb. (1793) = *Rhizomorpha* Roth fide Mussat (*Syll. fung.* 15, 1901) nom. dub. fide, Donk (*Taxon* 11: 79, 1962).
- Aphragmia** Trevis. (1880) [non *Aphragmia* Nees 1836, *Acanthaceae*] = *Ionaspis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Aphylophorales**. Order proposed by Rea (after Patouillard) for basidiomycetes having macroscopic basidiocarps in which the hymenophore is flattened (*Thelephoraceae*), club-like (*Clavariaceae*), tooth-like (*Hydnaceae*) or has the hymenium lining tubes (*Polyporaceae*) or sometimes on lamellae, the poroid or lamellate hymenophores being tough and not fleshy as in the *Agaricales*. Traditionally the order has had a core of 4 fam. (as indicated above) based on hymenophore shape but detailed microscopic studies of basidiocarp structure and molecular evidence has shown these groupings to be unnatural. Keys to 550 spp. in culture are given by Stalpers (*Stud. mycol.* 16, 1978).
- Aphyllotus** Singer (1974), ? Marasmiaceae. 1, Colombia. See Singer (*Sydowia Beih.* 7: 29, 1974).
- Aphysa** Theiss. & Syd. (1917) = *Coleroa* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Aphysiostroma** Barrasa, A.T. Martínez & G. Moreno (1986), Hypocreaceae. Anamorph *Verticillium*-like. 1 (coprophilous), Spain. See Barrasa *et al.* (*CJB* 63: 2439, 1985), Spatafora & Blackwell (*Mycol.* 85: 912, 1993; DNA), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Suh & Blackwell (*Mycol.* 91: 836, 1999; phylogeny), Sung *et al.* (*Nova Hedwigia* 72: 311, 2001; phylogeny), Sung *et al.* (*Stud. Mycol.* 57: 1, 2007).
- apical**, at the end (or apex); - **granule**, a deeply staining granule at the hyphal apex, esp. in *Basidiomycetes*; the 'Spitzenkörper' of Brunswik (1924); - **veil**, see annulus; - **wall building**, see wall building.
- apiculate**, having an apiculus.
- apiculus** (of a spore), a short projection at one end; a projection by which it was fixed to the sterigma (Josserand); apicule; hilar appendage.
- apileate**, having no pileus; resupinate.
- Apinisia** La Touche (1968), Onygenales. Anamorph *Chrysosporium*. 2 or 3, Europe; Australia. See Guarro *et al.* (*Mycotaxon* 42: 193, 1991), Sugiyama *et al.* (*Mycoscience* 40: 251, 1999; DNA), Sugiyama *et al.* (*Stud. Mycol.* 47: 5, 2002; phylogeny).
- Apiocamarops** Samuels & J.D. Rogers (1987), Boliniaceae. 3, C. & S. America. See Samuels & Rogers (*Mycotaxon* 28: 54, 1987), Rogers & Samuels (*Mycol.* 80: 738, 1988), Rogers & Ju (*Sydowia* 55: 359, 2003).
- Apiocarpella** Syd. & P. Syd. (1919), anamorphic *Pezizomycotina*, Cpd.1eH.1. 8, widespread. See Mel'nik (*Nov. Sist. niz. Rast.* 13: 93, 1976), Punithalingam (*Mycol. Pap.* 142, 1979; synonym of *Ascochyta*), Vanev & Sofia (*Fitologiya* 29: 39, 1985; key).
- Apioclypea** K.D. Hyde (1994), ? Clypeosphaeriaceae. 1 (saprobic on palms), Papua New Guinea. See Hyde *et al.* (*Sydowia* 50: 21, 1998), Kang *et al.* (*Mycoscience* 40: 151, 1999), Smith *et al.* (*Fungal Diversity* 13: 175, 2003; rel. to *Apiospora*), Taylor & Hyde (*Fungal Diversity Res. Ser.* 12, 2003).
- Apiocrea** Syd. & P. Syd. (1921) = *Hypomyces* fide Rogerson & Samuels (*Mycol.* 81: 413, 1989), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Apiodiscus** Petr. (1940), ? Rhytismatales. 1, Iran.
- Apiodothina** Petr. & Cif. (1932) = *Coccoidea* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Apiognomonina** Höhn. (1917), Gnomoniaceae. Anamorphs *Discula*, *Gloeosporidina*. 10 (from stems and leaves), Europe; N. America. *A. erythrostoma* (cherry leaf scorch), *A. quercina* (oak anthracnose). See von Arx (*Antonie van Leeuwenhoek* 17: 259, 1951), Barr (*Mycol. Mem.* 7, 1978; key), Monod (*Sydowia* 37: 222, 1984), Barr (*Mycotaxon* 41: 287, 1991; N Am. spp.), Haemmerli *et al.* (*Molecular Plant-Microbe Interactions* 5: 479, 1992; DNA), Viret & Petrini (*MR* 98: 423, 1994), Butin & Kehr (*Eur. J. For. Path.* 28: 297, 1998; anam.), Castlebury *et al.* (*Mycol.* 94: 1017, 2002), Castlebury *et al.* (*Mycoscience* 44: 203, 2003), Sogonov *et al.* (*Sydowia* 57: 102, 2005; typification), Sogonov *et al.* (*MR* 111: 693, 2007; revision).
- Apioplagiostoma** M.E. Barr (1978), Gnomoniaceae. 3, Europe; N. America. See Mouchacca (*Cryptog. Mycol.* 8: 141, 1987), Fröhlich & Hyde (*MR* 99: 727, 1995), Zhang & Blackwell (*Mycol.* 93: 355, 2001; phylogeny).
- Apioporthella** Höhn. (1917) = *Anisogramma* fide Müller & von Arx in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 87, 1973).
- Apioporthella** Petr. (1929), ? Valsaceae. 1 (from stems etc.), Europe; N. America. See Barr (*Mycotaxon* 41: 287, 1991).
- Apiorhynchostoma** Petr. (1923), Clypeosphaeriaceae. 5 (saprobic on wood), Europe. See Sivanesan (*TBMS* 65: 19, 1975), Rogers *et al.* (*Mycol.* 86: 700, 1994), Waldner (*Beitr. Kenntn. Pilze Mitteleur.* 11: 67, 1997), Hyde *et al.* (*Sydowia* 50: 21, 1998), Réblová (*Sydowia* 50: 229, 1998), Kang *et al.* (*Mycoscience*

- 40: 151, 1999; posn).
- Apiosordaria** Arx & W. Gams (1967), Lasiosphaeriaceae. Anamorph *Cladorrhinum*. 11, widespread. See Krug *et al.* (*Mycotaxon* 17: 553, 1983), Guarro & Cano (*TBMS* 91: 587, 1988), Mouchacca & Gams (*Mycotaxon* 48: 415, 1993; anamorphs), Hyde *et al.* (*Mycoscience* 38: 437, 1997), Stchigel *et al.* (*Mycol.* 92: 1206, 2000), Stchigel *et al.* (*Mycol.* 95: 1218, 2003), Huhndorf *et al.* (*Mycol.* 96: 368, 2004; phylogeny), Miller & Huhndorf (*Mol. Phylogen. Evol.* 35: 60, 2005; phylogeny), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Apiosphaeria** Höhn. (1909), Phyllachoraceae. Anamorph *Oswaldina*. 5 (from living leaves), widespread (neotropics). See Dianese *et al.* (*Sydowia* 46: 233, 1994; anamorph), Hyde *et al.* (*Sydowia* 50: 21, 1998), Hyde & Cannon (*Mycol. Pap.* 175: 114, 1999; spp. on palms).
- Apiospora** Sacc. (1875), Apiosporaceae. Anamorphs *Arthrimum*, *Cordella*, *Pteroconium*. 7 (on *Palmae*, grasses etc.), widespread. See Samuels *et al.* (*N.Z. Jl Bot.* 19: 137, 1981), Müller (*Boln Soc. argent. Bot.* 28: 201, 1992; key), Hyde *et al.* (*Sydowia* 50: 21, 1998), Smith *et al.* (*Fungal Diversity* 13: 175, 2003; phylogeny), Huhndorf *et al.* (*Mycol.* 96: 368, 2004; phylogeny), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Apiosporaceae** K.D. Hyde, J. Fröhl., Joanne E. Taylor & M.E. Barr (1998), Sordariomycetidae (inc. sed.). 6 gen. (+ 16 syn.), 47 spp.
Lit.: Samuels *et al.* (*N.Z. Jl Bot.* 19: 137, 1981), Müller (*Boln Soc. argent. Bot.* 28: 201, 1992), Hyde *et al.* (*Sydowia* 50: 21, 1998), Wang & Hyde (*Fungal Diversity* 3: 159, 1999), Huhndorf *et al.* (*Mycol.* 96: 368, 2004).
- Apiosporella** Höhn. ex Theiss. (1917) = *Pseudomassaria* fide Barr (*Mycol.* 68, 1976).
- Apiosporella** Speg. (1910) = *Apiocarpella*.
- Apiosporella** Speg. (1912) = *Aplosporidium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Apiosporina** Höhn. (1910) = *Venturia* Sacc. See also *Dibotryon*. fide Barr (*Sydowia* 41: 25, 1989), Crous *et al.* (*Stud. Mycol.* 58: 185, 2007; phylogeny), Winton *et al.* (*Mycol.* 99: 240, 2007; phylogeny).
- Apiosporina** Petr. (1925) = *Pseudomassaria* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Apiosporium** Kunze (1817), anamorphic *Capnodium*, St.OeH.?. 2. See Kunze (*Mykologische Hefte* Leipzig 1, 1817).
- Apiosporopsis** (Traverso) Mariani (1911), ? Melanconidaceae. 1, Europe. See Reid & Dowsett (*CJB* 68: 2398, 1990).
- apiosporous** (of two-celled spores), where one cell is markedly smaller than the other.
- Apiothecium** Lar.N. Vassiljeva (1987) = *Apioporthella* fide Barr (*Mycotaxon* 41: 287, 1991).
- Apiothyrium** Petr. (1947), Hyponectriaceae. 1, Finland. See Wang & Hyde (*Fungal Diversity* 3: 159, 1999).
- Apiotrabutia** Petr. (1929) = *Munkiella* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Apiotrichum** Stautz (1931) = *Trichosporon* fide Middelhoven *et al.* (*FEMS Yeast Res.* 1: 15, 2001; taxonomy).
- Apiotypa** Petr. (1925), Pezizomycotina. 1, Philippines. Type material is missing. See Hyde *et al.* (*Sydowia* 50: 21, 1998), Hyde & Cannon (*Mycol. Pap.* 175, 1999).
- Aplacodina** Ruhland (1900) = *Pseudomassaria* fide Barr (*Mycol.* 68, 1976).
- aplanetism**, the condition of having non-motile spores in place of zoospores.
- Aplanocalenia** Lücking, Sérus. & Vězda (2005), Gomphillaceae (L). 1. See Lücking *et al.* (*Lichenologist* 37: 163, 2005).
- aplanogamete**, a non-motile gamete.
- aplanospore** (1) a naked, amoeboid or non-amoeboid mobile cell; (2) a sporangiospore.
- Aplanosporites** R.K. Kar (1979), Fossil Fungi. 1, India. See Kar (*Palaeobotanist* 26: 35, 1977).
- Aplectosoma** Drechsler (1951), Cochlonemataceae. 1, USA. See Drechsler (*Mycol.* 43: 173, 1951).
- aplerotic**, of an oospore which occupies < 60% of the oogonial volume (Shahzad *et al.*, *Bot. J. Linn. Soc.* 108: 143, 1992).
- Aplopsora** Mains (1921), Chaconiaceae. c. 6 (on dicots), N. America; Brazil; Russian far east; China; Japan. See Buriticá (*Revista de la Academia Colombiana de Ciencias Exactas, Físicas y Naturales* 22 no. 84: 325, 1998; neotrop. spp).
- Aplosporella** Speg. (1880), anamorphic *Botryosphaeriaceae*, St.OeP.1. 66, widespread (esp. tropical). See Petrak (*Sydowia* 6: 336, 1952), Tilak & Ramchandra Rao (*Mycopath. Mycol. appl.* 24: 362, 1964), Ramchandra Rao (*Mycopath. Mycol. appl.* 28: 45, 1966; Indian spp.), Ramchandra Rao (*Mycopath. Mycol. appl.* 28: 68, 1966; Indian spp.), Pandey (*Perspectives in mycological research* 2: 77, 1990; review), Pande & Rao (*Nova Hedwigia* 60: 79, 1995; key to 44 spp.), Damm *et al.* (*Fungal Diversity* 27: 35, 2007; posn).
- Aplosporidium** Speg. (1912) = *Asteromella* fide Sutton (*Mycol. Pap.* 141, 1977).
- Aplotomma** A. Massal. ex Beltr. (1858) ? = *Buellia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Apoa** Syd. (1931) = *Pachypatella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- apobasidiomycete**, a gasteromycete having apobasidia.
- apobasidium**, see basidium.
- Apocoryneum** B. Sutton (1975) = *Massariothea* fide Sutton (*Mycol. Pap.* 141, 1977).
- apocyte**, multinucleate cell in which the multinucleate condition is accidental, transitory or secondary. See coenocyte.
- Apocytospora** Höhn. (1924) = *Plectophomella* fide Petrak (*Annls mycol.* 27: 368, 1929).
- apodial**, having no stalk; sessile.
- Apodospora** Cain & J.H. Mirza (1970), Lasiosphaeriaceae. 4 (coprophilous), N. America; Europe. See Lundqvist (*Symb. bot. upsal.* 20 no. 1, 1972), Barr (*Mycotaxon* 39: 43, 1990; posn).
- Apodothina** Petr. (1970), Phyllachoraceae. 1 (on living leaves of *Yucca*), USA. See Petrak (*Sydowia* 23: 276, 1969).
- Apodus** Malloch & Cain (1971), ? Lasiosphaeriaceae. 1 (coprophilous), N. America. See Malloch & Cain (*CJB* 49: 869, 1971), Cai *et al.* (*MR* 110: 137, 2006; phylogeny), Cai *et al.* (*MR* 110: 359, 2006; polyphyly).
- Apogaeumannomyces** Matsush. (2003) nom. inval., ? Chaetosphaeriales. Anamorph *Cercosporula*. 1 (on palm leaf), Peru. See Matsushima (*Matsush. Mycol. Mem.* 10: 152, 2001).

- apogamy**, the apomictic development of diploid cells.
- Apogloeum** Petr. (1954), anamorphic *Pezizomycotina*, St.0eH.?. 1, Tasmania. See Petrak (*Sydowia* 8: 57, 1954).
- Apoharknessia** Crous & S.J. Lee (2004), anamorphic *Diaporthales*. 1, pantropical. See Lee *et al.* (*Stud. Mycol.* 50: 239, 2004).
- Apomelasmia** Grove (1937), anamorphic *Diaporthales*, St.0eH.15. 2, Europe. See Mel'nik (*Nov. Sist. niz. Rast.* 28: 69, 1992).
- Apomella** Syd. (1937) = *Botryosphaeria* fide Sutton (*in litt.*).
- apomixis** (adj. **apomictic**), the development of sexual cells into spores, etc., without being fertilized. Cf. amphimixis, automixis, and pseudomixis.
- Aponectria** (Sacc.) Sacc. (1883) = *Nectria* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- apophysis**, a swelling or a swollen filament, e.g. at the end of a sporangiophore below the sporangium in *Mucorales* (cf. *columella*) or on the stem of some species of *Geastrum*; (in basidiomycetes), the swelling at the tip of a sterigma from which the basidiospore develops and which becomes the hilar appendage (q.v.).
- Apophysomyces** P.C. Misra (1979), *Radiomycetaceae*. 1, India. See Misra *et al.* (*Mycotaxon* 8: 377, 1979), Ellis & Ajello (*Mycol.* 74: 144, 1982), Lakshmi *et al.* (*J. Clin. Microbiol.* 31: 1368, 1993; zygomycosis), Eaton *et al.* (*J. Clin. Microbiol.* 32: 2827, 1994; mucormycosis), Meis *et al.* (*J. Clin. Microbiol.* 32: 3078, 1994; osteomyelitis), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny), Liang *et al.* (*J. Clin. Microbiol.* 44: 892, 2006; rhino-orbitocerebral mucormycosis).
- apoplasmodial** (of *Acrasiales*), having non-fusion of the myxamoebae.
- apoplactic**, movement of substances via the cell walls, not entering the living cell; cf. symplastic.
- Aporella** Syd. (1939) [non *Aporella* Podp. 1916, *Musci*] = *Aporellula* fide Sutton (*Mycotaxon* 3: 377, 1976).
- Aporellula** B. Sutton (1986), anamorphic *Pezizomycotina*, St.1≡ eH.15. 1, Ecuador. See Sutton (*Sydowia* 38: 324, 1985).
- Aporhytisma** Höhn. (1917) = *Diaporthe* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954), Petrak (*Sydowia* 24: 249, 1971), Castlebury *et al.* (*Mycoscience* 44: 203, 2003).
- Aporia** Duby (1862) = *Lophodermium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Aporidicellaesporites** Frunzescu & Bacaran (1990), Fossil Fungi. 1. See Frunzescu & Bacaran (*Revue roum. Géol., Géophys. Géogr. Géol.* 34: table 1, 1990).
- Aporimonocellaesporites** Frunzescu & Bacaran (1990), Fossil Fungi. 1. See Frunzescu & Bacaran (*Revue roum. Géol., Géophys. Géogr. Géol.* 34: 12, 1990).
- Aporimonodicellaesporites** Frunzescu & Bacaran (1990), Fossil Fungi. 1. See Frunzescu & Bacaran (*Revue roum. Géol., Géophys. Géogr. Géol.* 34: table 1 + pl. 1, fig. 8, 1990).
- Aporimulticellaesporites** Frunzescu & Bacaran (1990), Fossil Fungi. 1. See Frunzescu & Bacaran (*Revue roum. Géol., Géophys. Géogr. Géol.* 34: 24, 1990).
- Aporitetracellaesporites** Frunzescu & Bacaran (1990), Fossil Fungi. 1. See Frunzescu & Bacaran (*Revue roum. Géol., Géophys. Géogr. Géol.* 34: table 1, 1990).
- Aporitricellaesporites** Frunzescu & Bacaran (1990), Fossil Fungi. 1. See Frunzescu & Bacaran (*Revue roum. Géol., Géophys. Géogr. Géol.* 34: table 1, 1990).
- Aporomyces** Thaxt. (1931), *Laboulbeniaceae*. 8 (on *Limnichideae* and *Strophylinidae*), widespread. See Benjamin (*Aliso* 12: 335, 1989; key), Kaur & Mukerji (*Mycoscience* 37: 61, 1996), Santamaría (*Fl. Mycol. Iberica* 5, 2003; Europe).
- Aporophallus** Möller (1895), *Phallaceae*. 1, Brazil.
- Aporothielavia** Malloch & Cain (1973) ? = *Chaetomidium* fide Malloch & Cain (*Mycol.* 65: 1055, 1973), Suh & Blackwell (*Mycol.* 91: 836, 1999; phylogeny), Untereiner *et al.* (*CJB* 79: 321, 2001; phylogeny, genus concept), Cai *et al.* (*MR* 110: 359, 2006; phylogeny), Cai *et al.* (*MR* 110: 137, 2006), Greif & Currah (*MR* 111: 70, 2007; ontogeny).
- Aporpiaceae** Bondartsev & Bondartseva (1960) = *Auriculariaceae*.
- Aporpium** Bondartsev & Singer (1944) = *Protomerulius* fide Núñez (*Folia cryptog. Estonica* 33: 99, 1998).
- Aposphaeria** Berk. (1860) nom. rej., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Aposphaeria** Sacc. (1880) nom. cons., anamorphic *Melanomma*, Cpd.0eH.15. 101, widespread. See Chesters (*TBMS* 22: 116, 1938), Heiny *et al.* (*Mycotaxon* 44: 137, 1992).
- Aposphaeriella** Died. (1912) = *Zignoëlla* fide Höhnelt (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt. 1* 126: 283, 1917).
- Aposphaeriopsis** Died. (1913) = *Cephalotheca* fide Chesters (*TBMS* 19: 261, 1935).
- Aposporella** Thaxt. (1920), anamorphic *Pezizomycotina*, Hso.0eP.38. 1 (on *Insecta*), Africa.
- asporory**, direct incorporation in a spore of an oogonial or antheridial diploid nucleus with cytoplasm uninfluenced by any meiosis at the time of spore wall formation (Dick, 1972).
- Apostemidium** P. Karst. (1871) = *Apostemium*.
- Apostemium** (P. Karst.) P. Karst. (1870) = *Vibrissea* fide Graddon (*TBMS* 48: 639, 1965; key), Sánchez & Korf (*Mycol.* 58: 733, 1966).
- Apostrasseria** Nag Raj (1983), anamorphic *Phacidium*, St.0eH.15. 4, New Zealand; N. America. See Kramer (*Stud. Mycol.* 30: 151, 1987).
- Apotemnoum** Corda (1833) = *Clasterosporium* fide Saccardo (*Syll. fung.* 4: 382, 1886).
- apothecium** (pl. **apothecia**), a cup-like or saucer-like ascoma in which the hymenium is exposed at maturity, sessile or stipitate, the stipes sometimes lichenized (podetium; q.v.). See the following for terminology of anatomical structures of apothecia: Degelius (*Sym. bot. upsal.* 13 (2), 1954; tabulation of terms), Korf (*Sci. Rep. Yokohama nat. Univ.* II 7: 7, 1958; in Ainsworth *et al.* (Eds), *The Fungi* 4A: 249, 1973), Letrouit-Galinou (*Bryologist* 71: 297, 1969), Maas Geesteranus (*Blumea* 6: 41, 1947), Sheard (*Lichenologist* 3: 328, 1967).
- Apoxona** Donk (1969) = *Hexagonia* Fr. fide Bondartsev & Singer (*Polyporaceae of the European part of the U.S.S.R. and Caucasus*: 1106 pp., 1953).
- Appelia** (Sacc.) Trotter (1931) = *Trichoconis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- appendage**, a process (outgrowth) of any sort. For coelomycete conidial appendage terminology see

- Nag Raj (*Coelomycetous anamorphs*, 1993).
- Appendichordella** R.G. Johnson, E.B.G. Jones & S.T. Moss (1987), Halosphaeriaceae. 1 (marine), Europe; N. America. See Johnson *et al.* (*CJB* 65: 931, 1987), Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 34: 1, 1991).
- Appendicispora** Spain, Oehl & Sieverd. (2006) = *Ambispora* fide Walker & Schüssler (*MR* 112: 297, 2008).
- Appendicisporaceae** C. Walker, Vestberg & A. Schüssler (2007) nom. illegit. = *Ambisporaceae*.
Lit.: Walker *et al.* (*MR* 111: [253], 2007), Walker *et al.* (*MR* 111: 137, 2007).
- Appendicisporonites** R.K. Saxena & S. Khare (1991), Fossil Fungi. 1, India. See Saxena & Khare (*Geophytology* 21: 40, 1991).
- Appendicospora** K.D. Hyde (1995), ? Xylariales. 2 (dead palm fronds), widespread (tropical). See Hyde (*Sydowia* 47: 31, 1995), Yanna *et al.* (*Mycoscience* 38: 395, 1997), Hyde *et al.* (*Sydowia* 50: 21, 1998; posn).
- Appendicularia** Peck (1885) [non *Appendicularia* DC. 1828, *Melastomataceae*] = *Appendiculina*.
- appendiculate** (1) (cf an agaric basidioma), having the edge of the expanded pileus fringed with tooth-like remains of the veil, as in *Psathyrella candolleana*; (2) (of a spore), having one or more setulae.
- Appendiculella** Höhn. (1919), Meliolaceae. 250 (from leaves), widespread (tropical). See Hughes (*Mycol. Pap.* 166, 1993), Song (*Mycosystema* 17: 214, 1998; China), Song *et al.* (*Mycosystema* 21: 177, 2002; China), Hosagoudar (*Sydowia* 55: 162, 2003; placement), Rodríguez & Piepenbring (*Mycol.* 99: 544, 2007; Panama).
- Appendiculina** Berl. (1889) = *Stigmatomyces* fide Thaxter (*Proc. Amer. Acad. Arts & Sci.* 25: 8, 1890).
- Appendispora** K.D. Hyde (1994), Didymosphaeriaceae. 2, Brunei. See Hyde (*Sydowia* 46: 29, 1994), Hyde *et al.* (*Nova Hedwigia* 69: 449, 1999).
- Appendixia** B.S. Lu & K.D. Hyde (2000), Xylariaceae. 1, USA. Questionably distinct from *Anthostomella*. See Lu & Hyde (*Fungal Diversity Res. Ser.* 4: 224, 2000).
- Appianoporites** S.Y. Sm., Currah & Stockey (2004), Fossil Fungi. 1, Canada. See Smith *et al.* (*Mycol.* 96: 181, 2004).
- applanate**, flattened.
- apple canker**, disease caused by *Nectria galligena*.
- appressed (adpressed)**, closely flattened down.
- appressorium**, a swelling on a germ-tube or hypha, esp. for attachment in an early stage of infection, as in certain *Pucciniales* and in *Colletotrichum*; the 'expression of the genotype during the final phase of germination', whether or not morphologically differentiated from vegetative hyphae, as long as the structure adheres to and penetrates the host (Emmett & Parbery, *Ann. Rev. Phytopath.* 13: 146, 1975); the term hyphopodium (q.v.) is probably best treated as a synonym.
- Apra** J.F. Hennen & F.O. Freire (1979), Raveneliaceae. 1 (on *Mimosa* (*Leguminosae*)), Brazil. See Hennen & Freire (*Mycol.* 71: 1053, 1979).
- Apterivorax** S. Keller (2005), Neozygitaceae. 2, widespread. See Keller & Petrini (*Sydowia* 57: 47, 2005), Keller & Petrini (*Sydowia* 57: 23, 2005; key), Keller (*Sydowia* 58: 75, 2006; validation of *A. acaricida*).
- Aptrootia** Lücking & Sipman (2007), Trypetheliaceae (L). 1, Costa Rica; Papua New Guinea. See Lücking *et al.* (*Lichenologist* 39: 187, 2007), Aptroot *et al.* (*Bibliotheca Lichenol.* 97, 2008; Costa Rica).
- apud**, in; sometimes used to indicate a name published by one author in the work of another; cf. ex.
- Apus** Gray (1821) = *Schizophyllum*.
- Apyrenium** Fr. (1849) nom. dub., anamorphic *Hypocreales*. See Donk (*Taxon* 7: 164, 1958).
- Aquadiscula** Shearer & J.L. Crane (1985), Helotiaceae. 2 (aquatic), USA. See Shearer & Crane (*Mycol.* 77: 441, 1985), Fallah & Shearer (*Mycol.* 93: 566, 2001).
- Aquadulciospora** Fallah & Shearer (2001), Hyponectriaceae. 1, USA.
- Aqualignicola** V.M. Ranghoo, K.M. Tsui & K.D. Hyde (2001), Annulatascaceae. 1, Hong Kong. See Ranghoo *et al.* (*MR* 105: 628, 2001).
- Aquamarina** Kohlm., Volkm.-Kohlm. & O.E. Erikss. (1996), ? Dothideomycetes. 1, North Carolina. See Kohlmeyer *et al.* (*MR* 100: 393, 1996).
- Aquamortierella** Embree & Indoh (1967), Mortierellaceae. 1, New Zealand; Japan. See Embree & Indoh (*Bull. Torrey bot. Club* 94: 464, 1967), Indoh (*TMSJ* 8: 28, 1967).
- Aquaphila** Goh, K.D. Hyde & W.H. Ho (1998), anamorphic *Tubeufia*, Hso.???. 2, Australia. See Goh *et al.* (*MR* 102: 588, 1998), Tsui *et al.* (*Mycol.* 99: 884, 2007; phylogeny, anamorph).
- Aquapoterium** Raja & Shearer (2008), Helotiales. 1 (from fresh water), USA. See Raja *et al.* (*Mycol.* 100: 141, 2008).
- Aquascypha** D.A. Reid (1965), Meruliaceae. 1, C. & S. America. See Reid (*Nova Hedwigia* Beih. 18: 51, 1965), Ryvarden (*Syn. Fung.* 18: 76, 2004).
- Aquasphaeria** K.D. Hyde (1995), ? Annulatascaceae. 1 (submerged wood), Queensland. See Hyde (*Nova Hedwigia* 61: 119, 1995).
- Aquathanatephorus** C.C. Tu & Kimbr. (1978) = *Thanatephorus* fide Stalpers & Anderson in Sneh *et al.* (Eds) (*Rhizoctonia Species Taxonomy, Molecular Biology, Ecology, Pathology and Disease Control*: 58, 1996).
- Aquatic fungi**. Living in water. Over 3000 species of Fungi and almost 150 chromistans have been recorded from freshwater, brackish and marine environments (Shearer *et al.*, *Biodiversity and Conservation* 16: 49, 2007). Here the term is restricted to freshwater in contrast to Marine fungi (q.v.). The chief zoosporic fungi of freshwater are *Chytridiomycota* and chromistans, esp. *Chytridiales* and *Saprolegniales*: Sparrow (*Aquatic phycomycetes*, 1943 [edn 2, 1960]; *Mycol.* 50: 797, 1959, phylogeny), Emerson (*Mycol.* 50: 589, 1959; culture), Fuller & Jaworski (*Zoosporic fungi in teaching and research*, 1987). Many are fish parasites; some parasitize freshwater plankton: Canter & Lund (*Ann. Bot., Lond.*, n.s. 14-15, 1950-51; *New Phytol.* 47: 238, 1948; *TBMS* 36: 13, 37: 111, 1953-54), Cook (*Am. J. Bot.* 50: 580, 1943, on desmids), Khulbe (*Manual of aquatic fungi (Chytridiomycetes and Oomycetes)*, 2001), Paterson (*Mycol.* 50: 85, 483, 1958).
- 'Hyphomycetes' of freshwater have received much attention (Ingold, *TBMS* 25: 339, 1942). These fungi frequently have branched or sigmoid spores as an adaptation (typically of convergent evolution, see Tsui & Berbee, *Molecular Phylogenetics and Evolution* 39: 587, 2006) to life on decaying leaves in fast running water (Ingold, *Mycol.* 58: 43, 1966), but may also show other forms of adaptation, for example empty cells acting as float chambers in the genus *Ru-*

bikia. Over 100 anamorph gen. and 300 spp. have been recorded (Ingold, *Am. J. Bot.* 66: 218, 1979; *An illustrated guide to aquatic and water-borne hyphomycetes* [Publ. Freshwater biol. Assn 30], 1975, keys, illustr.; *Biol. J. Linn. Soc.* 7: 1, 1975, convergent evolution), Nilsson (*Symb. bot. upsal.* 18 (2), 1964), Webster & Descals (in Cole & Kendrick, *Biology of conidial fungi* 1: 295, 1981). **Ecology:** Bärlocher (Ed.) (*The ecology of aquatic hyphomycetes*, 1992). **Teleomorphs:** Webster (in Bärlocher, *The ecology of aquatic hyphomycetes*: 99, 1992). **Regional surveys.** **China:** Zhu & Yu (*Acta Mycol. Sin.* 11: 43, 1992). **Cuba:** Marvanová & Marvan (*Česká Myk.* 23: 135, 1969). **Ghana:** Dixon (*TBMS* 42: 174, 1959). **Hawaii:** Ranzoni (*Mycol.* 71: 786, 1979). **Iceland:** Johnson (*J. Elisha Mitch. sci. Soc.* 84: 179, 1968). **Jamaica:** Hudson & Ingold (*TBMS* 43: 469, 1960). **Japan:** Tubaki (*Bull. Nat. Sci. Mus. Tokyo* 41: 149, 1957). **Malaysia:** Nawawi (*Malayan Nature Journal* 39: 75, 1985). **New Zealand.** Aimer & Segedin (*N.Z. J. Bot.* 23: 273, 1985). **Nigeria:** Ingold (*TBMS* 39: 108, 42: 479, 1956-59). **N. Am.:** Peterson (*Mycol.* 54: 117, 55: 18, 570, 1962-63; gen. key). **Norway:** Bråthen (*Nord. J. Bot.* 4: 375, 1984). **Puerto Rico:** Santos-Flores & Betancourt-López (*Caribbean J. Sci. Special Publ.* 2: 1, 1997), Nieves-Rivera & Santos-Flores (*J. Agric. Univ. Puerto Rico* 89: 97, 2005). **Sierra Leone:** Le'John (*TBMS* 48: 261, 1965). **S. Am.:** Schoenlein-Crusius & Grandi (*Brazilian J. Microbiol.* 34: 183, 2003). **Uganda:** Ingold (*TBMS* 41: 109). **Ukraine:** Dudka ([*Aquatic hyphomycetes of the Ukraine*], 1974). **Venezuela:** Nilsson (*Svensk bot. Tidskr.* 56: 351, 1962). **Zimbabwe:** Ingold (*TBMS* 41: 109). See also aero-aquatic fungi.

Over 200 ascomycetes have also been recorded from freshwater habitats (Shearer, *Nova Hedw.* 56: 1, 1993) and the tropics are now proving extremely rich in novel ascomycete genera (e.g. Hyde, *MR* 98: 719, 1994).

Some saxicolous lichens, mainly of the *Lichina*-ceae and the gen. *Dermatocarpon*, *Hymenelia*, *Placynthium*, *Polyblastia*, *Staurothele*, *Verrucaria* (q.v.), occur in freshwater; some may be always submerged (e.g. *Collema fluviatile*, *Hydrothria venosa*). They can form zones on river and lake margins related to the frequency of submersion (Rosentreter, *Northwest Sci.* 58: 108, 1984; Santesson, *Medd. Lunds Univ. Limnol. Inst.* 1, 1939, Sweden; Scott, *Lichenologist* 3: 368, 1967, Zimbabwe), and can be used in the determination of river channel capacity (Gregory, *Earth Surface Processes* 1: 273, 1976; Australia); a 'lichen-line' on trees can also indicate highwater levels (Hale, *Bryologist* 87: 261, 1984).

A small number of smuts are associated with aquatic plants and may show some adaptation themselves to a freshwater environment (Piatek, *Polish Bot. J.* 51: 173, 2006). In addition to plant debris saprobes and animal parasites, various other substrata in freshwater have been investigated for fungi (Czeczuga *et al.*, *Polish J. Environmental Sci.* 13: 21, 2004). Yeasts are also known from aquatic environments, and may contribute to water self-purification (Dynowska *et al.*, *Int. J. Ecohydrology and Hydrobiol.* 5: 147, 2005).

At least some aquatic fungi also occupy dry land habitats, for example as endophytes (Sati *et al.*, *Nat. Acad. Sci. Letters* 29: 351, 2006). The land environment adjacent to fresh water can markedly affect the

aquatic mycota. Introduced forest trees, for example, may result in a change in the range of aquatic fungi colonizing fallen leaves (Ferreira *et al.*, *Archiv für Mikrobiol.* 166: 467, 2006). Diverse fungi are found in polluted water and sewage: Cooke (*Sydowia, Beih.* 1: 136, 1957, list; *A laboratory guide to fungi in polluted waters, sewage and sewage treatment systems*, 1963; *Our mouldy earth*, 1970 [reprints and summarizes his studies in this field]). There have been many studies of aquatic fungi in relation to pollution (Krauss *et al.*, *Aquatic fungi in heavy metal and organically polluted habitats*, in Deshmukh & Rai (Eds) *Biodiversity of fungi, their role in human life*, 2005). Some attention has been given to possibilities of using aquatic fungi in bioremediation of oil pollution (Etim & Antai, *Global J. Env. Sci.* 6: 33, 2007).

Aquaticheirospora Kodsueb & W.H. Ho (2007), anamorphic *Pleosporales*, H??.?. 1, Thailand. See Kodsueb *et al.* (*Botanical Journal of the Linnean Society* 155: 283, 2007; descr.).

Aquaticola W.H. Ho, K.M. Tsui, Hodgkiss & K.D. Hyde (1999), *Annulatascaceae*. 5, Australia; Hong Kong. See Ho *et al.* (*Fungal Diversity* 3: 87, 1999), Fallah & Shearer (*Mycol.* 93: 566, 2001), Tsui *et al.* (*Nova Hedwigia* 77: 161, 2003), Campbell & Shearer (*Mycol.* 96: 822, 2004; phylogeny).

Arachniaceae Coker & Couch (1928) = *Lycoperdaceae*.

Arachnion Schwein. (1822), *Agaricaceae*. 6, widespread (subtropical). See Demoulin (*Nova Hedwigia* 21: 641, 1972), Quadraccia (*Mycotaxon* 58: 331, 1996; Italy).

Arachniopsis Long (1917) [non *Arachniopsis* Spruce 1882, *Hepaticae*] = *Arachnion* fide Demoulin (*Nova Hedwigia* 21: 641, 1972).

Arachniotus J. Schröt. (1893), *Gymnoascaceae*. 3, Poland. See Orr *et al.* (*Mycol.* 69: 126, 1977), Currah (*Mycotaxon* 24: 1, 1985), Udagawa & Uchiyama (*Mycoscience* 41: 303, 2000), Sugiyama & Mikawa (*Mycoscience* 42: 413, 2001), Solé *et al.* (*Stud. Mycol.* 47: 141, 2002; synonymy with *Gymnascella*).

Arachnocrea Z. Moravec (1956), *Hypocreaceae*. Anamorph *Verticillium*-like. 1 (on old polypores and plant tissues), widespread. See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Pöldmaa (*Stud. Mycol.* 45: 83, 2000), Samuels *et al.* (*CBS Diversity Ser.* 4, 2006; USA).

arachnoid, covered with, or formed of, delicate hairs or fibres; araneose.

Arachnomycelium Grüss (1931), *Fossil Fungi*. 1.

Arachnomycetes Massee & E.S. Salmon (1902), *Arachnomycetaceae*. Anamorph *Onychocola*. 10, Europe; America. See Malloch & Cain (*CJB* 48: 839, 1970), Currah (*Mycotaxon* 24: 1, 1985), Gibas *et al.* (*Medical Mycology* 40: 573, 2002; anam.), Gibas *et al.* (*Stud. Mycol.* 47: 131, 2002; phylogeny, links with *Eurotiales*), Sugiyama *et al.* (*Stud. Mycol.* 47: 5, 2002; phylogeny), Gibas *et al.* (*Stud. Mycol.* 50: 525, 2004), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny).

Arachnomycetaceae Gibas, Sigler & Currah (2002), *Arachnomycetales*. 2 gen., 11 spp.

Lit.: Gibas *et al.* (*Stud. Mycol.* 47: 131, 2002), Geiser *et al.* (*Mycol.* 98: 1053, 2006).

Arachnomycetales Gibas, Sigler & Currah (2002). *Eurotiomycetidae*. 1 fam., 2 gen., 11 spp. Fam.:

Arachnomycetaceae

For *Lit.* see under fam.

- Arachnopeziza** Fuckel (1870), ? Hyaloscyphaceae. 15, widespread (north temperate). See Korf (*Lloydia* 14: 129, 1951), Huhtinen (*Mycotaxon* 30: 9, 1987), Cantrell & Hanlin (*Mycol.* 89: 745, 1997; DNA), Yu & Zhuang (*Nova Hedwigia* 74: 415, 2002; China).
- Arachnopezizella** Kirschst. (1938) = *Arachnopeziza* fide Korf (*Lloydia* 14: 129, 1951).
- Arachnophora** Hennebert (1963), anamorphic *Pezizomycotina*, Hso.≡ eP.1. 4, widespread (esp. north temperate). See Hughes (*N.Z. Jl Bot.* 17: 139, 1979; descr.), Castañeda Ruiz *et al.* (*Nova Hedwigia* 64: 473, 1997), Kendrick (*CJB* 81: 75, 2003; morphogenesis).
- Arachnoscypha** Boud. (1885) = *Arachnopeziza* fide Korf (*Lloydia* 14: 129, 1951), Svrček (*Česká Mykol.* 41: 193, 1987).
- Arachnospora** R.F. Castañeda, Minter & Camino (2003), anamorphic *Pezizomycotina*, H??.?. 1 (on decaying leaves), Cuba. See Castañeda Ruiz *et al.* (*Mycotaxon* 87: 386, 2003).
- Arachnotheca** Arx (1971), Onygenales. Anamorph *Chrysosporium*. 3, widespread. See Currah (*Mycotaxon* 24: 1, 1985), Uchiyama *et al.* (*Mycoscience* 36: 211, 1995), Sugiyama & Mikawa (*Mycoscience* 42: 413, 2001), Sugiyama *et al.* (*Stud. Mycol.* 47: 5, 2002; phylogeny).
- Arachnula** Cienk. (1876), Biomyxida. q.v.
- Araecoryne** Corner (1950), Gomphaceae. 1, Malaysia. See Corner (*Ann. Bot. Mem.* [A monograph of *Clavaria* and allied genera] 1: 194, 1950).
- Araneomyces** Höhn. (1909), anamorphic *Paranectriella*, Hso.1bH.1. 1 (mycoparasitic), Brazil. See Sutton (*TBMS* 83: 399, 1984), Rossman (*Mycol. Pap.* 157: 71 pp., 1987), Wu *et al.* (*MR* 101: 1318, 1997).
- Araneosa** Long (1941), Agaricaceae. 1, USA. Basidioma gasteroid. See Long (*Mycol.* 33: 351, 1941).
- araneose** (araneous), see arachnoid.
- Arberia** Nieuwl. (1916) [non *Arberia* C.D. White 1908, fossil ? *Pteridophyta*] ≡ *Asteridium*.
- Arborella** Zebrowski (1936), Fossil Fungi ? Chytridiomycetes. 2 (Cambrian to ? Recent), Australia.
- arboricolous**, growing on trees.
- Arborillus** Munt.-Cvetk. & Gómez-Bolea (1998), anamorphic *Pezizomycotina*, Hso.?.?. 1 (lichenicolous), Spain. See Muntañola-Cvetkovic & Gómez-Bolea (*Mycotaxon* 68: 152, 1998).
- Arborispora** K. Ando (1986), anamorphic *Pezizomycotina*, Hso.1bH.1/10. 3 (aquatic), Japan. See Ando (*TMSJ* 27: 120, 1986), Gönczöl & Révay (*Fungal Diversity* 12: 19, 2003; ecology).
- arbuscle** (arbuscule), see mycorrhiza.
- Arbuscula** Bat. & Peres (1965) [non *Arbuscula* H.A. Crum, Steere & L.E. Anderson 1964, *Musci*] ≡ *Neoarbuscula*.
- Arbusculidium** B. Sutton (1982) [non *Arbusculidium* J. Deunff 1968, fossil *Acritarcha*] ≡ *Neoarbuscula*.
- Arbusculina** Marvanová & Descals (1987), anamorphic *Pezizomycotina*, Hso.1bH.19. 2 (aquatic), widespread. See Marvanová & Descals (*TBMS* 89: 499, 1987), Marvanová (*TBMS* 90: 607, 1988), Descals (*MR* 109: 545, 2005; propagules).
- Arbusculites** Paradkar (1976), Fossil Fungi. 1 (Cretaceous), India. See Paradkar (*Journal of Palynology* 10: 120, 1974).
- Arcangelia** Sacc. (1890) = *Didymella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Arcangeliella** Cavara (1900) = *Lactarius* fide Miller *et al.* (*Mycol.* 93: 344, 2001).
- Archaea** (archaeobacteria), an heterogeneous group of prokaryotic organisms belonging to the Domain Archaea. See bacteria.
- archaeascus**, see ascus.
- Archaeoglomus** N. Sharma, R.K. Kar, A. Agarwal & R. Kar (2005), Fossil Fungi, Glomeraceae. 1.
- Archaeomarasmius** Hibbett, D. Grimaldi & Donoghue (1997), Fossil Fungi. 1, New Jersey. See Hibbett *et al.* (*Am. J. Bot.* 84: 982, 1997).
- Archaeospora** Morton & Redecker (2001), Archaeosporaceae. 1, USA. See Morton & Redecker (*Mycol.* 93: 183, 2001), Redecker & Raab (*Mycol.* 98: 885, 2006; phylogeny).
- Archaeosporaceae** J.B. Morton & D. Redecker (2001), Archaeosporales. 1 gen., 1 spp.
Lit.: Azcon-Aguilar & Barea (*Mycorrhiza* 6: 457, 1996), van der Heijden *et al.* (*Nature Lond.* 396: 69, 1998), Morton & Redecker (*Mycol.* 93: 183, 2001), Schüßler *et al.* (*MR* 105: 1413, 2001), Spain (*Mycotaxon* 87: 109, 2003), Hafeel (*Mycorrhiza* 14: 213, 2004), Redecker (*Glomeromycota* Arbuscular mycorrhizal fungi and their relative(s). Version 01 July 2005.
<http://tolweb.org/Glomeromycota/28715/2005.07.01> in The Tree of Life Web Project, <http://tolweb.org>: [unpaginated], 2005), Walker *et al.* (*MR* 111: 137, 2007).
- Archaeosporales** C. Walker & A. Schüssler (2001). Glomeromycetes. 3 fam., 3 gen., 6 spp. Fams:
(1) **Ambisporaceae**
(2) **Archaeosporaceae**
(3) **Geosiphonaceae**
For *Lit.* see under fam.
- Archagaricon** A. Hancock & Atthey (1869), Fossil Fungi (mycel.) Fungi. 5 (Carboniferous), British Isles.
- Archecribraria** Locq. (1983), Fossil Fungi. 2, Sahara.
- Archemycota**. Name in the rank of phylum including the groups treated in this *Dictionary* as *Chytridiomycota* and *Zygomycota* (incl. *Trichomycetes*); see Cavalier-Smith (*in* Rayner *et al.* (Eds), *Evolutionary biology of the fungi*: 339, 1987; *in* Osawa & Honjo (Eds), *Evolution of life*: 271, 1991).
- Archeomycelites** Bystrov (1959), Fossil Fungi (mycel.) Fungi. 1 (Devonian), former USSR.
- Archephoma** Watanabe, H. Nishida & Kobayashi (1999), Fossil Fungi. 1, Japan. See Watanabe *et al.* (*Int. J. Pl. Sci.* 160: 436, 1999).
- Archeplax** Locq. (1985), Fossil Fungi. 1, Sahara.
- Archeterobasidium** Koeniguer & Locq. (1979), Fossil Fungi, Agaricomycetes. 1 (Miocene), Libya.
- Archiascomycetes** = Taphrinomycetes. Class of *Ascomycota* provisionally proposed by Nishida & Sugiyama (*Mycoscience* 35: 361, 1994) for *Pneumocystis*, *Protomyces*, *Saitoella*, *Schizosaccharomyces* and *Taphrina* based on 18S rRNA sequences; considered by the authors to perhaps not be monophyletic but to have originated before *Euascomycetes* and *Hemiascomycetes*.
- archicarp** (of ascomycetes), the cell, hypha, or coil which later becomes the ascoma or part of it.
- Archilichens**, lichens in which the algae are bright green (obsol.).
- Archimycetes** (obsol.). Name used rarely for *Plasmodiophoromycota* and *Chytridiomycota*. *Myxochytridiales*.
- Architrypethelium** Aptroot (1991), Trypetheliaceae

- (L). 3, widespread (tropical). See Aptroot (*Biblthca Lichenol.* 44: 120, 1991), Aptroot *et al.* (*Biblthca Lichenol.* 97, 2008; Costa Rica).
- archontosome**, an electron-dense body occurring near nuclei at all stages from crozier formation to the development of young ascospores in *Xylaria polymorpha*. See Beckett & Crawford (*J. gen. Microbiol.* 63: 269, 1970).
- Arcispora** Marvanová & Bär. (1998), anamorphic *Basidiomycota*. 1 (aquatic), Canada. See Marvanová & Bärlocher (*Mycol.* 90: 531, 1998).
- arctic mycology**, see Polar and alpine mycology.
- Arcticomyces** Savile (1959) = *Exobasidium* fide Donk (*Persoonia* 4: 287, 1966).
- Arctocetraria** Kärnefelt & A. Thell (1993), Parmeliaceae (L). 2, Europe. See Kärnefelt *et al.* (*Bryologist* 96: 394, 1993), Thell *et al.* (*Mycol. Progr.* 1: 335, 2002; phylogeny), Mattsson & Articus (*Symb. bot. upsal.* 34 no. 1: 237, 2004; phylogeny), Randle & Saag (*Central European Lichens*: 75, 2006; key).
- Arctohheppia** Lynge (1938) = *Thelignya* fide Jørgensen & Henssen (*Taxon* 39: 343, 1990).
- Arctomia** Th. Fr. (1860), Arctomiaceae (L). 5, Europe; N. America. See Henssen (*Svensk bot. Tidskr.* 63: 126, 1969), Jørgensen (*Lichenologist* 35: 287, 2003; China), Wedin *et al.* (*MR* 109: 159, 2005; phylogeny, link with *Hymeneliaceae*).
- Arctomiaceae** Th. Fr. (1860), Ostropomycetidae (inc. sed.) (L). 3 gen., 7 spp.
Lit.: Jørgensen (*Lichenologist* 35: 287, 2003), Lumbsch *et al.* (*Lichenologist* 37: 291, 2005), Jørgensen (*Nordic Lichen Flora* 3: Cyanolichens: 9, 2007), Lumbsch *et al.* (*MR* 111: 257, 2007; phylogeny).
- Arctoparmelia** Hale (1986), Parmeliaceae. 5, widespread. See Thell *et al.* (*Symb. bot. upsal.* 34 no. 1: 429, 2004; biogeography), Blanco *et al.* (*Mol. Phylogen. Evol.* 39: 52, 2006; phylogeny).
- Arctopeltis** Poelt (1983), Lecanoraceae (L). 1, Arctic. See Arup & Grube (*Lichenologist* 30: 415, 1998; DNA), Feige & Lumbsch (*Cryptog. Bryol.-Lichénol.* 19: 147, 1998; ontogeny), Grube *et al.* (*MR* 108: 506, 2004; phylogeny).
- Arctosporidium** Thor (1930) nom. dub., ? Fungi. 1, Svalbard.
- Arcuadendron** Sigler & J.W. Carmich. (1976), anamorphic *Pezizomycotina*, Hso.0eH.40. 2, India; former Yugoslavia. See Sigler & Carmichael (*Mycotaxon* 4: 355, 1976).
- arcuate**, arc-like.
- ardella**, a small spot-like apothecium, as in the lichen *Arthonia*.
- Ardhachandra** Subram. & Sudha (1978), anamorphic *Pezizomycotina*, H. 4, widespread. Placed into synonymy with *Rhinocladiella* by some authors. See Onofri & Castagnola (*Mycotaxon* 18: 337, 1983), Keates & Carris (*Cryptog. Bot.* 4: 336, 1994; from *Vaccinium macrocarpon*), Chen & Tzean (*MR* 99: 364, 1995; key to 4 spp.).
- ardosiaceous** (ardesiaceous), slate-coloured.
- Arecacicola** Joanne E. Taylor, J. Fröhl. & K.D. Hyde (2001), Sordariomycetes. 1 (on palm trunk), Indonesia. See Taylor *et al.* (*Mycoscience* 42: 370, 2001).
- Arecomyces** K.D. Hyde (1996), Hyponectriaceae. 9 (saprobic on palms), widespread. See Hyde (*Sydowia* 48: 224, 1996).
- Arecophila** K.D. Hyde (1996), Xylariales. 13 (on *Palmae*), S.E. Asia. Placed in the *Cainiaceae* by some authors, but relationships are obscure. See Hyde (*Nova Hedwigia* 63: 81, 1996), Jeewon *et al.* (*MR* 107: 1392, 2003).
- Aregma** Fr. (1815) = *Phragmidium* fide Vánky (*in litt.*).
- Arenaea** Penz. & Sacc. (1901) = *Lachnum* fide Korf in Ainsworth *et al.* (*The Fungi* 4A, 1973).
- Arenariomyces** Höhnk (1954), Halosphaeriaceae. 4 (marine), widespread. See Jones *et al.* (*J. Linn. Soc. Bot.* 87: 193, 1983), Kohlmeyer & Volkmann-Kohlmeyer (*MR* 92: 413, 1989; key), Jones *et al.* (*CJB* 74 Suppl. 1: S790, 1995; ultrastr.).
- Arenicola** Velen. (1947) = *Entoloma* fide Kuyper (*in litt.*).
- Areolaria** Kalchbr. (1884) = *Phellorinia* fide Stalpers (*in litt.*).
- areolate**, having division by cracks into small areas.
- Areolospora** S.C. Jong & E.E. Davis (1974), Xylariaceae. 1, widespread. Treated as *Phaeosporis* by Hawksworth (*SA* 13: 1, 1994). See Hawksworth (*Norw. J. Bot.* 27: 97, 1980), Krug *et al.* (*Mycol.* 86: 581, 1994).
- arescent**, becoming crustose on drying.
- Argentinomyces** N.I. Peña & Aramb. (1997), ? Sordariomycetes. 1 (on driftwood), Argentina. See Peña & Arambarri (*Mycotaxon* 65: 333, 1997).
- Argomyces** Arthur (1912) = *Argotelium*.
- Argomycetella** Syd. (1922) = *Maravalia* fide Mains (*Bull. Torrey bot. Club* 66: 173, 1939).
- Argopericonia** B. Sutton & Pascoe (1987), anamorphic *Pezizomycotina*, Hso.0eH.6/10. 2, Australia; India. See Sutton & Pascoe (*TBMS* 88: 41, 1987), D'Souza *et al.* (*Mycotaxon* 82: 133, 2002; Andaman Is.).
- Argopsis** Th. Fr. (1857), ? Brigantiaeaceae (L). 3, widespread (sub-Antarctica). See Lamb (*J. Hattori bot. Lab.* 38: 447, 1974).
- Argotelium** Arthur (1906) = *Puccinia* fide Arthur (*Am. J. Bot.* 5: 485, 1918).
- Argyllum** Wallr. (1833) = *Melanogaster* fide Stalpers (*in litt.*).
- Argynna** Morgan (1895), Argynnaceae. 1, N. America. See Shearer & Crane (*TBMS* 75: 193, 1980).
- Argynnaceae** Shearer & J.L. Crane (1980), ? Dothideomycetes (inc. sed.). 2 gen., 2 spp.
Lit.: Shearer & Crane (*TBMS* 75: 193, 1980), Hawksworth (*SA* 6: 153, 1987).
- arid**, dry.
- Ariefia** Jacz. (1922) = *Zopfiella* fide Cannon (*in litt.*).
- Ariella** E.-J. Gilbert (1941) = *Amanita* Pers. fide Singer (*Agaric. mod. Tax.* edn 3, 1975).
- Aristadiplodia** Shirai (1919) nom. dub., anamorphic *Pezizomycotina*. 1, Japan. See Sutton (*Mycol. Pap.* 141, 1977).
- Aristastoma** Tehon (1933), anamorphic *Pezizomycotina*, Cpd. = eH.1. 5, widespread. *A. oeconomicum* (zonate leaf spot of cowpea, *Vigna*). See Sutton (*Mycol. Pap.* 97, 1964; key), Hyde & Philemon (*MR* 95: 1151, 1991).
- Arkoola** J. Walker & Stovold (1986), Venturiaceae. 1, Australia. See Walker & Stovold (*TBMS* 87: 23, 1986).
- Armata** W. Yamam. (1958), ? Micropeltidaceae. 1, Japan. See Yamamoto (*Science Reports of the Hyogo University of Agriculture Series Agricultural Biology* 3: 89, 1958).
- Armatella** Theiss. & Syd. (1915), Meliolaceae. 12 (from leaves), widespread (tropical). See von Arx (*Fungus Wageningen* 28: 1, 1958), Hosagoudar (*J.*

- Econ. Taxon. Bot.* 15: 195, 1991; India), Hosagoudar & Abraham (*J. Econ. Taxon. Bot.* 25: 560, 2001), Hosagoudar (*Sydowia* 55: 162, 2003; family placement).
- Armatellaceae** Hosag. (2003) = Meliolaceae.
Lit.: Hosagoudar (*Sydowia* 55: 162, 2007).
- armilla**, see annulus.
- Armillaria** (Fr.) Staude (1857), Physalacriaceae. 35, widespread. Most species cause serious root diseases in woody plants; some form orchid mycorrhizas. Application of a biological species concept has led to recognition of a larger number of biological species, which cannot always be recognised morphologically. See Ullrich & Anderson (*Exp. Mycol.* 2: 119, 1978; karyology), Shaw & Kile (*Armillaria root disease*, 1991), Anderson & Stasovski (*Mycol.* 84: 506, 1992; phylogeny), Smith *et al.* (*Nature* 256: 428, 1992; population biology), Piercey-Normore *et al.* (*Mol. Phylogen. Evol.* 10: 49, 1998; phylogeny), Fox (*Armillaria root rot: biology and control of honey fungus*, 2000).
- Armillariella** (P. Karst.) P. Karst. (1881) = *Armillaria* fide Dennis *et al.* (*TBMS* 37: 33, 1954).
- armillate**, edged; fringed; frilled.
- Arnaudia** Bat. (1960) = *Acantharia* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Arnaudiella** Petr. (1927), Microthyriaceae. Anamorph *Xenogliocladiopsis*. 3 or 6, widespread. See Crous & Kendrick (*CJB* 72: 59, 1994).
- Arnaudina** Trotter (1931), anamorphic *Pezizomycotina*, Hsp. $\equiv$ eP.?. 1, Brazil. See Carmichael *et al.* (*Genera of Hyphomycetes*, 1980).
- Arnaudovia** Valkanov (1963) = *Polyphagus* fide Karling (*Chytriomyc. Iconogr.*, 1977).
- Arniella** Jeng & J.C. Krug (1977), Lasiosphaeriaceae. 2 (coprophilous), USA; Venezuela. See Jeng & Krug (*Mycol.* 69: 73, 1977), Huhndorf *et al.* (*Mycol.* 96: 368, 2004).
- Arnium** Nitschke ex G. Winter (1873), Lasiosphaeriaceae. 12 (mostly coprophilous), widespread. See Krug & Cain (*CJB* 50: 367, 1972; key), Krug & Cain (*CJB* 55: 83, 1977), Lorenzo & Havrylenko (*Mycol.* 93: 1221, 2001; Argentina), Miller (*Sydowia* 55: 267, 2003; ascomata), Huhndorf *et al.* (*Mycol.* 96: 368, 2004).
- Arnoldia** A. Massal. (1856) [non *Arnoldia* Cass. 1824, *Compositae*] = *Lempholemma* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Arnoldia** D.J. Gray & Morgan-Jones (1980) $\equiv$ *Arnoldiomyces*.
- Arnoldiella** R.F. Castañeda (1984), anamorphic *Pezizomycotina*, Hso.0 $\equiv$ hP.10. 1, Cuba. See Castañeda (*Revta Jardín bot. Nac. Univ. Habana* 5: 58, 1984), Goos (*Mycol.* 79: 1, 1987).
- Arnoldiomyces** Morgan-Jones (1980), anamorphic *Hypomyces*, Hso. $\equiv$ eH.10. 2, Americas. See Morgan-Jones (*Mycotaxon* 11: 446, 1980), Samuels & Seifert in Sugiyama (Ed.) (*Pleomorphic Fungi: The Diversity and its Taxonomic Implications*: 29, 1987).
- Arongyllum**, see *Strongyllum* (Ach.) Gray.
- Aropsiclus** Kohlm. & Volkm.-Kohlm. (1994), Xylariales. 1, USA. Perhaps related to *Phomatospora*. See Kohlmeyer & Volkmann-Kohlmeyer (*SA* 11: 95, 1993), Kohlmeyer & Volkmann-Kohlmeyer (*SA* 13: 24, 1994).
- Aroramycetes** Castellano & Verbeken (2000) = *Hysterangium* fide Hosaka *et al.* (*Mycol.* 98: 949, 2006; systematic position, nested in *Hysterangium*).
- Arpinia** Berthet (1974), Pyronemataceae. 4, Europe. See Hohmeyer (*Mycol. Helv.* 3: 221, 1988; key), Häffner (*Mitt. Arbeitsg. Pilzk. Niederrhein* 7: 132, 1989; key), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- arrect**, stiffly upright.
- Arrhenia** Fr. (1849), Tricholomataceae. c. 25, widespread (temperate). Recognition of *Arrhenia* makes *Omphalina* paraphyletic. See Redhead (*CJB* 62: 865, 1984), Lutzoni & Vilgalys (*CJB* 73 Suppl. 1: S649, 1995), Lutzoni (*Syst. Biol.* 46: 373, 1997), Redhead *et al.* (*Mycotaxon* 83: 19, 2002; phylogeny), Barrasa & Rico (*Mycol.* 95: 700, 2003; Iberian Peninsula).
- Arrhenosphaera** Stejskal (1974), Ascospaeraceae. 1 (from bee hives), Venezuela. See Stejskal (*J. Apicult. Res.* 13: 39, 1974).
- Arrhytidia** Berk. & M.A. Curtis (1849) = *Dacrymyces* fide Donk (*Persoonia* 4: 269, 1966).
- arsenic detection**, see *Scopulariopsis*.
- Artallendea** Bat. & H. Maia (1960) = *Armatella* fide Katumoto (*Bull. Fac. Agr. Yamag. Univ.* 13: 291, 1962).
- Artheliopsis** Vain. (1896) = *Echinoplaca* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Arthonaria** Fr. (1825) ? = *Enterographa* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Arthonia** Ach. (1806) nom. cons., Arthoniaceae ($\pm$ L). Anamorph *Septocyta*. c. 491 (partly on lichens), widespread. See Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952; foliicolous spp.), Coppins (*Lichenologist* 21: 195, 1989; Brit. Isl.), Tehler (*CJB* 68: 2458, 1990; cladistics), Grube *et al.* (*Lichenologist* 27: 25, 1995; key 9 spp. on lichens), Lücking (*Lichenologist* 27: 127, 1995; Costa Rica), Myllys *et al.* (*Bryologist* 101: 70, 1998; phylogeny), Sundin & Tehler (*Lichenologist* 30: 381, 1998; phylogeny), Wedin & Hafellner (*Lichenologist* 30: 59, 1998; lichenicolous spp.), Grube & Lücking (*MR* 105: 1007, 2001; ascomogenous hyphae), Follmann & Werner (*J. Hattori bot. Lab.* 94: 261, 2003; on *Roccellaceae*).
- Arthoniaceae** Rchb. (1841), Arthoniales ($\pm$ L). 12 gen. (+ 48 syn.), 603 spp.
Lit.: Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952; foliicolous spp.), Coppins (*Lichenologist* 21: 195, 1989), Diederich (*Flechten Follmann Contributions to Lichenology in Honour of Gerhard Follmann*: 179, 1995), Lücking (*Lichenologist* 27: 127, 1995; 25 foliicolous spp. Costa Rica), Ferraro & Lücking (*Phyton* 37: 61, 1997; foliicolous spp.), Grube & Matzer (*Bibliotheca Lichenol.* 68: 1, 1997), Thor (*Symb. bot. upsal.* 32 no. 1: 267, 1997), Grube (*Bryologist* 101: 377, 1998), Makhija & Patwardhan (*Mycotaxon* 67: 287, 1998), Myllys *et al.* (*Bryologist* 101: 70, 1998), Sundin & Tehler (*Lichenologist* 30: 381, 1998), Wedin & Hafellner (*Lichenologist* 30: 59, 1998), Lutzoni (*Am. J. Bot.* 91: 1446, 2004).
- Arthoniactis** (Vain.) Clem. (1909) = *Lecanactis* Körb. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Arthoniales** Henssen ex D. Hawksw. & O.E. Erikss. (1986), ($\pm$ L). Arthoniomyces. 3 fam., 74 gen., 1538 spp. Sister-group of the *Dothideomycetes*.
 Thallus varied, crustose but sometimes very poorly developed or absent; ascomata usually apothecial but sometimes with a poroid opening, often elongated and branched, ascomatal wall poorly to well-developed. Interascal tissue composed of branched paraphysoids in a gel matrix. Asci thick-walled, $\pm$

fissitunicate, usually with a large apical dome, blueing in iodine; ascospores simple or septate, sometimes becoming brown and ornamented, without sheath. Anamorph pycnidial. Forming crustose lichens with green photobionts (esp. trentepohlioid), lichenicolous or saprobes; on a wide range of substrata, incl. many trop. foliicolous and corticolous spp. Fams:

(1) **Arthoniaceae**

(2) **Chrysothricaceae**

(3) **Roccellaceae** (syn. *Opegraphaceae*)

Lit.: Grube (*Bryologist* 101: 377, 1998; phylogeny), Henssen & Thor (in Hawksworth (ed.), *Ascomycete Systematics: Problems and Perspectives in the Nineties*: 43, 1994), Letrouit-Galinou *et al.* (*Bull. Soc. linn. Provence* 45: 389, 1994; ultrastr. asci), Myllys *et al.* (*Bryologist* 101: 70, 1998; phylogeny), Renobales & Barreno (*Anales jard. bot. Madrid* 46: 263, 1989; asci), Spatafora *et al.* (*Mycol.* 98: 1018, 2006), Tehler (*CJB* 68: 2458, 1990, phylogeny; *Crypt. Bot.* 5: 82, 1995, molec. & morph. phylogeny).

Arthoniomyces E.A. Thomas ex Cif. & Tomas. (1953) = *Arthonia*.

Arthoniomyces O.E. Erikss. & Winka (1997), *Pezizomycotina*. 1 ord., 4 fam., 78 gen., 1608 spp. Ord.: **Arthoniales**

For *Lit.* see ord. and fam.

Arthoniomycetidae, see *Arthoniomyces*.

Arthoniopsis Müll. Arg. (1890) = *Arthonia* fide Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952).

Arthophacopsis Hafellner (1998), *Arthoniales* ($\pm$ L). 1, widespread. See Grube (*Bryologist* 101: 377, 1998; phylogeny), Hafellner (*Cryptog. Bryol.-Lichénol.* 19: 159, 1998), Diederich (*Herzogia* 16: 41, 2003; USA).

Arthopyrenia A. Massal. (1852), *Arthopyreniaceae* ($\pm$ L). c. 117, widespread. See Swinscow (*Lichenologist* 3: 55, 1965), Harris (*Mich. Bot.* 12: 1, 1973), Riedl (*Sydowia* 29: 115, 1977; *A. punctiformis*-group), Coppins (*Lichenologist* 20: 305, 1988; Brit. Isl.), Foucard (*Graphis Scripta* 4: 49, 1992; key 13 spp. on bark, Sweden), Gams (*Taxon* 41: 99, 1992; nomencl.), Harris (*More Florida Lichens*, 1995), Aptroot *et al.* (*Biblotheca Lichenol.* 64: 220 pp., 1997; New Guinea), Kainz *et al.* (*Nova Hedwigia* 72: 209, 2001; Namibia), Mohr *et al.* (*MR* 108: 515, 2004), Del Prado *et al.* (*MR* 110: 511, 2006; phylogeny), Aptroot *et al.* (*Biblotheca Lichenol.* 97, 2008; Costa Rica).

Arthopyreniaceae Walt. Watson (1929), *Pleosporales* ($\pm$ L). 3 gen. (+ 11 syn.), c. 162 spp.

Lit.: Coppins (*Lichenologist* 20: 305, 1988), Upreti & Pant (*Bryologist* 96: 226, 1993), Harris (*More Florida Lichens*, 1995), Aptroot (*Nova Hedwigia* 64: 169, 1997), Sérusiaux & Aptroot (*Bryologist* 101: 144, 1998), Del Prado *et al.* (*MR* 110: 511, 2006; phylogeny).

Arthopyreniella J. Steiner (1911) = *Mycoglaena* fide Harris (*in litt.*).

Arthopyreniomyces Cif. & Tomas. (1953) = *Pyrenylium* fide Aguirre-Hudson (*Bull. Br. Mus. nat. hist. Bot.* 21: 85, 1991).

Arthotheliomyces Cif. & Tomas. (1953) = *Arthothelium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Arthotheliopsidomyces Cif. & Tomas. (1953) = *Arthotheliopsis*.

Arthotheliopsis Vain. (1896), *Gomphillaceae* (L). 4,

neotropics. See Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Arthothelium A. Massal. (1852), *Arthoniales* ($\pm$ L). c. 121, widespread. See Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952), Coppins & James (*Lichenologist* 11: 27, 1979; key Brit. spp.), Tehler (*CJB* 68: 2451, 1990; posn), Makhija & Patwardhan (*J. Hattori bot. Lab.* 78: 189, 1995; India), Makhija & Patwardhan (*Trop. Bryol.* 10: 205, 1995; nomencl.), Grube & Giralte (*Lichenologist* 28: 15, 1996; Mediterranean), Grube (*Bryologist* 101: 377, 1998; phylogeny).

arthric (of conidiogenesis), thallic conidiogenesis characterized by the conversion of a pre-existing, determinate hyphal element into a conidium (**arthroconidium**, thallic-arthroconidium, arthrospore), as in *Geotrichum*. See arthrocatenate.

Arthriniaceae Nann. (1934) = *Apiosporaceae*.

Arthriniites Babajan & Tasl. (1977), *Fossil Fungi*. 1 (Tertiary), former USSR.

Arthrinium Kunze (1817), anamorphic *Apiospora*, Hso.0eP.37. c. 31, widespread (temperate). See Ellis (*Mycol. Pap.* 103, 1965; key), Minter (*Proc. Indian Acad. Sci. Pl. Sci.* 94: 281, 1985; relationships with other anamorphic fungi), Rai (*Mycoses* 32: 472, 1989; *A. phaeospermum* var. *indicum* in humans), Scheuer (*Öst. Z. Pilzk.* 5: 1, 1996), Kang *et al.* (*Mycotaxon* 81: 321, 2002; phylogeny).

arthro- (prefix), jointed.

Arthroascus Arx (1972) = *Saccharomycopsis* Schiønning See von Arx (*Fungus Wageningen* 28: 1, 1958), Smith *et al.* (*Antonie van Leeuwenhoek* 58: 249, 1990; DNA), Hosagoudar (*J. Econ. Taxon. Bot.* 15: 195, 1991; India), Kurtzman & Robnett (*Antonie van Leeuwenhoek* 73: 331, 1998), Hosagoudar & Abraham (*J. Econ. Taxon. Bot.* 25: 560, 2001), Hosagoudar (*Sydowia* 55: 162, 2003; family placement), Naumov *et al.* (*J. gen. appl. Microbiol.* Tokyo 49: 267, 2003; reinstatement of genus), Naumov & Kondrat'eva (*Doklady Biological Sciences* 403: 298, 2005; Japan), Naumov *et al.* (*Int. J. Syst. Evol. Microbiol.* 56: 1997, 2006; phylogeny).

Arthrobotryaceae Corda (1842) = *Orbiliaceae*.

Arthrobotryella Sibia (1928) ? = *Cordana* fide Hughes (*N.Z. Jl Bot.* 16: 326, 1978).

Arthrobotryomyces Bat. & J.L. Bezerra (1961) nom. dub., anamorphic *Pezizomycotina*, Hsy. = eH.? (L). 1, Brazil. See Lücking *et al.* (*Lichenologist* 30: 121, 1998).

Arthrobotrys Corda (1839), anamorphic *Orbilina*, Hsy.1eH.6. 63 (nematophagous), widespread. See also Predacious fungi. See Haard (*Mycol.* 60: 1140, 1969; key), Jarowaja (*Acta Mycologica Warszawa* 6: 337, 1970; key), van Oorschot (*Stud. Mycol.* 26: 61, 1985; key), Werthmann-Cliemas & Lysek (*TBMS* 87: 656, 1987; synnema formation), Rubner (*Stud. Mycol.* 39, 1996), Liou & Tzean (*Mycol.* 89: 876, 1997; phylogeny), Ahrén *et al.* (*FEMS Microbiol. Lett.* 158: 179, 1998; phylogeny), Hagedorn & Scholler (*Sydowia* 51: 27, 1999; phylogeny), Scholler *et al.* (*Sydowia* 51: 89, 1999; gen. concept, comb. Novs), Zhang *et al.* (*Mycosystema* 20: 51, 2001; morphogenesis), Mo *et al.* (*Fungal Diversity* 18: 107, 2005; synanamorphs), Li *et al.* (*Mycol.* 97: 1034, 2005; phylogeny).

Arthrobotryum Ces. (1854), anamorphic *Pezizomycotina*, Hsy. = eP.19. 4, widespread. See Hughes (*Naturalist Hull*: 171, 1951), Illman & White (*CJB* 63: 423, 1985).

Arthrobotryum O. Rostr. (1916) $\equiv$ *Gonyella*.

arthrocatenate (of thalloconidia), formed in chains by the simultaneous or random fragmentation of a hypha.

Arthrocladia Golovin (1956) [non *Arthrocladia* Duby 1830, *Algae*] $\equiv$ *Arthrocladiella*.

Arthrocladiella Vassilkov (1960), Erysiphaceae. Anamorph *Oidium* subgen. *Graciloidium*. 3, widespread. See Vassilkov (*Botanicheskii Zhurnal* 45: 1368, 1960), Braun *et al.* (*The Powdery Mildews A Comprehensive Treatise*: 13, 2001; review), Cunningham *et al.* (*Australas. Pl. Path.* 32: 421, 2003; diagnosis), Takamatsu (*Mycoscience* 45: 147, 2004; phylogeny), Cook *et al.* (*MR* 110: 672, 2006; on *Catalpa*), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).

Arthrocladium Papendorf (1969), anamorphic *Pezizomycotina*, Hso. $\equiv$ eP.1/10. 1 (from soil), S. Africa. See Papendorf (*TBMS* 52: 483, 1969).

arthroconidium, see arthric.

Arthrocristula Sigler, M.T. Dunn & J.W. Carmich. (1982), anamorphic *Pezizomycotina*, Hso.0eP.40. 1, USA; Sri Lanka. See Sigler *et al.* (*Mycotaxon* 15: 409, 1982).

Arthroderma Curr. (1860), Arthrodermataceae. Anamorphs *Microsporum*, *Trichophyton*. 25 (on skin etc.), widespread. See Padhye & Carmichael (*CJB* 49: 1525, 1971; key 13 spp.), Currah (*Mycotaxon* 24: 1, 1985), Takashio *et al.* (*Mycol.* 77: 166, 1985; ontogeny), Weitzman *et al.* (*Mycotaxon* 15: 505, 1986), Kawasaki *et al.* (*Mycopathologia* 118: 95, 1992), Ito *et al.* (*Mycoses* 41: 133, 1998; ultrastr.), Kano *et al.* (*Curr. Microbiol.* 37: 236, 1998; chitin synthase phylogeny), Makimura *et al.* (*J. Clin. Microbiol.* 36: 2629, 1998; phylogeny), Harmsen *et al.* (*Mycoses* 42: 67, 1999; DNA), Kano *et al.* (*Mycoses* 42: 71, 1999; primers), Blanz *et al.* (*Mycoses* 43 Suppl. 1: 11, 2000; diagnosis), Gräser *et al.* (*Medical Mycology* 38: 143, 2000; phylogeny), Kuraishi *et al.* (*Antonie van Leeuwenhoek* 77: 179, 2000; ubiquinones), Simpanya (*Revta Iberoamer. Micol.* 17 [Special]: 1, 2000; ecology), Kim *et al.* (*Mycoses* 44: 157, 2001; populations), Gupta *et al.* (*Stud. Mycol.* 47: 87, 2002; diagnosis), Kano *et al.* (*Mycoses* 45: 277, 2002; Japan), Kano *et al.* (*Stud. Mycol.* 47: 49, 2002; chitin synthase genes), Sugiyama *et al.* (*Stud. Mycol.* 47: 5, 2002; phylogeny), Summerbell *et al.* (*Stud. Mycol.* 47: 75, 2002; biological species), Takahashi *et al.* (*Jap. J. Med. Mycol.* 44: 31, 2003; epidemiology), Bedard *et al.* (*MR* 110: 86, 2006; clonal spp.), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny).

Arthrodermataceae Locq. ex Currah (1985), Onygenales. 5 gen. (+ 29 syn.), 65 spp.

Lit.: Currah (*Mycotaxon* 24: 1, 1985), Weitzman *et al.* (*Mycotaxon* 25: 505, 1986), Currah (*SA* 7: 1, 1988), Amer *et al.* (*Int. J. Dermat.* 32: 97, 1993), Guillaumon *et al.* (*Antonie van Leeuwenhoek* 69: 223, 1996), Chandler (*Topley & Wilson's Microbiology and Microbial Infections* Edn 9. Vol. 4 Medical Mycology: 111, 1998), Hoog *et al.* (*Medical Mycology* 36 Suppl. 1: 52, 1998), Bastert *et al.* (*Mycoses* 42: 525, 1999), Gräser *et al.* (*Medical Mycol.* 37: 105, 1999; phylogeny), Harmsen *et al.* (*Mycoses* 42: 67, 1999), Kano *et al.* (*Mycoses* 42: 71, 1999), Makimura *et al.* (*J. Clin. Microbiol.* 37: 807, 1999; phylogeny), Sugiyama *et al.* (*Mycoscience* 40: 251, 1999), Gräser *et al.* (*Medical Mycology* 38: 143, 2000), Simpanya (*Revta Iberoamer. Micol.* 17 [Special]: 1, 2000),

Summerbell (*Revta Iberoamer. Micol.* 17: 30, 2000).

Arthrodochium R.F. Castañeda & W.B. Kendr. (1990), anamorphic *Agaricomycetes*, Hsp.0eH.38. 1 (with clamp connexions), Cuba. See Castañeda & Kendrick (*Univ. Waterloo Biol. Ser.* 32: 6, 1990).

Arthrographis G. Cochet ex Sigler & J.W. Carmich. (1976), anamorphic *Eremomyces*, Hso.0eH.38. 8, widespread. See Sigler & Carmichael (*Mycotaxon* 18: 495, 1983), Ayer & Nozawa (*Can. J. Microbiol.* 36: 83, 1990; inhibitory metabolite), Sigler *et al.* (*Can. J. Microbiol.* 36: 77, 1990; n.sp.), Uchida *et al.* (*TMSJ* 34: 275, 1993; *A. cuboidea*), Chin-Hong *et al.* (*J. Clin. Microbiol.* 39: 804, 2001; epidemiology).

Arthrographium Ces. (1854) = *Arthrobotryum* Ces. fide Mussat (*Syll. fung.* 15, 1901).

Arthromitus Leidy (1849) nom. dub., Bacteria. 1, USA. Bacteria occurring as trichomes in intestines of millipedes, cockroaches and toads; formerly incorrectly placed in *Trichomycetes*.

Arthromyces T.J. Baroni & Lodge (2007), Tricholomataceae. 2, C. America. See Baroni *et al.* (*MR* 111: 572, 2007).

Arthroon Renault (1894), Fossil Fungi ? Fungi. 1 (Carboniferous), France.

Arthropsis Sigler, M.T. Dunn & J.W. Carmich. (1982), anamorphic *Onygenales*, Hso.0eH/1eP.38. 4, widespread. See Ulfig *et al.* (*Mycotaxon* 54: 281, 1995).

Arthropycnis Constant. (1992), anamorphic *Rhynchostoma*, Cpd.0eP.39. 1, widespread. See Constantinescu & Tibell (*Nova Hedwigia* 55: 174, 1992).

Arthrorhaphidaceae Poelt & Hafellner (1976), Ostropomycetidae (inc. sed.) ($\pm$ L). 2 gen. (+ 4 syn.), 12 spp.

Lit.: Galloway & Bartlett (*N.Z. Jl Bot.* 24: 393, 1986), Obermayer (*Nova Hedwigia* 58: 275, 1994), Santesson & Tønsberg (*Lichenologist* 26: 295, 1994), Hansen & Obermayer (*Bryologist* 102: 104, 1999), Wedin *et al.* (*MR* 109: 159, 2005), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Lumbsch *et al.* (*MR* 111: 257, 2007; phylogeny).

Arthrorhaphis Th. Fr. (1860) nom. cons., Arthrorhaphidaceae ($\pm$ L). 11, widespread (temperate; montane). See Galloway & Bartlett (*N.Z. Jl Bot.* 24: 393, 1986; NZ spp.), Obermayer (*Nova Hedwigia* 58: 275, 1994; key 5 Eur. spp.), Hafellner & Obermayer (*Cryptog. Bryol.-Lichénol.* 1 6: 177, 1995; key fungi on), Obermayer (*J. Hattori bot. Lab.* 80: 331, 1996; Himalaya), Hansen & Obermayer (*Bryologist* 102: 104, 1999; Greenland), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).

Arthrorhynchus Kolen. (1857), Laboulbeniaceae. 3 (on insects), widespread. See Benjamin in Thaxter (*Mem. Am. Acad. Arts Sci. 1896-1931* 12-16, 1971), Blackwell (*Mycol.* 72: 159, 1980; morphology), Santamaria (*Nova Hedwigia* 82: 349, 2006).

Arthrospora Th. Fr. (1861) $\equiv$ *Arthrosporum*.

arthrospore (1) see arthric; (2) a specialized uninucleate cell functioning as a spore and derived from the disarticulation of cells of a formerly vegetative branch (*Asellariales*).

Arthrosporella Singer (1970), ? Tricholomataceae. Anamorph *Nothoclavulina*. 1, S. America. See Singer (*Fl. Neotrop. Monogr.* 3: 17, 1970).

Arthrosporia Grigoraki (1925) = *Trichophyton* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Arthrosporium Sacc. (1880), anamorphic *Pezizomycotina*, Hsy. $\equiv$ eH.10. 2, Italy; N. America. See Wang

- (*Mycol.* 64: 1175, 1972), Kendrick (*CJB* 81: 75, 2003; morphogenesis).
- Arthrosporum** A. Massal. (1853), Ramalinaceae (L.). 1, Europe. See Timdal (*Op. Bot.* 110, 1991), Ekman (*MR* 105: 783, 2001; phylogeny).
- arthrosterigma** (of lichens), a septate conidiophore (spermatophore) (obsol.).
- Arthrowallemia** R.F. Castañeda, D. García & Guarro (1998), anamorphic *Pezizomycotina*, Hso.???. 1, Cuba. See Castañeda Ruiz *et al.* (*MR* 102: 17, 1998).
- Arthroxyllaria** Seifert & W. Gams (2002), anamorphic *Xylariaceae*. 1 (on dung), USA. See Seifert *et al.* (*Czech Mycol.* 53: 299, 2002).
- Arthur** (Joseph Charles; 1850-1942; USA). Botanist, Agricultural Experiment Station, Geneva, NY (1884-1887); Purdue University (1887-1915). Noted for his work on *Uredinales*: the 'Arthur Herbarium' at Purdue is one of the most important collections of rusts (75,000 specimens; see Baxter & Kern, *Proceedings of the Indiana Academy of Science* 71: 228, 1962). *Publs.* *Pucciniales North American Flora* 7 (1907-1927); *Plant Rusts* (1929); *Manual of the Rusts in United States and Canada* (1934). *Biogs, obits etc.* Cummins (*Annual Review of Phytopathology* 16: 19, 1978); Kern (*Phytopathology* 32: 833, 1942); Mains (*Mycol.* 34: 601, 1942); Stafleu & Cowan, (*TL-2* 1: 70, 1976); Stafleu & Mennega (*TL-2, Suppl.* 1: 173, 1992); Urban (*Česká Mykologie* 25: 185, 1971).
- Arthurella** Zebrowski (1936), Fossil Fungi ? Chytridiomycetes. 1 (Cambrian to ? Recent), Australia.
- Arthuria** H.S. Jacks. (1931), Phakopsoraceae. Anamorph *Aeciure*. 6 (on *Euphorbiaceae*, 1 on *Asclepiadaceae*), S. America; Caribbean; India. See Buriticá (*Revista de la Academia Columbiana de Ciencias Exactas, Físicas y Naturales* 22: 325, 1998; neotrop. sp.).
- Arthuriomyces** Cummins & Y. Hirats. (1983), Phragmidiaceae. 3 (on *Rubus* (*Rosaceae*)), N. America; Russia; China; Japan. See Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*: 114, 1983), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003; syn. of *Gymnoconia*).
- Articularia** Höhn. (1909), anamorphic *Pezizomycotina*, Hsy.0eH.?. 1, N. America. See Charles (*Mycol.* 27: 74, 1935).
- Articulariella** Höhn. (1909) = *Microstoma* Bernstein fide von Arx (*Gen. Fungi Sporul. Cult.*, 1970).
- articulated**, jointed.
- Articulis** Clem. & Shear (1931) ≡ *Articulariella*.
- Articulophora** C.J.K. Wang & B. Sutton (1982), anamorphic *Pezizomycotina*, Hso.#eP.11. 1, USA. See Wang & Sutton (*Mycol.* 74: 489, 1982).
- Articulospora** Ingold (1942), anamorphic *Hymenoscyphus*, Hso.0= bH.10. 6 (aquatic), widespread. See Petersen (*Mycol.* 54: 143, 1962; key), Jooste *et al.* (*MR* 94: 947, 1990; S Africa), Sivichai *et al.* (*Mycol.* 95: 340, 2003; Thailand), Belliveau & Bärlocher (*MR* 109: 1407, 2005; phylogeny), Descals (*MR* 109: 545, 2005; propagules).
- Artocarpomyces** Subram. (1996), anamorphic *Pezizomycotina*. 1, S.E. Asia. See Subramanian (*Kavaka* 22/23: 52, 1994).
- Artocreas** Berk. & Broome (1875) nom. ambig., Fungi.
- Artolenzites** Falck (1909) = *Trametes* fide Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974).
- Artomyces** Jülich (1982) = *Clavicornia* fide Stalpers (*in litt.*).
- Artymenium** Berk. ex E. Fisch. (1933) nom. inval. = *Secotium* fide Stalpers (*in litt.*).
- Arualis** Katz (1980), anamorphic *Agaricomycetes*, Hso.0eH-P.1. 1 (with clamp connexions), USA. See Katz (*Mycotaxon* 11: 230, 1980).
- Arwidsson** B. Erikss. (1974), Hyponectriaceae. 2 (on *Empetrum* and *Loiseleuria*), Europe. See Eriksson (*Svensk bot. Tidskr.* 68: 199, 1974), Holm *et al.* (*Karstenia* 39: 59, 1999), Wang & Hyde (*Fungal Diversity* 3: 159, 1999).
- Arx** (Joseph Adolf, von; 1922-1988; Switzerland, later Netherlands). Student of Gäumann (q.v.) [and contemporary of E. Müller (q.v.) with whom he collaborated for many years], Zürich (1942-1948); Phytopathologist, Willie Commelin Scholten Phytopathological Laboratories, Baarn (1949); Director of CBS (1963-1987). An outstanding general mycologist, noted for his review of the fungal kingdom (1970, expanded in 1974 and 1987). He was able to recognize and carry out necessary taxonomic rationalization, leading to publications synonymizing many redundant names, particularly in *Gloeosporium*. *Publs.* *Beiträge zur Kenntnis der Gattung Mycosphaerella*. Sydowia (1949); (with Müller) *Die Gattungen der amerosporen Pyrenomyceten. Beiträge zur Kryptogamenflora der Schweiz* (1954); *Revision der zu Gloeosporium gestellten Pilze. Verhandelingen der Koninklijke Nederlandse Akademie van Wetenschappen afd. Natuurkunde Tweede Sectie* (1957); (with Müller) *Die Gattungen der didymosporen Pyrenomyceten. Beiträge zur Kryptogamenflora der Schweiz* (1962); (with Müller) *Pyrenomycetes: Meliolales, Coronophorales, Sphaeriales*. In Ainsworth, Sparrow & Sussman [eds] *The Fungi. An Advanced Treatise* 4A (1973); *The Genera of Fungi Sporulating in Pure Culture* (1981) [edn 3]. *Biogs, obits etc.* van der Aa *et al.* (*Studies in Mycology* 31, 1989) [bibliography, portrait]; Arnold (*Boletus* 13: 24, 1989) [portrait]; Müller (*Sydowia* 41: 1, 1989) [portrait].
- Arxiella** Papendorf (1967), anamorphic *Pezizomycotina*, Hso.1eH.9. 2, widespread. See Papendorf (*TBMS* 50: 73, 1967), Matsushima (*Matsush. Mycol. Mem.* 6, 1989), Mercado-Sierra *et al.* (*Mycotaxon* 63: 369, 1997; Cuba).
- Arxiomyces** P.F. Cannon & D. Hawksw. (1983), ? Ceratostomataceae. 2 (from wood etc.), Europe; Japan. See Horie *et al.* (*Mycotaxon* 25: 229, 1986).
- Arxiozyma** Van der Walt & Yarrow (1984) = *Kazachstania* fide Augustyn *et al.* (*Syst. Appl. Microbiol.* 13: 44, 1990; fatty acids), Kurtzman *et al.* (*J. Clin. Microbiol.* 43: 101, 2005; phylogeny).
- Arxula** Van der Walt, M.T. Sm. & Y. Yamada (1989) = *Blastobotrys* fide Yamada & Nogawa (*J. gen. appl. Microbiol.* Tokyo 36: 425, 1990; molecular phylogeny), Kunze & Kunze (*Microbiol. Eur.* 2: 24, 1994; comparative morphology), Kunze & Kunze (*Antonie van Leeuwenhoek* 65: 29, 1994; DNA fingerprinting of *A. adenivorans*), Smith in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 441, 1998), Kurtzman & Robnett (*FEMS Yeast Res.* 7: 141, 2007).
- Asahina** (Yasuhiko; 1881-1975; Japan). Assistant, University for Pharmacognosy, Tokyo (c. 1907); Professor, University of Tokyo (1912-1941). Natural product chemist and later lichenologist; established use of chemotaxonomy for lichen-forming fungi and introduced use of PD (see Metabolic products) in 1934 and microcrystal tests in 1936-1940 (*Journal of Japanese Botany* 12 516, 1936). *Publs.* *Lichens of*

- Japan 3 vols (1950-1956); (with Shibata) *Chemistry of Lichen Substances* (1954) [reprint 1971]; *Atlas of Japanese Cladoniae* (1971). *Biogs, obits etc.* Culberson & Culberson (*Bryologist* 79: 258, 1976) [portrait]; Grumann (1974: 585); Kurokawa (*Lichenologist* 8: 93, 1976) [portrait]; Lichenological Society of Japan *Dr Yasuhiko Asahina's Lichenological Bibliography* 1980 [281 titles]; Stafleu & Cowan (*TL-2* 1: 72, 1976); Stafleu & Mennega (*TL-2, Suppl.* 1: 184, 1992).
- Asahinea** W.L. Culb. & C.F. Culb. (1965), Parmeliaceae (L). 3, widespread (circumpolar). See Gao (*Nordic J Bot.* 11: 483, 1991), Saag (*Dissertationes Biologicae Universitatis Tartuensis* 34, 1998; evolution), Thell *et al.* (*Mycol. Progr.* 1: 335, 2002; phylogeny), Thell *et al.* (*Symb. bot. upsal.* 34 no. 1: 429, 2004; Scandinavia), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Randlane & Saag (*Central European Lichens*: 75, 2006; key).
- Asaphomyces** Thaxt. (1931), Laboulbeniaceae. 4, widespread. See Rossi & Máca (*Sydowia* 58: 110, 2006).
- Asbolisia** Bat. & Cif. (1963), anamorphic *Aithaloderma*, Cpd.0eH.?. 6, widespread. See Batista & Ciferri (*Quaderno Ist. Bot. Univ. Pavia* 31: 37, 1963), Reynolds & Gilbert (*Cryptog. Mycol.* 27: 249, 2006; Panama).
- Asbolisia** Speg. (1918) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Asbolisiomyces** Bat. & H. Maia (1961) nom. dub., anamorphic *Pezizomycotina*, Cpd.0eH.? (L). 1, Brazil. See Lücking *et al.* (*Lichenologist* 30: 121, 1998).
- Ascagilis** K.D. Hyde (1992) = *Jahnula* fide Hyde (*Aust. Syst. Bot.* 5: 109, 1992), Hyde & Wong (*Nova Hedwigia* 68: 489, 1999).
- ascending (ascendent)** (of an annulus), having the free edge above attached, cf. descending; (of conidio-phores), curving up, cf. erect; (of lamellae), on a cone-like or an unexpanded pileus.
- Aschersonia** Endl. (1842) nom. rej. = *Laschia* Jungh.
- Aschersonia** Mont. (1848) nom. cons., anamorphic *Hypocrella*, St.0-1eH.15. c. 21 (on whiteflies (*Aleyrodidae*) and scale insects (*Coccidae*)), widespread (subtropical). See Petch (*Ann. R. bot. Gdns Peradeniya* 7: 167, 1921), Mains (*Lloydia* 22: 215, 1960), Hywel-Jones & Evans (*MR* 97: 871, 1993; ecology), Evans (*MR* 98: 165, 1994; spore germination), Obornik *et al.* (*Pl. Protection Science* 35: 1, 1999; molecular characterization and phylogeny), Evans (*Mycology Series* 19: 517, 2003; biocontrol), Liu *et al.* (*Mycol.* 97: 246, 2005), Liu *et al.* (*MR* 110: 537, 2006; *A. aleyrodidis* group), Chaverri *et al.* (*Stud. Mycol.* 60, 2008; phylogeny, monogr. Neotropics).
- Aschersoniopsis** Henn. (1902) = *Munkia* fide Höhnelt (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt. 1* 126: 283, 1917).
- Aschion** Wallr. (1833) = *Tuber*.
- Aschizotrichum** Rieuf (1962) = *Wiesneriomyces* fide Carmichael *et al.* (*Genera of Hyphomycetes*, 1980).
- Asciophora** Rchb. [not traced] ? = *Mucor* Fresen. fide Mussat (*Syll. fung.* 15, 1901).
- Ascidium** Fée (1824) nom. rej. = *Ocellularia* fide Hale (*Bull. Br. Mus. nat. hist. Bot.* 8: 227, 1981).
- Ascidium** Tode (1782) nom. dub., Fungi. Based on insect eggs fide Fries (*Syst. mycol.* 3, Index: 52, 1832).
- ascigerous**, having asci.
- ascigerous centrum**, the special tissue which produces the asci and hamathecium.
- Ascitendus** J. Campb. & Shearer (2004), Annulatascaeae. 1 (on wood in freshwater), Austria. See Campbell & Shearer (*Mycol.* 96: 829, 2004).
- Ascluella** DiCosmo, Nag Raj & W.B. Kendr. (1983), Dermateaceae. 1 (from living leaves), India. See DiCosmo *et al.* (*Mycotaxon* 21: 1, 1984).
- asco-** (prefix), pertaining to an ascus.
- Ascoblastomycetes**, see *Blastomycota*.
- Ascobolaceae** Boud. ex Sacc. (1884), Pezizales. 6 gen. (+ 9 syn.), 129 spp.
- Lit.*: van Brummelen (*Persoonia* Suppl. 1: 1, 1967; monogr.), Dissing (*Op. bot.* 100: 43, 1989), van Brummelen (*Persoonia* 14: 203, 1990), Gargas (*Fungal Genetics Newsl.* Suppl. 38: 26, 1991), Wu & Kimbrough (*Taiwania* 41: 7, 1996; devel.), Jahn *et al.* (*Z. Mykol.* 63: 133, 1997), Landvik *et al.* (*Nordic J Bot.* 17: 403, 1997), Prokhorov (*Mikol. Fitopatol.* 31: 27, 1997), Landvik *et al.* (*Mycoscience* 39: 49, 1998; DNA), Ranalli & Mercuri (*Mycotaxon* 67: 505, 1998), van Brummelen (*Persoonia* 16: 425, 1998), Wu & Kimbrough (*Int. J. Pl. Sci.* 162: 91, 2001), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny).
- Ascobolus** Pers. (1792), Ascobolaceae. Anamorph *Rhizostilbella*. 61 (mainly coprophilous), widespread. See van Brummelen (*Persoonia* Suppl. 1: 1, 1967; key), Wells (*Univ. Calif. Publs Bot.* 62, 1972; ontogeny), Paulsen & Dissing (*Bot. Tidsskr.* 74: 67, 1979; key 20 spp.), Kaushal & Thind (*J. Indian bot. Soc.* 62: 16, 1983; W. Himalayas, key 12 spp.), Parrettini (*Boll. Gruppo Micol. 'G. Bresadola'* 28: 140, 1985; col. pls), Dissing (*Op. Bot.* 100: 43, 1989), Kempken (*Biblthca Mycol.* 128, 1989; extrachromosomal DNA), Prokhorov (*Mikol. Fitopatol.* 28: 17, 1994; key to Russian spp.), Landvik *et al.* (*Nordic J Bot.* 17: 403, 1997), Landvik *et al.* (*Mycoscience* 39: 49, 1998; DNA), Antonín & Moravec (*Czech Mycol.* 52: 295, 2001; variation), Wu & Kimbrough (*Int. J. Pl. Sci.* 162: 91, 2001; ultrastructure), Dokmetzian *et al.* (*Mycotaxon* 92: 295, 2005; isozymes), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny).
- Ascobotryozyma** J. Kerrigan, M.T. Sm. & J.D. Rogers (2001), Saccharomycetales. Anamorph *Botryozyma*. 2 (associated with nematodes), Italy; USA. See Kerrigan *et al.* (*Antonie van Leeuwenhoek* 79: 15, 2001), Kerrigan *et al.* (*MR* 107: 1110, 2003), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Ascocalathium** Eidam ex J. Schröt. (1893), ? Pyrenomataceae. 1, Europe.
- Ascocalvatia** Malloch & Cain (1971), Onygenaceae. 1 (coprophilous), Canada. See Sugiyama *et al.* (*Mycoscience* 40: 251, 1999; DNA).
- Ascocalyx** Naumov (1926), Helotiaceae. Anamorph *Bothrodiscus*. 6, widespread. See Groves (*CJB* 46: 1273, 1968; key), Schlapfer-Bernard (*Sydowia* 22: 1, 1969), Müller & Dorworth (*Sydowia* 36: 193, 1983; key, 6 spp.), Petrini *et al.* (*CJB* 67: 2805, 1989), Bernier *et al.* (*Appl. Environm. Microbiol.* 60: 1279, 1994; DNA), Wang (*MR* 101: 1195, 1997; genetic variation), Wang *et al.* (*CJB* 75: 1460, 1997; population structure, as *Gremmeniella*), Hamelin *et al.* (*Phytopathology* 88: 582, 1998; N. Am. introd., as *Gremmeniella*).
- ascocarp**, see *ascoma*.
- Ascocephalophora** K. Matsush. & Matsush. (1995), ? Endomycetaceae. Anamorphs *Fusidium*, *Trichosporiella*. 1, Japan. See Matsushima & Matsush.

- shima (*Matsush. Mycol. Mem.* 8: 45, 1995).
- Ascochalara** Réblová (1999), Chaetosphaeriaceae. Anamorph *Chalara*-like. 1 (from coniferous wood), Czech Republic. See Réblová (*Sydowia* 51: 210, 1999).
- Ascochyta** Lib. (1830), anamorphic *Didymella*, Cpd.1eH.15. 388, widespread. *A. fabae* (on *Vicia*), *A. phaseolorum* (on *Phaseolus*), *A. pisi* (on pea), *A. rabiei* (on chickpea), and others. The genus is in need of redefinition using molecular data. See Armstrong *et al.* (*Can. J. Pl. Path.* 23: 110, 2001; genetic diversity), Barve *et al.* (*Fungal Genetics Biol.* 39: 151, 2003; mating types), Fatehi *et al.* (*Mycopathologia* 156: 317, 2003; genetic diversity), Chongo *et al.* (*Pl. Dis.* 88: 4, 2004; genetic diversity), Peever *et al.* (*Mol. Ecol.* 13: 291, 2004; population structure), Lichtenzveig *et al.* (*Eur. J. Pl. Path.* 113: 15, 2005; mating types), Priest (*Fungi of Australia: Septoria* 0, 2006; Australian spp.), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny), Henson (*Eur. J. Pl. Path.* 119: 141 pp., 2007; special issue on leume-associated spp.), Peever *et al.* (*Mycol.* 99: 59, 2007; on legumes).
- Ascochyella** Tassi (1902) = *Ascochyta* fide Buchanan (*Mycol. Pap.* 156, 1987).
- Ascochytes** Babajan & Tasl. (1973), Fossil Fungi. 1 (Tertiary), former USSR.
- Ascochytes** Barlinge & Paradkar (1982), Fossil Fungi, anamorphic *Pezizomycotina*. 1 (Cretaceous), India.
- Ascochytopsis** Henn. (1905), anamorphic *Pezizomycotina*, Ccu.0fH.15. 5 (on *Leguminosae*), widespread. See Sutton (*The Coelomycetes*, 1980), Matsushima (*Matsush. Mycol. Mem.* 10, 2001).
- Ascochyula** (Potebnia) Died. (1912) = *Ascochyta* fide Buchanan (*Mycol. Pap.* 156, 1987).
- Ascochyulina** Petr. (1922), anamorphic *Pezizomycotina*, Cpd.1eP.15. 3, Europe. See Buchanan (*Mycol. Pap.* 156, 1987), Mel'nik (*Opredelitel' Gribov Rossii* Klass Coelomycetes Byp. 1. Redkie i Maloizvestnye Rody, 1997).
- Asoclavulina** Y. Otani (1974), Helotiaceae. Anamorph *Gliomastix*-like. 1, Japan. See Otani (*TMSJ* 15: 5, 1974).
- Asocodinaea** Samuels, Cand. & Magni (1997), Hypocreomycetidae. Anamorph *Dictyochaeta*-like. 2 (on old polypores), USA. See Samuels *et al.* (*Mycol.* 89: 156, 1997), Réblová *et al.* (*Sydowia* 51: 49, 1999), Huhndorf *et al.* (*Mycol.* 96: 368, 2004; phylogeny).
- Asocoma** H.J. Swart (1987), ? Phacidiaceae. Anamorph *Coma*. 1, Australia. See Swart (*TBMS* 87: 603, 1987), Beilharz & Pascoe (*Mycotaxon* 91: 273, 2005; microconidial state).
- ascoconidiophore**, the phialide bearing an ascoconidium in *Ascoconidium* (Seaver, *Mycol.* 34: 412, 1942).
- Ascoconidium** Seaver (1942), anamorphic *Sageria*, Hsp.≡ eH.15. 2, widespread (north temperate). See Funk (*CJB* 44: 39, 1966), Nag Raj & Kendrick (*Monogr. Chalara Allied Genera*, 1975).
- ascoconidium**, a conidium formed directly from an ascospore, esp. when still within the ascus (e.g. *Claussenomyces*).
- Ascocorticiaceae** J. Schröt. (1893), ? Helotiales. 1 gen., 2 spp.
Lit.: Vellinga & Vries (*Coolia* 30: 50, 1987).
- Ascocorticiellum** Jülich & B. de Vries (1982), Pezizomycotina. 1, Europe. See Jülich & de Vries (*Persoonia* 11: 410, 1982), Vries (*Coolia* 39: 18, 1996).
- Ascocorticium** Bref. (1891), Ascocorticiaceae. 2, widespread (temperate). See Cooke (*Ohio J. Sci.* 68: 161, 1968), Eriksson *et al.* (*Göteborgs Svampkl. Årsskr.*: 1, 1981).
- Ascocoryne** J.W. Groves & D.E. Wilson (1967), Helotiales. Anamorph *Coryne*. c. 8, widespread (north & south temperate). See Christiansen (*Friesia* 7: 75, 1963; anamorph, Danish spp.), Roll-Hansen & Roll-Hansen (*Norw. J. Bot.* 26: 193, 1979), Verkley (*MR* 99: 187, 1995; asci), Gamundí & Romero (*Fl. cryptog. Tierra del Fuego* 10, 1998), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Ascocorynium** S. Ito & S. Imai ex S. Imai (1934) = *Neolecta* fide Korf (*Phytologia* 21: 201, 1971).
- Ascocratera** Kohlm. (1986), ? Lophiostomataceae. 1 (marine), Belize. Possibly belongs to the *Trypetheliaceae* fide Eriksson (*in litt.*). See Kohlmeyer (*CJB* 64: 3036, 1986), Harris in Aptroot (Ed.) (*Bibliotheca Lichenol.* 44, 1991), Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 34: 1, 1991).
- Ascocybe** D.E. Wells (1954) = *Cephaloascus* fide von Arx (*Antonie van Leeuwenhoek* 38: 289, 1972).
- Ascodesmidaceae** J. Schröt. (1893), Pezizales. 3 gen. (+ 2 syn.), 21 spp. Clusters within *Pyronemataceae* in a recent molecular study.
Lit.: Currah (*Mycol.* 78: 198, 1986), Brummelen (*Persoonia* 14: 1, 1989), Kimbrough (*Mem. N. Y. bot. Gdn* 49: 326, 1989; fam. limits), van Brummelen (*Persoonia* 14: 1, 1989; ascus ultrastr.), Landvik *et al.* (*Nordic J. Bot.* 17: 403, 1997; DNA), Landvik *et al.* (*Mycoscience* 39: 49, 1998), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Hansen *et al.* (*Mycol.* 97: 1023, 2005), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Ascodesmis** Tiegh. (1876), Ascodesmidaceae. 6, widespread. See Obrist (*CJB* 39: 943, 1961; key), Delattre-Durand & Janex-Favre (*BSMF* 95: 49, 1979; ontogeny), van Brummelen (*Persoonia* 11: 377, 1981), Patil & Ghadge (*Indian Phytopath.* 40: 30, 1987; 5 spp.), van Brummelen (*Persoonia* 14: 1, 1989), van Brummelen (*Stud. Mycol.* 31: 41, 1989; ultrastr.), Landvik *et al.* (*Nordic J. Bot.* 17: 403, 1997), Landvik *et al.* (*Mycoscience* 39: 49, 1998; DNA), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny, paraphyly of *Pyronemataceae*).
- Ascodesmisites** Trivedi, Chaturv. & C.L. Verma (1973), Fossil Fungi. 1 (Eocene), Malaysia. See Korf (*Mycotaxon* 6: 193, 1977).
- Ascodichaena** Butin (1977), Ascodichaenaceae. Anamorph *Polymorphum*. 2, widespread (esp. temperate). See Hawksworth (*Taxon* 32: 212, 1983; nomencl.), Butin & Marmolejo (*Sydowia* 42: 8, 1990).
- Ascodichaenaceae** D. Hawksw. & Sherwood (1982), Rhytismatales. 5 gen. (+ 10 syn.), 11 spp.
Lit.: Hawksworth & Sherwood (*Mycotaxon* 16: 262, 1982), Butin & Marmolejo (*Sydowia* 42: 8, 1990), Minter (*Shoot and Foliage Diseases in Forest Trees* Proceedings of a Joint Meeting of the Working Parties: Canker & Shoot Blight of Conifers, Foliage Diseases: 65, 1995), Yuan *et al.* (*Australas. Pl. Path.* 29: 215, 2000).
- Ascofascicula** Matsush. (2003), ? Pezizales. 1, Japan. See Matsushima (*Matsush. Mycol. Mem.* 10: 190, 2001).
- ascogenous** (ascogenic), ascus-producing or ascus-

supporting.

ascogonium, the cell or group of cells in Ascomycotina fertilized by a sexual act.

Ascographa Velen. (1934), ? Helotiales. 1, former Czechoslovakia.

Ascohansfordiellopsis D. Hawksw. (1979) = *Koordersiella* fide Hawksworth (*Bull. Br. Mus. nat. hist. Bot.* 6, 1979).

Ascohymeniales Nannf. (1932). *Ascomycota* having asci (and paraphyses) developing as a hymenium and not in a pre-formed stroma, as in *Pyrenomyces* and *Discomycetes* (Nannfeldt, 1932); *Hymeniascomycetes*. Cf. *Ascoloculares*.

Ascoidea Bref. (1891), Ascoideaceae. 4, widespread. See Batra & Francke-Grossman (*Mycol.* 56: 632, 1964; key), von Arx & Müller (*Sydowia* 37: 6, 1984), de Hoog in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 136, 1998), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).

Ascoideaceae J. Schröt. (1894), Saccharomycetales. 1 gen., 4 spp.
Lit.: von Arx & Müller (*Sydowia* 37: 6, 1984), Batra (*Stud. Mycol.* 30: 415, 1987), Hoog in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 136, 1998), Kurtzman & Blanz in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 69, 1998), Kurtzman & Robnett (*Antonie van Leeuwenhoek* 73: 331, 1998), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).

Ascoideales = Saccharomycetales.

Ascolacicola Ranghoo & K.D. Hyde (1998), Sordariales. Anamorph *Trichocladium*. 1 (on wood in freshwater), Austria; Hong Kong. See Ranghoo & Hyde (*Mycol.* 90: 1055, 1998), Ranghoo *et al.* (*Fungal Diversity* 2: 159, 1999; DNA), Réblová & Winka (*Mycol.* 93: 478, 2001), Campbell & Shearer (*Mycol.* 96: 822, 2004).

Ascolanthanus Cailleux (1967) = *Pyxidiophora* fide Lundqvist (*Bot. Notiser* 133: 121, 1980).

Ascolectus Samuels & Rogerson (1990), Saccardiaceae. 1, Brazil. See Samuels & Rogerson (*Mem. N. Y. bot. Gdn* 64: 177, 1990).

Ascoloculares Nannf. (1932). *Ascomycota* having asci (and paraphyses) developing in cavities in a pre-formed stroma, as in *Loculoascomycetes* (Nannfeldt, 1932). Cf. *Ascohymeniales*.

ascoma (pl. **ascomata**), an ascus-containing structure, ascocarp.

Ascomauritiana Ranghoo & K.D. Hyde (1999), Pezizomycotina. 1, Mauritius. See Ranghoo & Hyde (*MR* 103: 938, 1999).

Ascominuta Ranghoo & K.D. Hyde (2000), ? Dothideomycetes. 1 (in freshwater), Hong Kong. See Ranghoo & Hyde (*Mycoscience* 41: 1, 2000).

Ascomyces Mont. & Desm. (1848) = *Taphrina*. Sometimes used for *Ginanniella* (Tillet.) anamorphs. fide Mussat (*Syll. Fung.* 15: 51, 1901).

ascomycete, one of the *Ascomycota*.

Ascomycetella Peck (1881) = *Cookella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Ascomycetella Sacc. (1886) = *Myriangiopsis*.

Ascomycetes. Originally introduced by Berkeley (*Intr. Crypt. Bot.*: 270, 1857) but without a clear indication of rank; see Whittaker (*Quart. Rev. Biol.* 34: 210, 1959) and Hibbett *et al.* (*MR* 111: 509, 2007). Commonly used in an equivalent sense to *Ascomycota* and/or *Pezizomycotina* in this *Dictionary*.

Ascomycota Caval.-Sm. (1998), Fungi. 15 class., 68

ord., 327 fam., 6355 gen., 64163 spp. (*Ascolichenes*, *Ascomycoptera*, *Thecamycetes*); sac fungi; ascomycetes. Saprobes, parasites (esp. of plants), or lichen-forming; cosmop. The largest group of *Fungi*, for which the ascus (q.v.) is the diagnostic character. The presence of lamellate hyphal walls with a thin electron-dense outer layer and a relatively thick electron-transparent inner layer also appears diagnostic; this enables anamorphic fungi to be recognized as ascomycetes even in the absence of asci. In the past they have often been grouped on fruit-body type and ascus arrangement (e.g. *Hemiascomycetes*, *Plectomycetes*, *Pyrenomyces*, *Discomycetes*, *Loculoascomycetes*; q.v.). In recent decades the development of the ascomata, especially the structure and discharge method of the asci, were considered important, but in the last 5-10 years molecular sequence data (especially of the ribosomal genome) have come to the fore.

The size of the group makes it difficult to embrace the enormous range of structures in the group, and to determine which morphological features should be stressed in the recognition of higher categories in addition to sequence data. In many instances, molecular and morphological data are congruent, but integration of these data have proved to be intractable in some cases. Further problems have been encountered with the need to assign families and orders to higher taxa where molecular data are not available. The desire of many systematic and applied mycologists to begin the process of amalgamating anamorph genera into the overall ascomycete system has become rapidly more volubly expressed (see for example Seifert *et al.*, *Stud. Mycol.* 45, 2000) and in response to this all genera of anamorphic fungi in this *Dictionary* with ascomycetous affinities have been provisionally assigned at least to a higher taxon of *Ascomycota*.

The classification in this edition of the *Dictionary* is based on a series of major phylogenetic studies of fungi under the umbrella of the 'Deep Hypha' and AFTOL ('Assembling the Fungal Tree of Life') projects, as well as other resources including *Myconet*. See esp. Blackwell *et al.* (*Mycol* 98: 829, 2006), Hibbett *et al.* (*MR* : 111: 509, 2007), James *et al.* (*Nature* 443: 818, 2006) and Lutzoni *et al.* (*Am. J. Bot.* 91: 1446, 2004).

Three Subphyla are accepted here. However, many accepted families are not referred to any specific order or class within these subphyla, and over 3200 genera could not be assigned with confidence to any family.

Subphyl.:

- (1) **Pezizomycotina** (syn. *Ascomycotina*)
- (2) **Saccharomycotina**
- (3) **Taphrinomycotina**

A significant number of orders and many families have yet to have any members in them sequenced, and this lack of molecular data means that any current phylogenetic framework contains many 'holes'. As in previous editions, we have attempted to place non-sequenced taxa within the overall classification structure, but many further changes are to be expected. The *Fungi* are treated in more detail at family level in a companion publication (Cannon & Kirk, *Fungal Families of the World*, 2007).

Lit.: **General**: von Arx (in Kendrick (Ed.), *The whole fungus* 1: 201, 1979, classif., anamorphs; *Genera of fungi sporulating in pure culture*, edn 3, 1981; keys gen., lit.; *Plant Pathogenic Fungi*, 1987), von

Arx & Müller (*Beitr. Krypt.-Fl. Schweiz* 11 (1), 1954; gen. amerospored pyrenom.; *Stud. mycol.* 9, 1975; bitunicate gen., keys), Barr (*Mem. N.Y. bot. Gdn* 28 (1): 1, 1976, classif.; *Prodromus to class Loculoascomycetes*, 1987, keys gen.; *Mycotaxon* 39: 43, 1990, keys pyren. gen.; in Parker, 1982, 1: 201), Benny & Kimbrough (*Mycotaxon* 12: 1, 1980; plectomycete gen.), Berbee (*Mol. Biol. Evol.* 13: 462, 1996, loculoascomycete evolution; *Physiol. Mol. Pl. Path.* 59: 165, 2001, phylogeny of pathogens), Clements & Shear (*Genera of Fungi*, 1931), Eriksson (*Opera Bot.* 60, 1981; bitunicate fams, *Myconet*, 1997-; annual system), Eriksson & Hawksworth (*SA* 12: 51, 1993; outline classif., orders, fam., gen.), Eriksson & Winka (*Myconet* 1: 1, 1997; supraordinal taxa), Hafellner (in Galun, *CRC Handbook of lichenology* 3: 41, 1988; lichenized gps), Hanlin (*Illustrated genera of ascomycetes*, 1990), Hansford (*Mycol. Pap.* 15, 1946; foliicolous spp.), Hawksworth (*Proc. Indian Natn Acad. Sci., Pl. Sci.* 94: 319, 1985, development classif. systems; (Ed.), *Ascomycete systematics: problems and perspectives in the nineties* [NATO ASI Ser. A 269], 1994), Henssen & Jahns (*Lichenes*, ['1974'] 1973), Kohlmeyer & Kohlmeyer (*Marine mycology*, 1979; *Bot. Mar.* 34: 1, 1991, keys 255 spp.), Korf (*The Fungi* 4A: 249, 1973; keys discomycete gen.), Lipscomb *et al.* (*Cladistics* 14: 303, fungi and eukaryote phylogeny), Liu *et al.* (*Mol. Biol. Evol.* 16: 1799, 1999; phylogeny based on RPB2 sequences), Liu & Hall (*Proc. Nat. Acad. Sci. USA* 101: 4507, 2004; phylogeny related to ascoma structure), Lopandic *et al.* (*Mycol. Progr.* 4: 205, 2005; rDNA phylogeny, chemotaxonomy), Luttrell (*Univ. Miss. Stud.* 24 (3), 1951 [reprint 1969]), Lutzoni *et al.* (*Nature* 411: 937, 2001; lichen ancestry), McLaughlin *et al.* (*The Mycota* 7A, 2001), Müller & von Arx (*Beitr. Krypt.-Fl. Schweiz* 11 (2), 1962, didymospored gen.; *The Fungi* 4A: 87, 1973; keys pyrenomycete gen.), Munk (*Dansk bot. Arkiv.* 15 (2), 1953; system), Nag Raj (*Coelomycetous Anamorphs with Appendage-Bearing Conidia*, 1993), Nannfeldt (*Nova Acta Reg. Soc. Sci. upsal.*, iii, 8 (2), 1932; inoperculate discom.), Nishida & Sugiyama (*Mycoscience* 35: 361, 1994; archiascomycetes), Padovan *et al.* (*J. Mol. Evol.* 60: 726, 2005; molecular clocks), Poelt (in Ahmadjian & Hale, *The lichens*: 599, ['1973'] 1974; fams), Reynolds (Ed.) (*Ascomycete systematics*, 1981; ascus, centrum types), Robbertse *et al.* (*Fungal Genet. Biol.* 43: 715, 2006; phylogenomic analysis), Santesson (*Symb. bot. upsal.* 12 (1), 1952; foliicolous L), Seifert *et al.* (*Stud. Mycol.* 45, 2000; anamorph integration), Sivanesan (*The bitunicate ascomycetes and their anamorphs*, 1985; keys), Spatafora *et al.* (*Mycol.* 98: 1018, 2006; overview of *Pezizomycotina* phylogeny), Sugiyama (*Mycoscience* 39: 487, 1998; phylogeny), Tehler *et al.* (*MR* 107: 901, 2003; rDNA phylogeny), Walker (in Grgurinovic & Mallett (Eds), *Fungi of Australia* 1A, 1996; system, key to orders), Wehmeyer (*The pyrenomycetous fungi*, 1975), Zahlbruckner (*Nat. Pflanzenfam.* 8: 61, 1926; L gen.).

Regional: **Australia**, Walker (in Grgurinovic & Mallett (Eds), *Fungi of Australia* 1A, 1996; system, key to orders), McCarthy (ed.), *Flora of Australia* 54, 1992 et seq.; lichenized groups). **British Isles**, Cannon *et al.* (*The British Ascomycotina: an annotated checklist*, 1985; 5100 spp.), Dennis (*British Ascomycetes*, 1968; edn 2, 1978), Ellis & Ellis (*Microfungi*

on land plants, 1985; *Microfungi on miscellaneous substrates*, 1988). **Brazil**, Da Silva & Minter (*Mycol. Pap.* 169, 1995; Batista & co-workers collns). **Caribbean**, Minter *et al.*, *Fungi of the Caribbean*, 2001, checklist. **Denmark**, Munk (*Dansk bot. Arkiv* 17(1), 1957). **Germany**, Schmidt & Schimdt (*Ascomyceten im Bild* 1-, 1990 on). **Hungary**, Bánhegyi *et al.* (*Magyarország* 1-3, 1985-87; keys). **Nordic countries**, Hansen & Knudsen, *Nordic Macromycetes* 1. *Ascomycota*, 2000). **North America**, Brodo *et al.*, *Lichens of North America*, 2001; Ellis & Everhart (*North American Pyrenomycetes*, 1892). **Pakistan**: Ahmad (*Monogr. Biol. Soc. Pakistan* 7-8, 1978; keys). **Romania**, Sandu-Ville (*Ciuperici Pyrenomycetes - Sphaeriales din România*, 1971). **Spain**, López (*Aportacion al conocimiento de los ascomycetes (Ascomycotina) de Cataluña*, 1, 1987). **Sweden**, Eriksson (*The non-lichenized pyrenomycetes of Sweden*, 1992; 1524 spp.). **Switzerland**, Breitenbach & Kränzlin (*Pilze der Schweiz* 1, 1981). **U.S.A.**, Farr *et al.* (*Fungi on plants and plant products in the United States*, 1989; checklist). **Venezuela**, Dennis (*Fungus flora of Venezuela and adjacent countries*, 1970).

See also under *Discomycetes*, Geographical distribution, *Lichens*, *Loculoascomycetes*, Plant pathogenic fungi, and *Yeasts*.

Ascomycotina. = *Pezizomycotina*.

ascoparaphysis, see *paraphysis*.

Ascophanella Faurel & Schotter (1965) = *Thecotheus* fide Korf in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 249, 1973).

Ascophanopsis Faurel & Schotter (1965) = *Thecotheus* fide Krug & Khan (*Mycol.* 79: 200, 1987).

Ascophanus Boud. (1869), ? *Ascobolaceae*. 20 (mostly on dung), widespread (temperate). See Kimbrough (*CJB* 44: 697, 1966), Moravec (*Česká Mykol.* 25: 150, 1971), Pouzar & Svrček (*Česká Mykol.* 26: 25, 1972; typification), van Brummelen in Hawksworth (Ed.) (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. 269 269: 398, 1994; posn), Prokhorov (*Mikol. Fitopatol.* 31: 27, 1997), Huhtinen & Spooner (*Kew Bull.* 58: 749, 2003).

Ascophora Tode (1790) nom. rej. = *Mucor* Fresen. fide Hesseltine (*Mycol.* 47: 344, 1955).

ascophore (1) an ascus-producing hypha, esp. the stalk-like hyphae supporting asci in *Cephaloascus*; (2) apothecium (obsol.).

ascophyte, hypothetical autotrophic ancestor of the *Ascomycota* (Cain, 1972), see *Phylogeny*, cf. *basidiophyte*.

ascoplasm, *epiplasm* (q.v.).

Ascopolyporus Möller (1901), *Cordycipitaceae*. 5, C. & S. America. See Heim (*BSMF* 69: 417, 1954), Doi *et al.* (*Bull. natn. Sci. Mus. Tokyo*, B 3: 22, 1977), Bischoff *et al.* (*Mycol.* 97: 710, 2005; ecology, phylogeny).

Ascoporia Samuels & A.I. Romero (1993) = *Pseudosolidum* fide Samuels & Romero (*Bolm Mus. paraense 'Emilio Goeldi'* sér. bot. 7: 263, 1991), Kutorga & Hawksworth (*SA* 15: 1, 1997), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).

Ascoporiaceae Kutorga & D. Hawksw. (1997), ? *Dothideomycetes* (inc. sed.). 1 gen. (+ 1 syn.), 1 spp.

Lit.: Samuels & Romero (*Bolm Mus. paraense 'Emilio Goeldi'* sér. bot. 7: 263, 1991), Kutorga & Hawksworth (*SA* 15: 1, 1997).

ASCOPORIACEAE

TABLE 2. Classification of the Ascomycota from the 9th Edition and as adopted in the 10th Edition

Dictionary 2001 (9 th Edition)	Dictionary 2008 (10 th Edition)
Agyniales (Lecanoromycetidae)	Acarosporales (Acarosporomycetidae)
Arthoniales (Arthoniomycetidae)	Acrospemales (Dothideomycetes)
Boliniales (Sordariomycetidae)	Agyriales (Ostropomycetidae)
Calosphaeriales (Sordariomycetidae)	Arachnomycetales (Eurotiomycetidae)
Capnodiales (Dothideomycetidae)	Arthoniales (Arthoniomycetes)
Chaetothyriales (Chaetothyriomycetidae)	Ascosphaerales (Eurotiomycetidae)
Coryneliales (Dothideomycetidae)	Baeomycetales (Ostropomycetidae)
Diaporthales (Sordariomycetidae)	Boliniales (Sordariomycetidae)
Dothideales (Dothideomycetidae)	Botryosphaeriales (Dothideomycetes)
Elaphomycetales (Eurotiomycetidae)	Calosphaeriales (Sordariomycetidae)
Erysiphales (Erysiphomycetidae)	Candelariales (Lecanoromycetes)
Eurotiales (Eurotiomycetidae)	Capnodiales (Dothideomycetidae)
Gyalectales (Lecanoromycetidae)	Chaetosphaeriales (Sordariomycetidae)
Halosphaeriales (Sordariomycetidae)	Chaetothyriales (Chaetothyriomycetidae)
Helotiales (Leotiomycetidae)	Coniochaetales (Sordariomycetidae)
Hypocreales (Sordariomycetidae)	Coronophorales (Hypocreomycetidae)
Hysteriales (Dothideomycetidae)	Coryneliales (Eurotiomycetidae)
Laboulbeniales (Laboulbeniomycetidae)	Cyttariales (Leotiomycetes)
Lahmiales (Dothideomycetidae)	Diaporthales (Sordariomycetidae)
Lecanorales (Lecanoromycetidae)	Dothideales (Dothideomycetidae)
Lichinales (Lecanoromycetidae)	Erysiphales (Leotiomycetidae)
Lulworthiales (Sordariomycetidae)	Eurotiales (Eurotiomycetidae)
Medeolariales (Leotiomycetidae)	Helotiales (Leotiomycetes)
Meliolales (Meliolomycetidae)	Hypocreales (Sordariomycetidae)
Microascales (Sordariomycetidae)	Hysteriales (Dothideomycetes)
Microthyriales (Dothideomycetidae)	Jahnulales (Dothideomycetes)
Mycocaliciales (Incertae sedis)	Laboulbeniales (Laboulbeniomycetidae)
Mycosphaerellales (Dothideomycetidae)	Lahmiales (Pezizomycotina)
Myriangiales (Dothideomycetidae)	Lecanorales (Lecanoromycetidae)
Neolectales (Neolectomycetidae)	Lecideales (Lecanoromycetidae)
Onygenales (Eurotiomycetidae)	Leotiales (Leotiomycetidae)
Ophiostomatales (Sordariomycetidae)	Lichinales (Lichinomycetes)
Ostropales (Incertae sedis)	Lulworthiales (Spathulosporomycetidae)
Patellariales (Dothideomycetidae)	Medeolariales (Pezizomycotina)
Peltigerales (Lecanoromycetidae)	Melanosporales (Hypocreomycetidae)
Pertusariales (Lecanoromycetidae)	Meliolales (Meliolomycetidae)
Pezizales (Pezizomycetidae)	Microascales (Hypocreomycetidae)
Phyllachorales (Sordariomycetidae)	Microthyriales (Dothideomycetes)
Pleosporales (Dothideomycetidae)	Mycocaliciales (Mycocaliciomycetidae)
Pneumocystidales (Pneumocystidomycetidae)	Myriangiales (Dothideomycetidae)
Pyrenulales (Dothideomycetidae)	Neolectales (Neolectomycetidae)
Pyxidiophorales (Laboulbeniomycetidae)	Onygenales (Eurotiomycetidae)
Rhytismatales (Leotiomycetidae)	Ophiostomatales (Sordariomycetidae)
Saccharomycetales (Saccharomycetidae)	Orbiliales (Orbiliomycetes)
Schizosaccharomycetales (Schizosaccharomycetidae)	Ostropales (Ostropomycetidae)
Sordariales (Sordariomycetidae)	Patellariales (Dothideomycetes)
Spathulosporales (Spathulosporomycetidae)	Peltigerales (Lecanoromycetidae)
Taphrinales (Taphrinomycetidae)	Pertusariales (Ostropomycetidae)
Teloschistales (Lecanoromycetidae)	Pezizales (Pezizomycetidae)
Thelebolales (Leotiomycetidae)	Phyllachorales (Sordariomycetes)
Triblidiales (Incertae sedis)	Pleosporales (Pleosporomycetidae)
Trichosphaeriales (Sordariomycetidae)	Pneumocystidales (Pneumocystidomycetidae)
Trichotheliales (Incertae sedis)	Pyrenulales (Chaetothyriomycetidae)
Verrucariales (Incertae sedis)	Pyxidiophorales (Laboulbeniomycetidae)
Xylariales (Sordariomycetidae)	Rhizocarpales (Lecanoromycetidae)
	Rhytismatales (Leotiomycetes)
	Saccharomycetales (Saccharomycetidae)
	Schizosaccharomycetales (Schizosaccharomycetidae)
	Sordariales (Sordariomycetidae)
	Taphrinales (Taphrinomycetidae)
	Teloschistales (Lecanoromycetidae)
	Thelebolales (Leotiomycetes)
	Triblidiales (Pezizomycotina)
	Trichosphaeriales (Sordariomycetes)
	Trypetheliales (Dothideomycetes)
	Umbilicariales (Lecanoromycetes)
	Verrucariales (Chaetothyriomycetidae)
	Xylariales (Xylariomycetidae)

- Ascorhiza** Lecht.-Trinka (1931), Pezizomycotina. 1, Europe. See Benny & Kimbrough (*Mycotaxon* 12: 1, 1980; referral to *Ascosphaerales*).
- Ascorhizoctonia** Chin S. Yang & Korf (1985), anamorphic *Tricharina*, Sc.-. 7, widespread (cool temperate). See Yang & Korf (*Mycotaxon* 23: 468, 1985), Yang & Kristiansen (*Mycotaxon* 35: 313, 1989), Barrera & Romero (*Mycotaxon* 77: 31, 2001).
- Ascorhombispora** L. Cai & K.D. Hyde (2007), Pleosporales. 1, China. See Cai & Hyde (*Cryptog. Mycol.* 28: 291, 2007).
- Ascoronospora** Matsush. (2003), ? Pleosporales. Anamorph *Coronospora*. 1, Japan. See Matsushima (*Matsush. Mycol. Mem.* 10: 179, 2001).
- Ascosacculus** J. Campb., J.L. Anderson & Shearer (2003), Halosphaeriaceae. 2, Australia. See Campbell *et al.* (*Mycol.* 95: 545, 2003).
- Ascosalsum** J. Campb., J.L. Anderson & Shearer (2003), Halosphaeriaceae. 3, France; USA. See Campbell *et al.* (*Mycol.* 95: 546, 2003), Pang & Jones (*Nova Hedwigia* 78: 269, 2004).
- Ascoscleroderma** Clémencet (1932) = *Elaphomyces* fide Trappe (*Mycotaxon* 9: 247, 1979).
- Ascosorus** Henn. & Ruhland (1900), Pezizomycotina. 1, N. America.
- Ascosparassis** Kobayasi (1960), Pyronemataceae. 1, widespread (tropics). See Korf (*Lloydia* 26: 23, 1963), Pfister & Halling (*Mycotaxon* 35: 283, 1989), Wang & Chou (*Fungal Science Taipei* 11: 45, 1996; Taiwan).
- Ascospermum** Schulzer (1863) nom. dub., Fungi. Based on sterile mycelium.
- Ascosphaera** L.S. Olive & Spiltoir (1955), Ascosphaeraceae. Anamorph *Chrysosporium*-like. 17 (associated with bees), widespread (north temperate; esp. Europe). *A. apis* on larvae of honey bees causing chalk brood. See McManus & Youssof (*Mycol.* 76: 830, 1984), Rose *et al.* (*Mycotaxon* 19: 41, 1984; key 7 spp., N. Am.), Bisset (*CJB* 66: 2541, 1988; key), Skou (*Mycotaxon* 31: 173, 1988; 7 spp. nov. Japan), Bisset *et al.* (*Mycol.* 88: 797, 1996; key), Anderson & Gibson (*Aust. Syst. Bot.* 11: 53, 1998; Australia), Anderson *et al.* (*MR* 102: 541, 1998; phylogeny), James & Skinner (*J. Invert. Path.* 90: 98, 2005; PCR diagnosis), Aronstein *et al.* (*Mycol.* 99: 553, 2007; mating type genes).
- Ascosphaeraceae** L.S. Olive & Spiltoir (1955), Ascosphaerales. 3 gen. (+ 1 syn.), 19 spp.
Lit.: Skou (*Friesia* 10: 1, 1972; monogr.), Brady (*IMI Descr. Fungi Bact.* 62: [1, 1979], Skou (*Mycotaxon* 15: 487, 1982; emended concept), Kowalska (*Polskie Arch. Wet.* 24: 7, 1984; biochem. syst.), Skou (*Aust. J. Bot.* 32: 225, 1984; spp.), Bisset (*CJB* 66: 2541, 1988), Kish *et al.* (*Mycol.* 80: 312, 1988), Skou (*Mycotaxon* 31: 191, 1988; rank), Berbee & Taylor (*BioSystems* 28: 117, 1992), Landvik *et al.* (*Mycoscience* 37: 237, 1996), Anderson & Gibson (*Aust. Syst. Bot.* 11: 53, 1998), Anderson *et al.* (*MR* 102: 541, 1998), Geiser & LoBuglio in McLaughlin *et al.* (Eds) (*The Mycota A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research* 7A: 201, 2001).
- Ascosphaerales** Gäum. ex Benny & Kimbr. (1980). Eurotiomycetidae. 1 fam., 3 gen., 19 spp. Fam.:
Ascosphaeraceae
 Apparently nests within *Onygenales*, but further molecular studies are needed and the limits of that order also require research.
- For *Lit.* see under fam.
- Ascosphaeromycetes** = Eurotiomycetes. Used by Skou (*Mycotaxon* 31: 191, 1988) to accommodate the single order (and family) *Ascosphaerales* (*Ascosphaeraceae*).
- Ascospora** Fr. (1825) = *Mycosphaerella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Ascospora** Mont. (1849) nom. conf., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Ascosporaceae** Bonord. (1851) = *Mycosphaerellaceae*.
- ascospore**, a spore produced in an ascus by 'free cell formation'; the ascospore wall is multilayered, it consists of an outer **perispore**, an intermediary layer, the proper wall (**epispore**) and sometimes an internal **endospore**; major differences in which layers are thickened, folded or pigmented can give rise to considerable variation even in a single family (e.g. *Lasiosphaeriaceae*); see Bellemère (in Hawksworth (Ed.), *Ascomycete systematics*: 111, 1994), basidiospore, spore wall.
- Ascosporium** Berk. (1860) = *Taphrina* fide Saccardo (*Syll. fung.* 8: 817, 1889).
- ascostome**, a pore in the apex of an ascus (obsol.).
- Ascostratum** Syd. & P. Syd. (1912), ? Dothideomycetes. 1, S. Africa.
- Ascostroma** Bonord. (1851) = *Kretzschmaria* fide Læssøe (*SA* 13: 43, 1994).
- ascostroma**, a stroma in or on which asci are produced, usually restricted to groups with ascolocular ontogeny.
- Ascotaiwania** Sivan. & H.S. Chang (1992), ? Sordariales. Anamorphs *Brachysporiella*, *Trichocladium*, *Monotosporella*. 12 (mostly from wood), widespread (tropical). See Wong *et al.* (*SA* 16: 17, 1998), Ranghoo *et al.* (*Fungal Diversity* 2: 159, 1999; DNA), Chang (*Fungal Science Taipei* 16: 35, 2001; anamorph), Réblová & Winka (*Mycol.* 93: 478, 2001), Wong & Hyde (*Cryptog. Mycol.* 22: 19, 2001), Campbell & Shearer (*Mycol.* 96: 822, 2004; phylogeny).
- Ascotremella** Seaver (1930), Helotiaceae. 2, widespread (north & south temperate). See Gamundí & Dennis (*Darwiniana* 15: 14, 1969; status), Gamundí & Romero (*Fl. criptog. Tierra del Fuego* 10, 1998).
- Ascotremellopsis** Teng & S.H. Ou ex S.H. Ou (1936) = *Myriodiscus* fide Liu & Guo (*Acta Mycol. Sin. Suppl.* 1: 97, 1988).
- Ascotricha** Berk. (1838), Xylariaceae. Anamorph *Dicyma*. 15, widespread. See Hawksworth (*Mycol. Pap.* 126, 1971; key), Horie *et al.* (*TMSJ* 34: 123, 1993), Læssøe (*SA* 13: 43, 1994; posn), Udagawa *et al.* (*Mycotaxon* 52: 215, 1994), Lee & Hanlin (*Mycol.* 91: 434, 1999; DNA), Stchigel *et al.* (*Mycol.* 92: 805, 2000).
- Ascotrichella** Valldos. & Guarro (1988), ? Coniochaetaceae. Anamorph *Humicola*-like. 1, Chile. See Valldosera & Guarro (*TBMS* 90: 601, 1988), Læssøe (*SA* 13: 43, 1994; posn).
- Ascovaginospora** Fallah, Shearer & W.D. Chen (1997), ? Hyponectriaceae. 1 (dead submerged stems), USA. See Fallah *et al.* (*Mycol.* 89: 812, 1997; DNA), Chen *et al.* (*Mycol.* 91: 84, 1999; DNA), Huhndorf *et al.* (*Mycol.* 96: 368, 2004; phylogeny).
- Ascoverticillata** Kamat, Subhedar & V.G. Rao (1979)

= *Crocicreas* fide Eriksson (*SA* 5: 119, 1986).

Ascovirgaria J.D. Rogers & Y.M. Ju (2002), Xylariaceae. Anamorph *Virgaria*. 1 (on wood), Hawaii. See Rogers & Ju (*CJB* 80: 478, 2002).

Ascoxyta Lib. (1830) nom. dub., Pezizomycotina. See Holm (*Taxon* 24: 475, 1975).

Ascoyunnania L. Cai & K.D. Hyde (2005), ? Sordariomycetes. 1 (in submerged bamboo stems), China. Possibly linked with *Ustilaginoidea*. See Cai *et al.* (*Fungal Diversity* 18: 2, 2005).

Ascozonus (Renny) E.C. Hansen (1877), Thelebolaceae. c. 6, widespread (north temperate). See Kimbrough (*CJB* 44: 693, 1966), Prokhorov (*Mikol. Fitopatol.* 31: 27, 1997), Landvik *et al.* (*Mycoscience* 39: 49, 1998; DNA), van Brummelen (*Persoonia* 16: 425, 1998; ultrastr.), Brummelen & Richardson (*Persoonia* 17: 487, 2000), Hoog *et al.* (*Stud. Mycol.* 51: 33, 2005).

ascus (pl. **asci**), term introduced by Nees (*Syst. Pilze*: 164, 1817) for the typically sac-like cell (first figured in *Pertusaria* by Micheli in 1729; q.v.) characteristic of *Ascomycota* (q.v.), in which (after karyogamy and meiosis) ascospores (generally 8) are produced by 'free cell formation' (Fig. 11). Asci vary considerably in structure, and work in the last two decades has shown previous separation into only 2-3 categories (e.g. **bitunicate**, **prototunicate**, **unitunicate**) to be an over simplification. Sherwood (1981) illustrated 9 main types distinguishable by light microscopy (reproduced on p. 36 of edn 7 of this *Dictionary*): prototunicate, bitunicate, astropalean, annellate, hypodermataceous, pseudopericulate, operculate, lecanoralean, and verrucarioid. Eriksson (1981) distinguished 7 types of dehiscence in bitunicate asci with an ectotunica and distinct endotunica (see p. 37 of edn 7). These classifications mask a much wider range of variation; Bellemère (1994) recognized 3 predehiscence types and 11 dehiscence categories (Fig. 1). The details of the asci are stressed in ascomycete systematics, esp. in lichen-forming orders where reactions with iodine are emphasized (q.v.) (Hafellner, 1984).

Bitunicate asci with two functional wall layers; those splitting at discharge (**fissitunicate**; 'jack-in-the-box') had been correlated with an ascolocular ontogeny by Luttrell (1951). Reynolds (1989) critically examined this paradigm and found the term to be applied to different ascus types and that an exclusive link to ascostromatic fungi could not be upheld; he also introduced the term **extenditunicate** for asci which extend without any splitting of the wall layers (Reynolds, *Cryptog. Mycol.* 10: 305, 1989).

Much variation depends on the modifications in the various wall layers, especially the thickness of the walls and the *c* and *d* layers, and the details of apical differentiation (Bellemère, 1994) (Fig. 2). Caution is needed in comparing ascus staining reactions (see iodine) and structures in the absence of ultrastructural data. For terms used to describe the various structures see Fig. 2.

Also encountered are - **crown** (annular thickenings in *Phyllachora*), and - **plug** (thickening in the apex through which the spores are forcibly discharged).

Lit.: Bellemère (*Ann. Sci. nat., Bot.* 12: 429, 1971; *Rev. Mycol.* 41: 233, 1977, bitunicate discom.; in Hawksworth, 1994: 111, review), Bellemère & Letrouit-Galinou (*Bibl. Lich.* 25: 137, 1987; ultrastr.), van Brummelen (*Persoonia* 10: 113, 1978; opercu-

late), Chadeaud (*Rev. Mycol.* 7: 57, 1942; 9: 3, 1944; apical apparatus), Chadeaud *et al.* (*Mém. Soc. bot. Fr.* 79, 1968; lichen asci), Eriksson (*Opera bot.* 60, 1981; bitunicate types), Griffiths (*TBMS* 60: 261, 1973; unitunicate pyrenom.), Hafellner (*Beih. Nova-Hedw.* 79: 24, 1984), Hawksworth (*J. Hattori bot. Lab.* 52: 323, 1982; evolution types; (Ed.), *Ascomycete systematics: problems and perspectives in the nineties*, 1994), Holm (*Symb. bot. upsal.* 30(3): 21, 1995; history of term), Honneger (*Lichenologist* 10: 47, 1978; lecanoralean, *Peltigera*; 12: 157, 1980; *Rhizocarpon*; 14: 205, 1982, *Pertusaria*; 15: 57, 1983, *Baeomyces*, *Cladonia*, *Leotia* etc.; *J. Hattori bot. Lab.* 52: 417, 1982, review lecanoralean types), Janex-Favre (*Revue bryol. Lichén.* 37: 421, 1971; lich. pyrenom.), Letrouit-Galinou (*Bryologist* 76: 30, 1973; archaeasceous), Parguey-Leduc (*Ann. Sci. nat., Bot.* XII, 7: 33, 1966; ascoloc.; *Rev. Mycol.* 41: 281, 1977; pyrenom.), Parguey-Leduc & Janex-Favre (*Cryptogamie Mycol.* 5: 171, 1984; ultrastr. 'unitunicate' types), Reynolds (Ed.) (*Ascomycete systematics: the Luttrellian concept*, 1981; *Bot. Rev.* 55: 1, 1989; bitunicate paradigm), Sherwood (*Bot. J. Linn. Soc.* 82: 15, 1981; main types), Ziegenspeck (*Bot. Arch. Koenigsberg* 13: 341, 1926).

ascus plug, thickening in the apex through which the spores are forcibly discharged.

Aseimotrichum Corda (1831) nom. dub., ? Fungi.

Asellaria R.A. Poiss. (1932), Asellariaceae. 9 (in *Isopoda*), widespread. See Lichtwardt (*Mycol.* 65: 1, 1973; morphology), Manier (*C.R. Hebd. Séanc. Acad. Sci. Paris* 276: 3429, 1973; ultrastr.), Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986; revision, key), Valle (*Fungal Diversity* 21: 167, 2006; Spain), White *et al.* (*Mycol.* 98: 872, 2006; phylogeny), Valle & Cafaro (*Mycol.* 100: 122, 2008; zygospores).

Asellariaceae Manier ex Manier & Lichtw. (1968), Asellariales. 3 gen. (+ 1 syn.), 14 spp.

Lit.: Moss (*TBMS* 65: 115, 1975), Moss & Young (*Mycol.* 70: 944, 1978), Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*: 343 pp., 1986), Cafaro (*Mycol.* 91: 517, 1999), Benny in McLaughlin *et al.* (Eds) (*The Mycota A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research* 7A: 147, 2001), Lichtwardt (*Cellular Origin and Life in Extreme Habitats* 4: 577, 2002).

Asellariales Manier ex Manier & Lichtw. (1978). Kickxellomycotina. 1 fam., 3 gen., 14 spp. Fam.:

Asellariaceae

Lit.: Manier (*Ann. Sci. nat., Bot. sér.* 12 10: 565, 1969; taxonomy), Scheer (*Z. binnenfischerei DDR* 19: 369, 1972; taxonomy), Lichtwardt & Manier (*Mycotaxon* 7: 441, 1978; taxonomy), Moss & Young (*Mycol.* 70: 944, 1978; phylogeny), Moss (in Batra (Ed.), *Insect-fungus symbiosis*: 175, 1979), Lichtwardt (1986; taxonomy, key), White *et al.* (*Mycol.* 98: 860, 2006; molecular phylogeny), Hibbett *et al.* (*MR* 111: 109, 2007), Valle & Cafaro (*Mycol.* 100: 122; zygospores), and see under Family.

aseptate, having no cross walls.

aseptic, free from damaging microorganisms.

Aseroë Labill. (1800), Phallaceae. 2, widespread (tropical). See Spooner (*Mycologist* 8: 153, 1994), Baseia & Calonge (*Mycotaxon* 92: 169, 2005; Brazil).

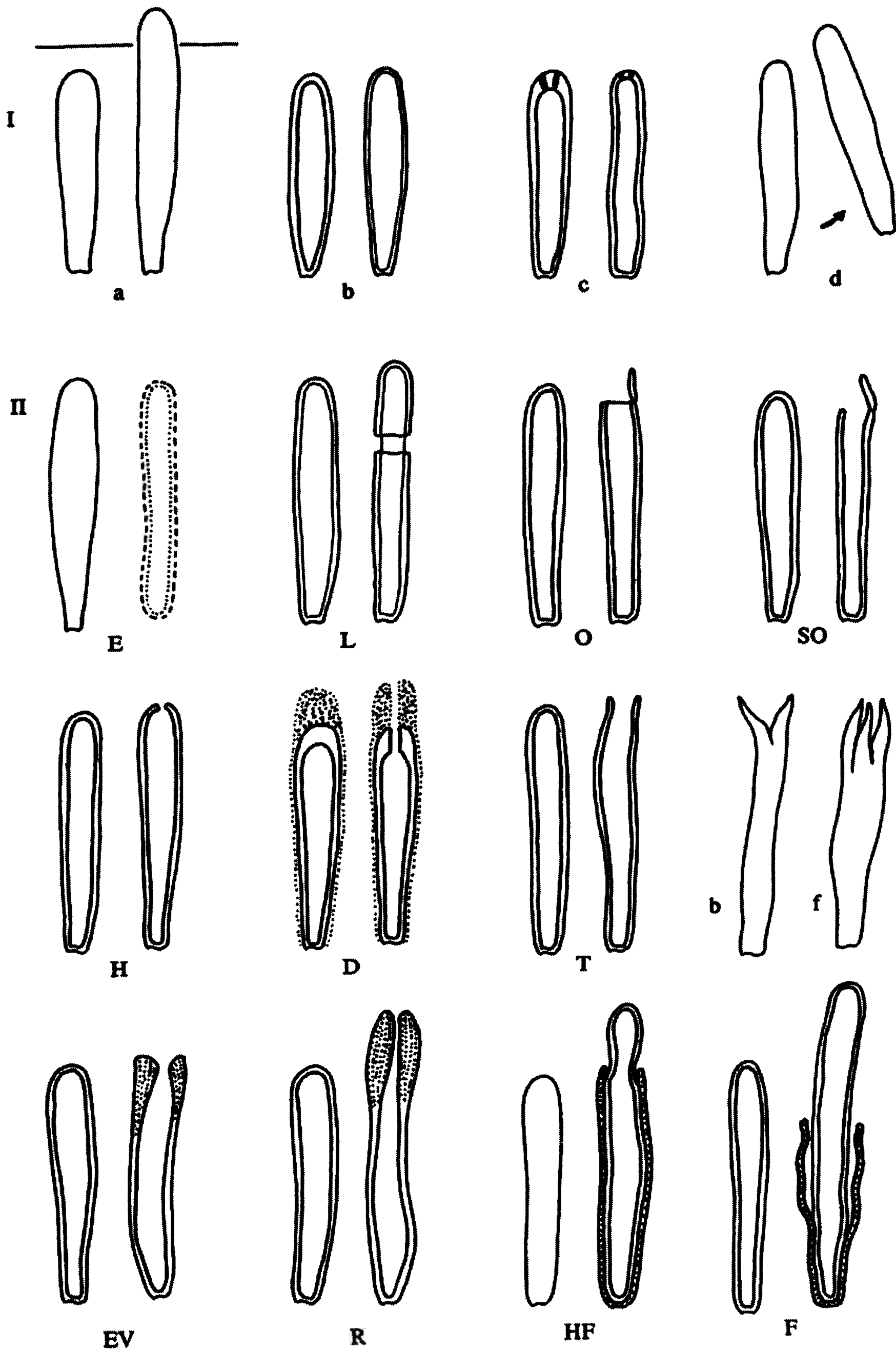


Fig. 4. I. Predehiscence stage of asci. a = protruding ascus; b = ascus wall becoming thinner; c = change in apical structure; d = ascus liberation. II. Dehiscence stage of asci; evanescent ascus (E); rupture of lateral wall (L); subapical rupture (O, operculate, and SO, suboperculate dehiscence); rupture by apical wall without extrusion (H, pore-like dehiscence); D, *Dactylospora*-type; T, *Teloschistes*-type = extenditunicate (b = bivalve, f = fissurate variants); rupture with extrusion (EV, eversion; R, rostrate; HF, hemifissitunicate; F, fissitunicate). After Bellemère, in Hawksworth (Ed.) (*Ascomycete Systematics*: 111, 1994).

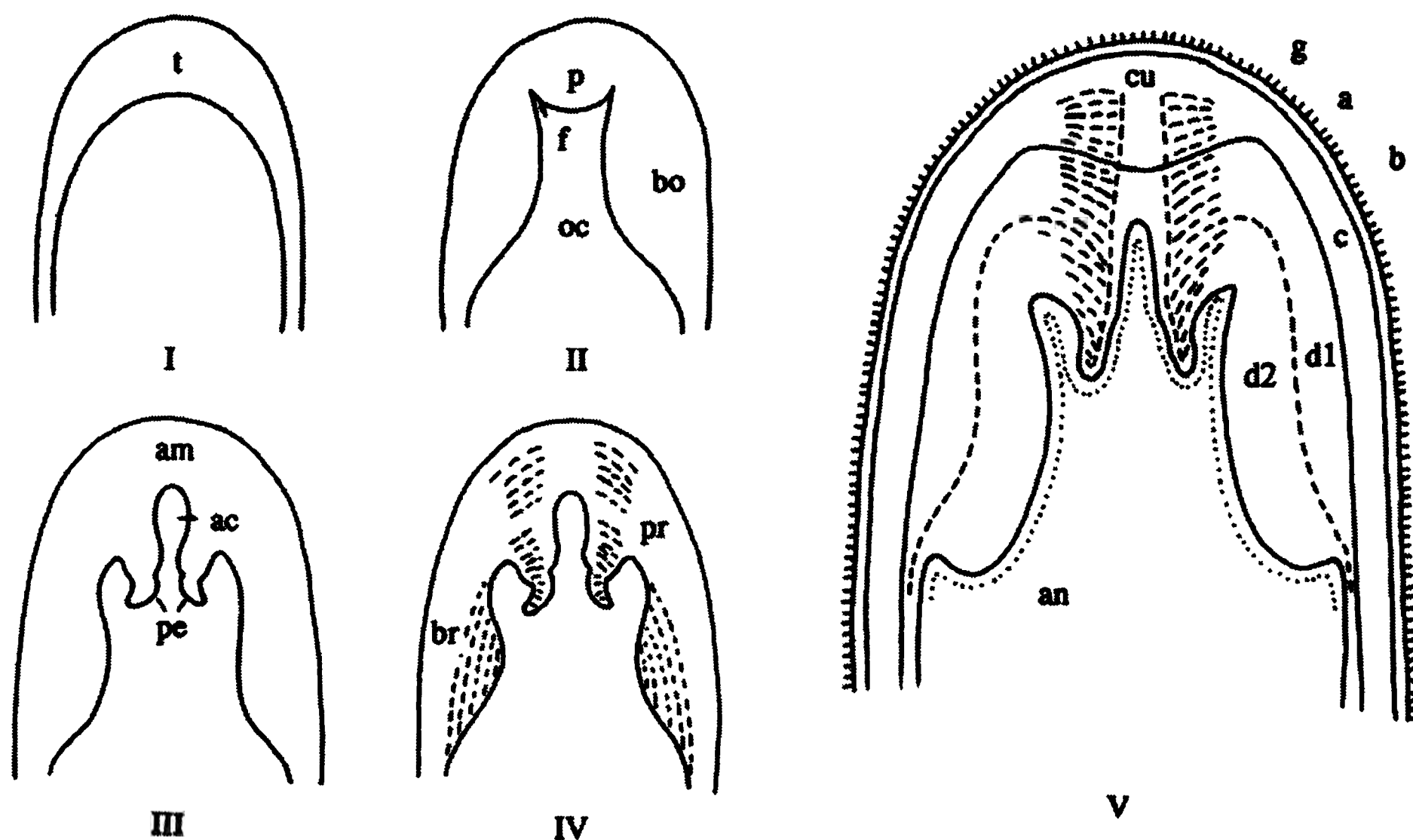


Fig. 5. I-V. Ascus apex components. ac = axial canal; am = axial mass; bo = bourrelet; br = ring in bourrelet; f = furrow; oc = ocular chamber; p = plug; pe = pendant; pr = rings in the plug and pendant; t = tholus; V, ascus apex structure. a = a layer; an = apical nasse; b = b layer; c = c layer; cu = cushion; d1 and d2 = sublayers of the d layer. After Bellemère (in Hawksworth (Ed.), *Ascomycete Systematics*: 111, 1994).

Aserophallus Mont. & Lepr. (1845) = *Clathrus* fide Dring (*Kew Bull.* 35: 1, 1980).

asexual, without sex organs or sex spores; vegetative.

Ashbia Cif. & Gonz. Frag. (1928) = *Ashbya*.

Ashbya Guillerm. (1928) = *Eremothecium* fide Batra (*USDA Tech. Bull.* 1469, 1973), Kurtzman (*J. Industr. Microbiol.* 14: 523, 1995), Prillinger *et al.* (*Yeast Chichester* 13: 945, 1997), de Hoog *et al.* in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 201, 1998; synonymy with *Eremothecium*), Kroken *et al.* (*Proc. natn Acad. Sci. U.S.A.* 100: 15670, 2003; polyketide synthase genes), Kurtzman (*FEMS Yeast Research* 4: 233, 2003; synonymy), Dietrich *et al.* (*Science N.Y.* 304 no. 5668: 304, 2004; genomic studies), Kohn (*Ann. Rev. Phytopath.* 43: 279, 2005; speciation), Brachat *et al.* (*Topics in Current Genetics* 15: 197, 2006; genome).

Ashtaangam Subram. (1995), anamorphic *Pezizomycotina*, Hso.0bP.1. 1, Malaysia. See Subramanian (*Korean J. Mycol.* 20: 281, 1992), Subramanian (*Kavaka* 20/21: 58, 1992).

Asirosiphon Nyl. (1873) = *Spilonema* fide Henssen (*Symb. bot. upsal.* 18 no. 1, 1963).

Asociación Latino-Americana de Micología. Founded in 1990; recognized as the Committee for Latin America within the International Mycological Association (q.v.); structure comprises individual members, an elected executive, and national representatives from Latin American and other countries; organizes Latin American Mycological Congress every three or four years. Website: www.almic.org/principal.php.

Asordaria Arx, Guarro & Aa (1987) = *Sordaria* fide Eriksson & Hawksworth (*SA* 7: 61, 1988), Cai *et al.*

(*MR* 110: 137, 2006; phylogeny).

asperate, rough with projections or points.

Aspergillaceae Link (1826) = *Trichocomaceae*.

Aspergillales = *Eurotiales*.

aspergilliform (of a sporulating structure), resembling that of an *Aspergillus* conidiophore.

aspergillin (1) a black, water-insoluble pigment of *Aspergillus niger* spores (Linossier, 1891); (2) various antibiotics produced by *Aspergillus* spp. See Tobie (*Nature* 158: 709, 1946).

Aspergillites Trivedi & C.L. Verma (1969), Fossil Fungi. 1 (Tertiary), Malaysia.

Aspergilloides Dierckx (1901) = *Penicillium* Link fide Raper & Thom (*Manual of the Penicillia*, 1949).

aspergilloma, a 'fungus ball' composed principally of hyphae of *Aspergillus*, found in a pre-existing cavity (esp. in an upper lobe of the lung) or a bronchus, which usually has a relatively benign or asymptomatic effect; cf. aspergillosis.

Aspergillopsis Sopp (1912) nom. dub., anamorphic *Pezizomycotina*. See Raper & Thom (*Manual of the Penicillia*, 1949).

Aspergillopsis Speg. (1910) = *Aspergillus* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Aspergillosis, Any disease in humans or animals caused by *Aspergillus* (esp. *A. fumigatus*); esp. common in birds; in humans usually respiratory and taking one of four forms: invasive (usually only in immuno-compromised patients, but with a high mortality rate), non-invasive, chronic pulmonary and aspergilloma, or severe asthma with fungal sensitisation (see Chute *et al.* (1971), Ainsworth & Austwick (1973) under Medical and veterinary mycology). See Austwick, (in Raper & Fennell, Eds, *The genus As-*

- pergillus*, 1965), Bossche *et al.* (Eds) (*Aspergillus and aspergillosis*, 1988).
- Aspergillus** P. Micheli ex Link (1809), anamorphic *Emericella*, *Eurotium*, *Neosartorya*, Hsy.0eH/1eP.32. 266, widespread. *A. niger* ('smut' of fig and date; black mould of cotton bolls, fruits, vegetables, etc., environmental contaminant and model organism), *A. fumigatus* (principal causal organism of aspergillosis). See aflatoxins, aspergillin, aspergillosis, Industrial Mycology. See Thom & Church (*The aspergilli*, 1926), Thom & Raper (*Manual of the Aspergilli*, 1945), Benjamin (*Mycol.* 47: 669, 1955), Raper & Fennell (*The genus Aspergillus*, 1965), Locci (*Rivista Patol. Veget.*, 1972; SEM of teleomorphs), Kozakiewicz (*TBMS* 70: 175, 1978; SEM of conidia), Samson (*Stud. Mycol.* 18, 1979; compilation spp. described since 1965), Bennett in Demain & Solomon (Eds) (*Biology of industrial microorganisms*: 359, 1985; taxonomy and biology), Currah (*Mycotaxon* 24: 1, 1985), Kurtzman *et al.* (*Mycol.* 78: 955, 1986; DNA relatedness), Sekhon *et al.* (*Diagn. immunol.* 4: 112, 1986; exoantigen grouping), Anon. in Bossche *et al.* (Ed.) (*Aspergillus and aspergillosis*, 1988), Bennett & Papa (*Adv. Pl. Path.* 6: 263, 1988; aflatoxigenic spp.), Bilai & Koval (*Aspergilly*: 1, 1988; spp. from former USSR), Bojovic-Cvetic & Vujicic (*TBMS* 91: 619, 1988; polysaccharide cytochemistry), Klich & Pitt (*TBMS* 91: 99, 1988; differentiation of *A. flavus* from *A. parasiticus*), Anon. in Samson & Pitt (Eds) (*Modern concepts in Penicillium and Aspergillus classification* [NATO ASI Series A: Life Sciences], 1989), Bezjak (*Mycoses* 32: 187, 1989; abnormal conidial structures), Hull *et al.* (*Mol. Microbiol.* 3: 553, 1989; L-proline catabolism gene cluster in *A. nidulans*), Klich & Mullaney (*Mycol.* 81: 159, 1989; differentiation of *A. parasiticus* from *A. sojae*), Kozakiewicz (*Mycol. Pap.* 161: 1, 1989; spp. on stored products), Pitt (*J. Appl. Bact.* 67 Suppl. Symp. Ser. 18: 375, 1989; recent developments in systematics), Weidenbörner *et al.* (*J. Phytopath.* 126: 1, 1989; preparation for SEM), Wirsal *et al.* (*Mol. Microbiol.* 3: 3, 1989; amylase genes in *A. oryzae*), Clutterbuck (*Fungal Genetics Newsl.* 37: 80, 1990; bibliography of *A. nidulans*), Moody & Tyler (*Appl. Environm. Microbiol.* 56: 2453, 1990; restriction enzyme analysis of mtDNA, and DNA RLFPs of *A. flavus* group), Moody & Tyler (*Appl. Environm. Microbiol.* 56: 2441, 1990; restriction enzyme analysis of mtDNA, and DNA RLFPs of *A. flavus* group), Novak & Kohn (*Exp. Mycol.* 14: 339, 1990; developmental proteins), Samson & Frisvad (*Proc. Jap. Assoc. Mycotoxic.* 32: 3, 1990; species concepts and mycotoxins), Tzean *et al.* (*Aspergillus and related teleomorphs from Taiwan* Mycological Monograph of the Food Industry Research & Development Institute, 1990), Chang *et al.* (*J. gen. appl. Microbiol.* Tokyo 37: 289, 1991; phylogeny), Fragner (*Česká Mykol.* 45: 113, 1991; spp. from humans and animals), Kozakiewicz *et al.* (*Taxon* 41: 109, 1992; spp. nom. cons. prop.), Klich (*Mycol.* 85: 100, 1993; sect. *Versicolores*), Pitt & Samson (*Regnum veg.* 128: 13, 1993), Tiedt (*MR* 97: 1459, 1993; ultrastr. conidiogenesis in *A. niger*), Anon. in Smith (Ed.) (*Aspergillus [Biotechnology Handbooks 7]*, 1994), Chang *et al.* (*Appl. Environm. Microbiol.* 61: 40, 1995; aflatoxin genes), Horn & Greene (*Mycol.* 87: 324, 1995; VCGs), Ismail *et al.* (*Mycotaxon* 53: 391, 1995; synoptic key), Peterson (*MR* 99: 1349, 1995; phylogeny of sects *Wentii* and *Cremeri*), Rinyu *et al.* (*J. Clin. Microbiol.* 33: 2567, 1995; variability in *A. fumigatus*), Verwei *et al.* (*J. Mycol. Médic.* 5: 194, 1995; ELISA test), Woloshuk *et al.* (*Appl. Environm. Microbiol.* 61: 3019, 1995; *A. flavus*), Kevei *et al.* (*Antonie van Leeuwenhoek* 70: 59, 1996; *A. carbonarius*), Kumeda & Asao (*Appl. Environm. Microbiol.* 62: 2947, 1996; SSCP analysis in sect. *Flavi*), Rodriguez *et al.* (*J. Clin. Microbiol.* 34: 2559, 1996; clinical strains of *A. fumigatus*), Kaufman *et al.* (*J. Clin. Microbiol.* 35: 2206, 1997; immunological diagnostics), Law *et al.* (*Mycoses* 39: 433, 1996; pyrolysis MS), Nemec *et al.* (*FEMS Microbiol. Lett.* 149: 201, 1997; sterols and fatty acids), Parenicová *et al.* (*MR* 101: 810, 1997; RFLP of black aspergilli), Bart-Delabesse *et al.* (*J. Clin. Microbiol.* 36: 2413, 1998; microsatellite markers), Birch *et al.* (*Medical Mycology* 36: 127, 1998; polar lipids), Fletcher *et al.* (*Journal of Clinical Pathology* 51: 617, 1998; detection of *A. fumigatus*), Geiser *et al.* (*Proc. natn Acad. Sci. U.S.A.* 95: 388, 1998; cryptic speciation), Geiser *et al.* (*Nature Lond.* 394 no. 6689: 137, 1998; pathogen of sea fans), Geiser *et al.* (*Mycol.* 90: 831, 1998; phylogeny of sect. *Fumigati*), Katz *et al.* (*FEMS Immunol. Med. Microbiol.* 20: 283, 1998; DNA sequence variation), McAlpin *et al.* (*Pl. Dis.* 82: 1132, 1998; genetic diversity of *A. parasiticus*), Nikkuni *et al.* (*J. gen. appl. Microbiol.* Tokyo 44: 225, 1998; *A. oryzae*), Brenier-Pinchart *et al.* (*J. Mycol. Médic.* 9: 16, 1999; molecular diagnostics), Latgé (*Clin. Microbiol. Rev.* 12: 310, 1999; aspergillosis), Samson (*Contributions to Microbiology* 2: 5, 1999; *A. fumigatus* group), Sigler & Kennedy (*Manual of Clinical Microbiology*: 1212, 1999; review), Frisvad & Samson (*Stud. Mycol.* 45: 201, 2000; subgenus *Circumdati*), Geiser *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 381, 2000; molecular analytical tools), Geiser *et al.* (*Fungal Genetics Biol.* 31: 169, 2000; phylogeny of *A. flavus* group), Hanazawa *et al.* (*Journal of Medical Microbiology* 49: 285, 2000; detection of *A. fumigatus*), Klich & Cleveland (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 425, 2000; mycotoxin biosynthesis), Okuda *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 83, 2000; morphological variation), Peterson (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 323, 2000; phylogeny), Pitt & Samson (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 51, 2000; typification), Pitt *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 9, 2000; accepted species), Seifert (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 139, 2000; synoptic key), Tamura *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 357, 2000; phylogeny), Tran-Dinh *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 435, 2000; toxigenicity), Varga *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 397, 2000; black aspergilli), Varga *et al.* (*Can. J. Microbiol.* 46: 593, 2000; *A. ochraceus* group), Moraes *et al.* (*Mycotaxon* 78: 413, 2001; from mosquitoes), Rath (*Mycoses* 44: 65, 2001; reference

- strains), Yokoyama *et al.* (*FEMS Microbiol. Lett.* **200**: 241, 2001; phylogeny of sect. *Nigri*), Zhao *et al.* (*J. Clin. Microbiol.* **39**: 2261, 2001; identification using nested PCR), Montiel *et al.* (*MR* **107**: 1427, 2003; AFLPs in sect. *Flavi*), Varga *et al.* (*Antonie van Leeuwenhoek* **83**: 191, 2003; sect. *Clavati*), Aguirre *et al.* (*J. Clin. Microbiol.* **42**: 3495, 2004; rapid diagnostics), Frisvad *et al.* (*Stud. Mycol.* **50**: 23, 2004; ochratoxigenic species), Raghukumar *et al.* (*Deep Sea Research Part I: Oceanographic Research Papers* **51**: 1759, 2004; deep sea sediments), Samson *et al.* (*Stud. Mycol.* **50**: 45, 2004; sect. *Nigri*), Sugita *et al.* (*Medical Mycology* **42**: 433, 2004; PCR identification), Varga *et al.* (*Eur. J. Pl. Path.* **110**: 627, 2004; agriculturally important species), Cary *et al.* (*Mycol.* **97**: 425, 2005; aflatoxigenic species), Dörfelt & Schmidt (*MR* **109**: 956, 2005; fossil in amber), Dyer & Paoletti (*Medical Mycology* **43** Suppl. 1: S7, 2005; sexuality in *A. fumigatus*), Galagan (*Nature Lond.* **438** no. 7071: 1105, 2005; sequencing of *A. nidulans*), Halliday *et al.* (*J. Clin. Microbiol.* **43**: 5366, 2005; real-time PCR), Hong *et al.* (*Mycol.* **97**: 1316, 2006; polyphasic taxonomy of *A. fumigatus* group), Leinberger *et al.* (*J. Clin. Microbiol.* **43**: 4943, 2005; microarrays), Nierman (*Nature Lond.* **438** no. 7071: 1151, 2005; genome of *A. fumigatus*), Pringle *et al.* (*Evolution* Lancaster, Pa. **59**: 1886, 2005; cryptic speciation in *A. fumigatus*), Varga *et al.* (*Antonie van Leeuwenhoek* **88**: 141, 2005; *A. terreus* group), Geiser *et al.* (*Mycol.* **98**: 1053, 2006; phylogeny), Hong *et al.* (*Mycol.* **97**: 1316, 2005; polyphasic taxonomy of *A. fumigatus* group), Balajee *et al.* (*Stud. Mycol.* **59**: 39, 2007; clinical identification), Frisvad *et al.* (*Stud. Mycol.* **59**: 31, 2007; chemistry, species recognition), Geiser *et al.* (*Stud. Mycol.* **59**: 1, 2007; review, identification methods), Houbraken *et al.* (*Stud. Mycol.* **59**: 107, 2007; section *Usti*), Klaasen & Osheroov (*Stud. Mycol.* **59**: 47, 2007; strain typing), Pál *et al.* (*Stud. Mycol.* **59**: 19, 2007; mating type and VC genes), Perrone *et al.* (*Stud. Mycol.* **59**: 53, 2007; in agricultural products), Pitt & Samson (*Stud. Mycol.* **59**: 67, 2007; nomencl.), Rokas *et al.* (*Stud. Mycol.* **59**: 11, 2007; comparative genomics), Samson *et al.* (*Stud. Mycol.* **59**: 71, 2007; species concepts), Samson *et al.* (*Stud. Mycol.* **59**: 129, 2007; black-spored spp.), Samson *et al.* (*Stud. Mycol.* **59**: 147, 2007; section *Fumigati*), Varga *et al.* (*Stud. Mycol.* **59**: 75, 2007; section *Candidi*), Varga *et al.* (*Stud. Mycol.* **59**: 89, 2007; section *Clavati*), Peterson (*Mycol.* **100**: 205, 2008; 4-locus phylogeny).
- Asperisporium** Maubl. (1913), anamorphic *Pezizomycotina*, Hsp.1eP.10. 12, America. *A. caricae* (*Carica papaya* leaf spot). See Baker *et al.* (*Mycotaxon* **76**: 247, 2000), Schubert & Braun (*Fungal Diversity* **20**: 187, 2005).
- Asperopilum** Spooner (1987), Hyaloscyphaceae. 1 (on *Juncus*), Australasia. See Spooner (*Biblthca Mycol.* **116**, 1987).
- Asperotrichum**, see *Asporotrichum*.
- asperulate**, delicately asperate.
- Aspicilia** A. Massal. (1852) nom. cons., Megasporaceae (L.). c. 230, widespread. See Clauzade & Roux (*Bull. Soc. bot. Centre-Ouest Nouv. sér.* **15**: 127, 1984; Eur., gen. concept.), Laundon & Hawksworth (*Taxon* **37**: 478, 1988; nomencl.), Rosentreter in Glenn *et al.* (Eds) (*Lichenogr. Thomsoniana*: 163, 1998), Wedin *et al.* (*MR* **109**: 159, 2005; posn), Miadlikowska *et al.* (*Mycol.* **98**: 1088, 2006; phylogeny), Schmitt *et al.* (*J. Hattori bot. Lab.* **100**: 753, 2006; phylogeny), Nordin *et al.* (*Biblthca Lichenol.* **96**: 247, 2007; phylogeny, chemistry), Nordin *et al.* (*Lichenologist* **40**: 127, 2008; phylogeny).
- Aspiciliella** M. Choisy (1932) = *Aspicilia* fide Purvis *et al.* (*Lichen Flora of Great Britain and Ireland*: 710 pp., 1992).
- aspicilioid** (of lecanorine apothecia), more or less immersed in the thallus, at least when young.
- Aspiciliomyces** Cif. & Tomas. (1953) = *Pachyospora*.
- Aspiciliopsis** (Müll. Arg.) M. Choisy (1929), Trapeliaceae (L.). 2. See Schmitt *et al.* (*Mycol.* **95**: 827, 2003; phylogeny), Lumbsch *et al.* (*MR* **111**: 1133, 2007).
- Aspidelia** Stirt. (1900) = *Parmelia* fide Culberson (*Bryologist* **69**: 113, 1966), Hale (*Bull. Br. Mus. nat. hist. Bot.* **8**: 227, 1981).
- Aspidella** E.-J. Gilbert (1941) = *Amanita* Pers. fide Singer (*Agaric. mod. Tax.* edn 3, 1975).
- Aspidopyrenis** Clem. & Shear (1931) = *Aspidopyrenium*.
- Aspidopyrenium** Vain. (1890) = *Aspidothelium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Lücking (*Willdenowia* **29**: 299, 1999).
- Aspidothea** Syd. (1927) = *Inocyclus* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* **11** no. 2, 1962).
- Aspidotheliaceae** Räsänen ex J.C. David & D. Hawksw. (1991), *Pezizomycotina* (inc. sed.) (L.). 1 gen. (+ 6 syn.), 13 spp.
Lit.: Aptroot & Sipman (*Lichenologist* **25**: 121, 1993), Malcolm & Vězda (*Australas. Lichenol. Newsl.* **37**: 13, 1995), Lücking & Sérusiaux (*Nordic Jl Bot.* **16**: 661, 1996), Lücking (*Willdenowia* **29**: 299, 1999), Arie *et al.* (*J. gen. appl. Microbiol.* Tokyo: 257, 2000).
- Aspidotheliomyces** Cif. & Tomas. (1953) = *Aspidothelium*.
- Aspidothelium** Vain. (1890), *Aspidotheliaceae* (L.). 13, widespread (tropical). See Santesson (*Symb. bot. upsal.* **12** no. 1: 1, 1952), Lücking (*Trop. Bryol.* **15**: 45, 1998; Guyana), Lücking (*Willdenowia* **29**: 299, 1999; Ecuador), McCarthy (*Flora of Australia* **58** A: 242 pp., 2001), Flakus & Wilk (*J. Hattori bot. Lab.* **99**: 307, 2006; Bolivia), Aptroot *et al.* (*Biblthca Lichenol.* **97**, 2008; Costa Rica).
- Aspilaima** Bat. & H. Maia (1961), anamorphic *Pezizomycotina*, Cpt.0eP.?. 1, Brazil. See Batista & Maia (*Publções Inst. Micol. Recife* **338**: 5, 1961).
- Aspilidea** Hafellner (2001), *Lecanorales* (L.). 1. See Hafellner & Türk (*Stapfia* **76**: 149, 2001).
- A-spore**, see alpha-spore.
- asporogenic (asporogenous)**, not forming spores.
- asporogenic yeasts**, see Yeasts.
- Asporomyces** Chaborski (1918) = *Torulopsis* Berl. fide Mrak *et al.* (*Mycol.* **34**: 139, 1942), Barnett *et al.* (*Yeasts: Characteristics and Identification* 3rd edn, 2000).
- Asporotrichum** Link (1809) nom. dub., anamorphic *Agaricomycetidae*. Based on mycelium fide Fries (*Syst. mycol.* **3**, index: 1832). = *Sporotrichum* (*Agaricomycetidae*, inc. sed.) fide Streinz (*Nom. fung.*, 1862).
- Asproinocybe** R. Heim (1970), ? *Tricholomataceae*. 5, Africa (tropical). See Heinemann & Thoen (*Fl. illustr. Champ. Afr. centr.* **5**: 102, 1977), Guzmán *et al.* (*Docums Mycol.* **33** no. 131: 23, 2004).
- Aspropaxillus** Kühner & Maire (1934) = *Leucopaxillus* fide Singer (*Agaric. mod. Tax.* edn 3, 1975).

assimilative (1) taking in; (2) (of hyphae) having to do with the growth phase before reproduction; non-reproductive; vegetative.

Assoa Urries (1944), *Pezizomycotina*. 1, Spain.

association, see phytosociology.

astatocoenocytic (of nuclear behaviour in basidiomycetes), haplont mycelium cells coenocytic, diplont binucleate but coenocytic and without clamps when aeration insufficient, basidioma binucleate; in contrast to **holocoenocytic** (haplont and diplont coenocytic, only developing basidium binucleate), **heterocytic** (haplont regularly coenocytic), and the **normal** condition when the haplont is uninucleate, the diplont binucleate (Boidin, in Petersen (Ed.), *Evolution in the higher basidiomycetes*: 129, 1971).

Astelechia Cif. (1962), anamorphic *Pezizomycotina*, Hso.≡ eP.?. 2, Dominican Republic. See Ciferri (*Atti Ist. bot. Univ. Lab. crittog. Pavia* sér. 5 19: 90, 1962).

Asterella (Sacc.) Sacc. (1891) [non *Asterella* P. Beauv. 1805, *Hepaticae*] = *Asterina* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).

Asterella Hara (1936) [non *Asterella* P. Beauv. 1805, *Hepaticae*] = *Astrosphaeriella* fide Hawksworth (*J. Linn. Soc. Bot.* 82: 35, 1981).

Asteridiella McAlpine (1897), *Meliolaceae*. 300, widespread (tropical). See Hansford (*Sydowia* 10: 41, 1956), Hughes (*Mycol. Pap.* 166, 1993), Song *et al.* (*Acta Mycol. Sin.* 15: 247, 1996; China), Dianese & Furlanetto (*Progress in Microbial Ecology* Proceedings of the Seventh International Symposium on Microbial Ecology. Santos, São Paulo, Brazil 1995: 207, 1997; Brazil), Hosagoudar *et al.* (*The Meliolineae A Supplement*: 201 pp., 1997; India), Mibey & Hawksworth (*Mycol. Pap.* 174: 108 pp., 1997; Kenya), Hsieh *et al.* (*Taiwan Ascomycetes* Pyrenomycetes and Loculoascomycetes, 2000; Taiwan), Song & Li (*Mycotaxon* 89: 201, 2004; China).

Asteridiellina Seaver & Toro (1926) = *Actinopeltis* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).

Asteridium (Sacc.) Speg. ex Sacc. (1891) = *Meliola* fide Höhnelt (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt. 1* 119: 414, 1910), Hosagoudar (*Sydowia* 55: 162, 2003).

Asterina Lév. (1845), *Asterinaceae*. Anamorphs *Asterostomella*, *Clasterosporium*-like. c. 336 (on leaves), widespread (esp. tropical). See Doidge (*Bothalia* 4: 273, 1942), Hansford (*Mycol. Pap.* 15, 1946), Reynolds (*Cryptog. Mycol.* 8: 251, 1987; asci), Rahayu & Parbery (*MR* 95: 731, 1991; Australia), Mibey & Hawksworth (*Mycol. Pap.* 174, 1997; Kenya), Hosagoudar & Abraham (*J. Econ. Taxon. Bot.* 24: 557, 2000; nomenclator), Hosagoudar *et al.* (*Journal of Mycopathological Research* 39: 61, 2001; posn), Song & Li (*Mycotaxon* 84: 407, 2002; China), Hosagoudar (*Zoos' Print Journal* 18: 1280, 2003; India), Hofmann & Piepenbring (*Mycol. Progr.* 7: 87, 2008; Panama).

Asterinaceae Hansf. (1946), ? *Capnodiales*. 46 gen. (+ 39 syn.), 653 spp.

Lit.: Doidge (*Bothalia* 4: 273, 1942; S. Afr.), Farr (*Mycol.* 78: 269, 1986), Swart (*TBMS* 87: 81, 1986), Farr (*Mycol.* 79: 97, 1987), Reynolds (*Cryptog. Mycol.* 8: 251, 1987), Rahayu & Parbery (*MR* 95: 731, 1991), Hosagoudar & Goos (*Mycotaxon* 52: 467, 1994), Hosagoudar *et al.* (*Mycotaxon* 58: 489, 1996), Mibey & Hawksworth (*Mycol. Pap.* 174: 108 pp., 1997), Mibey & Hawksworth (*Mycol. Pap.* 174, 1997; Kenya), Goos (*Mycotaxon* 73: 455, 1999).

Asterinales M.E. Barr ex D. Hawksw. & O.E. Erikss. (1986) = *Capnodiales*. Perhaps synonymous with *Capnodiales*, but very few molecular data are available. See *Asterinaceae*.

Asterinella Theiss. (1912), *Microthyriaceae*. Anamorphs *Asterostomula*, *Asteromella*-like. c. 6, widespread (subtropical). See Hosagoudar *et al.* (*Mycotaxon* 58: 489, 1996), Hosagoudar & Abraham (*MR* 102: 184, 1998).

Asterinema Bat. & Gayão (1953), *Microthyriaceae*. Anamorph *Eriothyrium*. 1, Brazil. See Farr (*Mycol.* 75: 1036, 1983).

Asterinites Doub. & D. Pons ex Kalgutkar & Janson. (2000), *Fossil Fungi*. 1, Colombia. See Kalgutkar & Jansonius (*AASP Contributions Series* 39: 31, 2000).

Asterinites Doub. & D. Pons (1973), *Fossil Fungi*. 2 (Paleocene), Colombia.

Asterinites Krassilov (1967), *Fossil Fungi*. 2 (Cretaceous), former USSR.

Asterinopeltis Bat. & H. Maia (1958) = *Platypeltella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).

Asterinotheca Bat. & H. Maia (1958) ? = *Asterina* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).

Asterinothyriella Bat. & Cif. (1959), anamorphic *Pezizomycotina*, Cpt.≡ eH.?. 1, Uganda. See Batista & Ciferri (*Atti Ist. bot. Univ. Lab. crittog. Pavia* sér. 5 16: 85, 1959).

Asterinothyrium Bat., Cif. & H. Maia (1959), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, S. Africa. See Batista *et al.* (*Mycopath. Mycol. appl.* 11: 27, 1959).

Asterinula Ellis & Everh. (1889) = *Leptothyrella* fide Saccardo (*Syll. fung.* 10: 1, 1892).

Asterisca G. Mey. (1825) = *Sarcographa* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Asteristion Leight. (1870) = *Chapsa* fide Hale (*Bull. Br. Mus. nat. hist. Bot.* 8: 227, 1981).

Asteristium Clem. (1909) ≡ *Asteristion*.

Asteritea Bat. & R. Garnier (1961), ? *Microthyriaceae*. 1, Brazil. See Batista & Garnier (*Broteria* ser. bot. 30: 41, 1961).

Asterobolus Redhead & P.W. Perrin (1972) = *Valdensia* fide Redhead & Perrin (*CJB* 50: 2083, 1972).

Asterocalyx Höhn. (1912), *Sclerotiniaceae*. 2, widespread. See Dumont & Carpenter (*Mycol.* 70: 68, 1978), Spooner (*Biblthca Mycol.* 116, 1987).

Asterochaete (Pat.) Bondartsev & Singer (1941) [non *Asterochaete* Nees 1834, *Cyperaceae*] ≡ *Echinochaete*.

Asteroconium Syd. & P. Syd. (1903), anamorphic *Pezizomycotina*, Cac.1bH.1/10. 2, C. America; India; China. See Sutton (*The Coelomycetes*, 1980).

Asterocyphella W.B. Cooke (1961), *Cyphellaceae*. 3, widespread. See Cooke (*Beih. Sydowia* 4: 118, 1961; key).

Asterocystis De Wild. (1893) = *Olpidium* fide Sampson (*TBMS* 23: 199, 1939).

Asterodon Pat. (1894), *Hymenochaetaceae*. 1, widespread (north temperate). See Corner (*TBMS* 31: 234, 1948), Müller *et al.* (*MR* 104: 1485, 2000).

Asterodontaceae Parmasto (2001) = *Hymenochaetaceae*.

Asterodothis Theiss. (1912), *Asterinaceae*. Anamorph *Asterostromina*. 1, Africa. See Hosagoudar *et al.* (*Journal of Mycopathological Research* 39: 61, 2001).

Asterogastraceae R. Heim (1934) = *Russulaceae*.

asteroid body, a stellate cell of *Sporothrix schenckii*

- (more rarely *Aspergillus* or other pathogens) in animal tissues resulting from an antigen-antibody complex precipitate deposited on the cell wall (Lurie & Snell, *Sabouraudia* 7: 64, 1969).
- Asteroides** Puntoni & Léon (1940) nom. dub., Fungi.
- Asterolibertia** G. Arnaud (1918), Asterinaceae. c. 18, widespread (subtropical). See Hosagoudar & Abraham (*Journal of Mycopathological Research* 35: 55, 1997; India).
- Asteroma** DC. (1815), anamorphic *Gnomoniella*, *Plagiostoma*, Cpd.0eH.15. 14, widespread (esp. north temperate). See Sutton (*The Coelomycetes*, 1980).
- Asteromassaria** Höhn. (1917), Pleomassariaceae. Anamorph *Scolicosporium*. 11, Europe; N. America. See Barr (*Mycotaxon* 15: 349, 1982), Spooner & Kirk (*TBMS* 78: 247, 1982; anamorph), Sivanesan (*TBMS* 91: 317, 1988; key 9 spp.), Mehrotra & Sivanesan (*MR* 93: 557, 1989), Barr (*Mycotaxon* 49: 129, 1993; key 8 N. Am. spp.), Tanaka *et al.* (*Mycoscience* 46: 248, 2005; Japan).
- Asteromella** Pass. & Thüm. (1880), anamorphic *Dothideomycetes*, Cpd.0eH.15. 234, widespread. Almost certainly polyphyletic. See Batista *et al.* (*Saccardoia* 1: 17, 1960), Sutton (*The Coelomycetes*, 1980), Vanev & van der Aa (*Persoonia* 17: 47, 1998; annotated list).
- Asteromellopsis** H.E. Hess & E. Müll. (1951), anamorphic *Dothidea*, St.0eH.15. 1, Switzerland. See Hess & Müller (*Ber. schweiz. bot. Ges.* 61: 18, 1951), Goodwin & Zismann (*Mycol.* 93: 934, 2001; phylogeny).
- Asteromidium** Speg. (1888), anamorphic *Pezizomycotina*, Cac.≡ eH.10. 3, Brazil. See Petrak & Sydow (*Annl. mycol.* 34: 14, 1936), Ferreira & Muchovej (*Mycotaxon* 30: 97, 1987; addit. spp.), Pomella *et al.* (*Mycotaxon* 64: 83, 1997).
- Asteromites** Poinar (2003), Fossil Fungi. 1, Chiapas. See Poinar (*MR* 107: 121, 2003).
- Asteromyces** Moreau & M. Moreau ex Hennebert (1962), anamorphic *Pezizomycotina*, Hso.0eP.11/14. 1, France. See Hennebert (*CJB* 40: 1211, 1962), Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 34: 1, 1991).
- Asteromyxa** Theiss. & Syd. (1918) ≡ *Dimeriella*.
- Asteronaevia** Petr. (1929) = *Diplonaevia* fide Hein (*Nova Hedwigia* 38: 669, 1983).
- Asteronectrioidea** Cant. (1949), anamorphic *Pezizomycotina*, St.1eH.15. 1, Africa.
- Asteronema** Trevis. (1845) nom. dub., ? Fungi.
- Asteronia** (Sacc.) Henn. (1895), Microthyriaceae. 2, Brazil. See Sutton (*Mycol. Pap.* 141, 1977).
- Asteropeltis** Henn. (1904) = *Trichothelium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Asterophlyctis** H.E. Petersen (1903) = *Diplophlyctis* fide Dogma (*Nova Hedwigia* 25: 121, 1974).
- Asterophoma** D. Hawksw. (1981), anamorphic *Chaenothecopsis*, Cpd.0eH.15. 1 (on *Calicium*), widespread. See Tibell (*CJB* 69: 2427, 1991; ultrastr.).
- Asterophora** Ditmar (1809), Lyophyllaceae. Anamorph *Ugola*. 3 (2 on other agarics, esp. *Russula*), widespread (temperate). On basidioma of *Russula* and *Lactarius*. See Redhead & Seifert (*Taxon* 50: 243, 2001; nomencl.), Walther *et al.* (*MR* 109: 525, 2005; conidiogenesis).
- asterophysis**, see seta.
- Asteroporomyces** Cif. & Tomas. (1953) ≡ *Asteroporum*.
- Asteroporum** Müll. Arg. (1884), Arthoniales (±L). 3, widespread (tropical). See McCarthy (*Flora of Australia* 58 A: 242 pp., 2001).
- Asteropsis** Gonz. Frag. (1917), anamorphic *Pezizomycotina*, Cpd.0eP.?. 1, Spain.
- Asteroscutula** Petr. (1948), anamorphic *Pezizomycotina*, Cpt.0eP.?. 1, Ecuador.
- asteroseta** (1) see cystidium; (2) see seta.
- Asterosphaeria** (Höhn.) Syd. (1913) = *Astrosphaeriella* fide Hawksworth (*J. Linn. Soc. Bot.* 82: 35, 1981).
- Asterosporales** = Russulales.
- Asterosporium** Kunze (1819), anamorphic *Pezizomycotina*, Cac.0bP.1. 5, widespread (temperate). See Murvanishvili & Dekanoidze (*Mikol. Fitopatol.* 26: 27, 1992; key).
- Asterostomella** Speg. (1886), anamorphic *Asterina*, Cpt.0eP.?. 39, widespread (tropical). See Batista & Ciferri (*Mycopathologia* 11: 44, 1959), Hosagoudar & Goos (*Mycotaxon* 52: 467, 1994; India), Hofmann & Piepenbring (*Mycol. Progr.* 7: 87, 2008; Panama).
- Asterostomidium** Lindau (1900) ≡ *Asteromidium*.
- Asterostomopora** Bat. & H. Maia (1960), anamorphic *Pezizomycotina*, Cpt.0eP.?. 1, Jamaica. See Batista & Maia (*Publções Inst. Micol. Recife* 221: 5, 1960).
- Asterostomopsis** Bat., Cif. & H. Maia (1959), anamorphic *Pezizomycotina*, Hsp.0eP.?. 1, Ghana. See Batista *et al.* (*Mycopath. Mycol. appl.* 11: 56, 1959).
- Asterostomula** Theiss. (1916), anamorphic *Pezizomycotina*, Cpt.0eP.?. 4, widespread (tropical).
- Asterostomulina** Bat., J.L. Bezerra & H. Maia (1964), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, Brazil. See Batista *et al.* (*Portugaliae Acta Biologica Série B* 7: 385, 1964).
- Asterostroma** Massee (1889), Lachnocladiaceae. 14, widespread. See Boidin (*BSMF* 113: 269, 1997; key), Wagner (*Mycotaxon* 79: 235, 2001; phylogenetics).
- Asterostromataceae** Pouzar (1983) = *Hymenochaetae*.
- Asterostromella** Höhn. & Litsch. (1907) = *Vararia* fide Burt (*Ann. Mo. bot. Gdn* 9: 1, 1922).
- Asterostromina** Bat. & A.F. Vital (1957), anamorphic *Asterodothis*, Cpt.0eH.?. 1, S. Africa. See Batista & Vital (*Revta Biol. Lisb.* 1: 116, 1957).
- Asterotaxis** Arx (1958), Asterinaceae. 2, America (tropical); Nepal. See von Arx (*Fungus Wageningen* 28: 6, 1958), Hosagoudar *et al.* (*Journal of Mycopathological Research* 39: 61, 2001; posn).
- Asterotheca** I. Hino (1938) [non *Asterotheca* C. Presl 1846, fossil *Pteridophyta*] ≡ *Astrotheca*.
- Asterothecium** Wallr. (1836) ≡ *Stephanoma*.
- Asterothelium**, see *Astrothelium*.
- Asterothrix** Kütz. (1843) [non *Asterothrix* Cass. 1827, *Compositae*] ≡ *Asteronema*.
- Asterothyriaceae** Walt. Watson ex R. Sant. (1952), Ostropales (L). 3 gen. (+ 12 syn.), 59 spp.
Lit.: Santesson (*Symb. bot. upsäl.* 12 no. 1: 1, 1952), Sérusiaux & de Sloover (*Veröff. geobot. Inst., Zürich* 91: 260, 1986; hypophores), Sérusiaux & Sloover (*Veröff. geobot. Inst., Zürich* 91: 260, 1986), Hansen *et al.* (*Herzogia* 7: 367, 1987), Vězda & Poelt (*Phyton Horn* 30: 47, 1990), Vězda & Poelt (*Nova Hedwigia Beih.* 53: 99, 1991), Etayo & Vězda (*Lichenologist* 26: 333, 1994), Boom & Vězda (*Mycotaxon* 54: 421, 1995), Lücking (*Cryptog. Mycol.* 20: 193, 1999; phylogeny, inclusion of *Solorinellaceae*), Lücking (*Willdenowia* 29: 299, 1999), Henssen & Lücking (*Ann. bot. fenn.* 39: 273, 2002),

- Lücking *et al.* (*Mycol.* **96**: 283, 2004).
- Asterothyriomyces** Cif. & Tomas. (1953) = *Asterothyrium* Müll. Arg.
- Asterothyrites** Cookson (1947), Fossil Fungi. 4 (Tertiary), widespread. = *Phragmothyrites* (Fossil fungi) fide Selkirk.
- Asterothyrium** Henn. (1904) = *Septothyrella*.
- Asterothyrium** Müll. Arg. (1890), *Asterothyriaceae* (L). 24, widespread (tropical). See Santesson (*Symb. bot. upsal.* **12** no. 1: 1, 1952), Vězda & Poelt (*Phyton Horn* **30**: 47, 1990; posn), Henssen & Lücking (*Ann. bot. fenn.* **39**: 273, 2002; anatomy, ontogeny), Lücking *et al.* (*Mycol.* **96**: 283, 2004; phylogeny, links with *Gomphillaceae*).
- Asterotrema** Müll. Arg. (1884) ? = *Arthonia* fide Aptroot (*Biblthca Lichenol.* **44**, 1991).
- Asterotremella** Prillinger, Lopandic & Sugita (2007), anamorphic *Trichosporonaceae*. 5, widespread. See Prillinger *et al.* (*J. gen. appl. Microbiol.* **53**: 167, 2007).
- Asterotremellaceae** Prillinger, Lopandic & Sugita (2007) = *Trichosporonaceae*.
- Asterotrichum** Bonord. (1851) = *Asterophora* fide Saccardo (*Syll. fung.* **4**: 1, 1886).
- Asterotus** Singer (1943) = *Resupinatus* fide Thorn *et al.* (*Mycol.* **97**: 1140, 2005).
- Asterula** (Sacc.) Sacc. (1891) = *Venturia* Sacc. fide von Arx & Müller (*Stud. Mycol.* **9**, 1975).
- Astiothyrium** Bat. (1964) = *Eudimerium* fide von Arx & Müller (*Stud. Mycol.* **9**, 1975).
- Astoma** Gray (1821) = *Sclerotium* fide Rabenhorst (*Deutsch. Krypt. Fl.* **1**: 1, 1844).
- astomate** (astomous), lacking an ostiole.
- Astomella** Thirum. (1947), *Pezizomycotina*. 1, India.
- Astrabomyces** Bat. (1961) nom. dub., anamorphic *Pezizomycotina*, Hso. = eP.? (L). 1, Brazil. See Lücking *et al.* (*Lichenologist* **30**: 121, 1998).
- Astraeaceae** Zeller ex Jülich (1982) = *Diplocystidiaceae*.
- Astraeus** Morgan (1889), *Diplocystidiaceae*. 2, widespread. *A. hygrometricus*, a mycorrhizal earth-star common in dry places. See Phosri *et al.* (*Mycotaxon* **89**: 453, 2004; Thailand), Sarasini (*Gasteromiceti Epigei*: 406 pp., 2005), Phosri *et al.* (*MR* **111**: 275, 2007).
- Astragoxyphium** Bat., Nascim. & Cif. (1963) = *Lep-toxyphium* fide Hughes (*Mycol.* **68**: 693, 1976), Inácio & Dianese (*MR* **102**: 695, 1998).
- Astrocitum** Raf. (1806) = *Astrycum*.
- Astrocystidaceae** Hara (1913) = *Xylariaceae*.
- Astrocystis** Berk. & Broome (1873), *Xylariaceae*. Anamorph *Acanthodochium*. 15 (esp. on bamboo and palms), widespread (tropical). See Diehl (*Mycol.* **17**: 185, 1925; morphology), Ju & Rogers (*Mycol.* **82**: 342, 1990; as *Rosellinia*), Læssøe & Spooner (*Kew Bull.* **49**: 1, 1994; key, monograph), Dulymamode *et al.* (*MR* **102**: 1325, 1998), Smith & Hyde (*Fungal Diversity* **7**: 89, 2001), Petrini (*N.Z. J Bot.* **41**: 71, 2003; New Zealand), Bahl *et al.* (*Mycol.* **97**: 1102, 2005; phylogeny).
- Astrodochium** Ellis & Everh. (1897), anamorphic *Pezizomycotina*, Hsp.0eP.?. 1, N. America. See Harrison (*Pl. Dis.* **77**: 1263, 1993), Carris (*Sydowia* **47**: 150, 1995).
- astrogastraceous fungi**, gasteroid members of the *Russulales*. See also *Hymenogastrales*, *Podaxales*.
- Astronatelia** Bat. & H. Maia (1962), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, USA. See Batista & Maia (*Publções Inst. Micol. Recife* **209**: 8, 1962).
- Astroplaca** Bagl. (1858) = *Placolecis* fide Hafellner (*Beih. Nova Hedwigia* **79**: 241, 1984).
- Astrosphaeriella** Syd. & P. Syd. (1913), ? *Melanommataceae*. Anamorph *Pleurophomopsis*. 51, widespread. See Hawksworth (*J. Linn. Soc. Bot.* **82**: 35, 1981), Hawksworth & Boise (*Sydowia* **38**: 114, 1986; key 10 spp.), Hyde & Fröhlich (*Sydowia* **50**: 81, 1998; spp. on palms), San Martín *et al.* (*Acta Bot. Mexicana* **46**: 19, 1999), Hyde *et al.* (*Nova Hedwigia* **70**: 143, 2000), Zhou *et al.* (*Cryptog. Mycol.* **24**: 191, 2003), Chen & Hsieh (*Bot. Bull. Acad. sin. Taipei* **45**: 171, 2004).
- Astrosporina** J. Schröt. (1889) = *Inocybe* fide Kauffman (*N. Amer. Fl.* **10**, 1924) See, Horak (*Persoonia* **10**: 157, 1979; key to 30 spp. from Indomalaya, Australasia).
- Astrotheca** I. Hino (1938) = *Astrosphaeriella* fide Hawksworth (*J. Linn. Soc. Bot.* **82**: 35, 1981).
- Astrotheliaceae** Zahlbr. (1898) = *Trypetheliaceae*.
- Astrothelium** Eschw. (1824), *Trypetheliaceae* (L). c. 40, widespread (tropical). See Harris (*Acta Amazon. Supl.* **14**: 55, 1984; key 13 spp. Brazil), Makhija & Patwardhan (*Biovigyanam* **15**: 61, 1989; fam. status), McCarthy (*Flora of Australia* **58 A**: 242 pp., 2001; Australia), Aptroot *et al.* (*Biblthca Lichenol.* **97**, 2008; Costa Rica).
- Astrycum** Raf. (1809) ? = *Geastrum* fide Stalpers (*in litt.*).
- Astylospora** Fayod (1889) = *Psathyrella* fide Singer (*Agaric. mod. Tax.* edn 3, 1975).
- asymmetric** (of spores), having one side flattened or concave.
- Asymmetricospora** J. Fröhl. & K.D. Hyde (1998), *Melanommataceae*. 1, Australia. See Fröhlich & Hyde (*Sydowia* **50**: 183, 1998).
- Asyregraamspora** Locq. & Sal.-Cheb. (1980), Fossil Fungi. 1, Cameroon.
- ATBI** (All-Taxon Biodiversity Inventory), a record of the total diversity of living organisms present in one area. See Cannon (*Inoculum* **46**(4): 1, 1995), Inventorying.
- ATCC**, American Type Culture Collection (Rockville, Md, USA); a not-for-profit service collection founded in 1925; see *American Type Culture Collection profile* (1992).
- Atelothylax** M. Ota & Langeron (1923), anamorphic *Pezizomycotina*, Hso.???. 1, Sweden.
- Atelocauda** Arthur & Cummins (1933), *Pileolariaceae*. 2 (on *Leguminosae: Faboideae*), C. America; Australia. See Walker (*Australasian Mycologist* **20**: 3, 2001; monogr., emend., key).
- Atelosaccharomyces** Beurm. & Gougerot (1909) = *Cryptococcus* Vuill. fide von Arx *et al.* (*Stud. Mycol.* **14**: 1, 1977).
- Atelosaccharomycetaceae** Guillerm. (1928) = *Filobasidiaceae*.
- Atestia** Trevis. (1861) = *Oropogon* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Athecaria** Nyl. (1897) ? = *Aspicilia* fide Santesson (*ING* **1**: 155, 1979; typification).
- Athelia** Pers. (1822), *Atheliaceae*. Anamorph *Fibularhizoctonia*. 28, widespread. See Jülich (*Willdenowia Beih.* **7**, 1972), Jülich (*Persoonia* **10**: 149, 1978; key 'lichenized' spp.) *A. arachnoidea* is an important pathogen of lichens, esp. *Lecanora conizaeoides*, also epiphytic green algae (causing brownish white lesions in its colonies; see, Arvidsson

- (*Svensk bot. Tidskr.* 72: 285, 1979), Okabe & Matsumoto (*MR* 107: 164, 2003; phylogeny *Athelia rolfsii*) See also *Sclerotium*.
- Atheliaceae** Jülich (1982), Atheliales. 22 gen. (+ 3 syn.), 106 spp.
- Lit.*: Gilbertson & Lindsey (*Mem. N. Y. bot. Gdn* 49: 138, 1989), Nakasone (*Mycol. Mem.* 15: 412 pp., 1990), Ryvarden (*Syn. Fung.* 5: 363 pp., 1991), Harlton *et al.* (*Phytopathology* 85: 1269, 1995), Adams & Kropp (*Mycol.* 88: 464, 1996), Stalpers & Andersen in Sneh *et al.* (Eds) (*Rhizoctonia Species Taxonomy, Molecular Biology, Ecology, Pathology and Disease Control*: 58, 1996), Boidin *et al.* (*Mycotaxon* 66: 445, 1998), Ginns (*Mycol.* 90: 19, 1998), Kirschner & Oberwinkler (*Mycoscience* 40: 345, 1999), Hibbett *et al.* (*Nature Lond.* 407: 506, 2000), Larsson *et al.* (*MR* 108: 983, 2004), Binder *et al.* (*Systematics and Biodiversity* 3: 113, 2005).
- Atheliales** Jülich (1981). Agaricomycetidae. 1 fam., 22 gen., 106 spp. Fam.:
- Atheliaceae**
- For *Lit.* see under fam.
- Athelium** K.H. Larss. & Hjortstam (1986), Atheliaceae. 2, Europe. See Larsson & Hjortstam (*Win-dahlia* 15: 49, 1986).
- Athelidium** Oberw. (1966), Stephanosporaceae. 1, Europe. See Oberwinkler (*Sydowia* 19: 62, 1965).
- Athelium** Nyl. (1886) = *Thelocarpon* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Atheloderma** Parmasto (1968), Hymenochaetales. 2, Europe; Asia. See Parmasto (*Consp. System. Corticiac.*: 73, 1968).
- Athelopsis** Oberw. ex Parmasto (1968), Atheliaceae. 10, widespread. Polyphyletic. See Hjortstam (*Mycotaxon* 42: 149, 1991), Kotiranta & Saarenoksa (*Ann. bot. fenn.* 42: 335, 2005; Finland).
- Athrismidium** Trevis. (1860) ? = *Tomasellia* fide Harris (*More Florida Lichens*, 1995).
- Atichia** Flot. (1850), anamorphic *Seuratia*, Hsy/Ccu.0bH-P.1. 6, widespread. See Meeker (*CJB* 53: 2483, 1975), Parbery & Brown (*Microbiology of the Phyllosphere*: 101, 1986), Kendrick (*CJB* 81: 75, 2003; morphogenesis).
- Atichiaceae** Racib. (1900) = *Seuratiaceae*.
- Atichiopsis** R. Wagner (1900) = *Seuratia* fide Meeker (*CJB* 53: 2462, 1975).
- Atkinson** (George Francis; 1854-1918; USA). Professor of Botany, Cornell University (1896-1918). His work did much to stimulate interest in the *Agaricaceae* in the USA. *Publs. Mushrooms Edible and Poisonous* (1901) [edn 2]; Phylogeny and relationships in the ascomycetes. *Annals of the Missouri Botanical Garden* (1915); also other papers on the *Agaricaceae*, phylogeny, and plant diseases. *Biogs, obits etc.* Farlow *et al.* (*American Journal of Botany* 6: 301, 1919); Stafleu & Cowan (*TL-2* 1: 78, 1976); Stafleu & Mennega (*TL-2, Suppl.* 1: 200, 1992).
- Atkinsonella** Diehl (1950), Clavicipitaceae. Anamorphs *Ephelis*, *Sphacelia*. 2, widespread (north temperate). See Leutschmann & Clay (*Mycol.* 81: 692, 1989), Morgan-Jones & White (*Mycotaxon* 35: 455, 1989), Schardl *et al.* (*Pl. Syst. Evol.* 178: 27, 1991; phylogeny), Morgan-Jones & White (*Mycotaxon* 44: 89, 1992; culture), Leutschmann & Clay (*Am. J. Bot.* 83: 1144, 1996; isozymes), Reddy *et al.* (*Mycol.* 90: 108, 1998; DNA).
- Atkinsonia** Lloyd (1916) [non *Atkinsonia* F. Muell. 1865, *Loranthaceae*] = *Sebacina* fide Donk (*Persoonia* 4: 305, 1966).
- atlantic**, confined to the Atlantic seaboard. For classification of different types of atlantic distribution in Europe see Ratcliffe (*New Phytol.* 67: 365, 1968).
- Atmospheric pollution**, see Air pollution.
- atomate**, having a powdered surface.
- Atopospora** Petr. (1925), ? Venturiaceae. Anamorph *Didymochora*. 2, widespread (north temperate). See Sivanesan (*Bitunicate Ascomycetes and their Anamorphs*, 1984), Barr (*Sydowia* 41: 25, 1989).
- Atractiella** Sacc. (1886), Phleogenaceae. 6, widespread. See Donk (*Persoonia* 4: 209, 1966), Bandoni & Inderbitzin (*Czech Mycol.* 53: 265, 2002; n.sp.), Aime *et al.* (*Mycol.* 98: 896, 2006; phylogeny).
- Atractiellaceae** R.T. Moore (1996) = *Phleogenaceae*.
- Atractiellales** Oberw. & Bandoni (1982). Atractiellomycetes. 3 fam., 10 gen., 34 spp. Fams:
- (1) **Atractogloeaceae**
 - (2) **Mycogelidiaceae**
 - (3) **Phleogenaceae** (syn. *Atractiellaceae*, *Hoehnelomycetaceae*)
- Lit.*: Oberwinkler & Bauer (*Sydowia* 41: 224, 1989), Bauer *et al.* (*Mycol. Progress* 5: 41, 2006).
- Atractiellomycetes** R. Bauer, Begerow, J.P. Samp., M. Weiss & Oberw. (2007). Pucciniomycotina. 1 ord., 3 fam., 10 gen., 34 spp. Ord.:
- Atractiellales**
- Lit.*: Bauer *et al.* (*Mycol. Progress* 5: 41, 2006).
- Atractilina** Dearn. & Barthol. (1924), anamorphic *Pezizomycotina*, Hso/Hsy.≡ eH-P.10. 2 (on leaf ascomycetes), widespread (tropical). See Deighton & Pirozynski (*Mycol. Pap.* 128, 1972).
- Atractina** Höhn. (1904) = *Sterigmatobotrys* fide Hughes (*CJB* 36: 727, 1958).
- Atractium** Link (1809), anamorphic *Pezizomycotina*, Hsy.≡ eH.?. 5, widespread.
- Atractobasidium** G.W. Martin (1935) = *Patouillardina* Bres. fide Rogers (*Mycol.* 28: 398, 1936).
- Atractobolus** Tode (1790), *Pezizomycotina*. 1, Europe. See Spooner (*Bibliotheca Mycol.* 116: 1, 1987).
- Atractocolax** R. Kirschner, R. Bauer & Oberw. (1999), Microbotryomycetes. 1 (associated with bark beetles), Europe. See Kirschner *et al.* (*Mycol.* 91: 542, 1999).
- Atractodorus** Klotzsch (1832) nom. dub., Fungi.
- Atractogloea** Oberw. & Bandoni (1982), Atractogloeaceae. 1, USA. See Oberwinkler & Bandoni (*Mycol.* 74: 634, 1982).
- Atractogloeaceae** Oberw. & R. Bauer (1989), Pucciniomycotina (inc. sed.). 1 gen., 1 spp.
- Lit.*: Oberwinkler & Bandoni (*Mycol.* 74: 634, 1982), Oberwinkler (*Stud. Mycol.* 30: 61, 1987), Oberwinkler & Bauer (*Sydowia* 41: 224, 1989).
- Atrichophyton** Castell. & Chalm. (1919) = *Chrysosporium* fide Carmichael in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 390, 1973).
- Atricordyceps** Samuels (1983) = *Podocrella* fide Samuels (*N.Z. Jl Bot.* 21: 171, 1983), Samson *et al.* (*Atlas of Entomopathogenic Fungi*, 1988), Shimazu & Glockling (*MR* 101: 1371, 1997), Chaverri *et al.* (*Mycol.* 97: 433, 2005).
- Atrocybe** Velen. (1947), ? Helotiales. 1, former Czechoslovakia.
- Atropellis** Zeller & Goodd. (1930), Dermateaceae. 4, N. America. *A. pinicola* (pine canker). See Reid & Funk (*Mycol.* 58: 428, 1966; key), Smith *et al.* (*Quarantine Pests for Europe* Edn 2, 1997).
- Atroporus** Ryvarden (1973) = *Polyporus* P. Micheli ex

- Adans. fide Reid (*Mem. N. Y. bot. Gdn* 28: 197, 1976).
- Atrosetaphiale** Matsush. (1995), anamorphic *Pezizomycotina*, Hso.0fH.15. 1, Peru. See Matsushima (*Matsush. Mycol. Mem.* 8: 14, 1995), Mel'nik *et al.* (*Mycol. Progr.* 3: 19, 2004).
- Atrotorquata** Kohlm. & Volkm.-Kohlm. (1993), Cainiaceae. 1, USA. Very similar and possibly related to *Cainia*. See Kohlmeyer & Volkmann-Kohlmeyer (*SA* 12: 7, 1993), Kang *et al.* (*MR* 103: 1621, 1999).
- Attamyces** Kreisel (1972), anamorphic *Leucoagaricus*. 1 (in ants nests), Cuba. See Singer (*Nova Hedwigia* 26: 435, 1975).
- attenuate** (1) narrowed; (2) (of a pathogen), having lowered pathogenicity or virulence.
- Atylospora**, see *Astylospora*.
- atypical**, not normal.
- Auerswaldia** Rabenh. (1857) = *Melanospora* Corda fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Auerswaldia** Sacc. (1883), ? Dothideaceae. 30, widespread (pantropical). See von Arx & Müller (*Stud. Mycol.* 9, 1975), Hyde & Cannon (*Mycol. Pap.* 175, 1999).
- Auerswaldiella** Theiss. & Syd. (1914), ? Botryosphaeriaceae. 4, widespread (tropical). See Sivanesan & Hsieh (*MR* 93: 340, 1989; key), Eriksson & Hawksworth (*SA* 14: 45, 1995; posn).
- Auerswaldiopsis** Henn. (1904) ? = *Patouillardia* fide Höhnelt (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt. 1* 119: 432, 1910).
- Aulacographa** Leight. (1854) = *Graphis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Aulacostroma** Syd. & P. Syd. (1914), Parmulariaceae. 5, pantropical. See Luttrell & Muthappa (*Mycol.* 66: 563, 1974), Magnes (*Biblthca Mycol.* 165, 1997), Inácio & Cannon (*MR* 107: 82, 2003).
- Aulaxina** Fée (1825), Gomphillaceae (L.). 12, widespread (tropical). See Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952), Vězda & Poelt (*Folia geobot. phytotax.* 22: 179, 1987).
- Aulaxinomyces** Cif. & Tomas. (1953) = *Arthonia* fide Lücking & Hawksworth (*Taxon* 56: 1274, 2007).
- auleate** (of gasteromycete basidiomata), a closed basidioma in which pleated plates of trama project into the gleba cavity from top and sides. See Dring (1973); after Kreisel (1969).
- Aulographaceae** Luttr. ex P.M. Kirk, P.F. Cannon & J.C. David (2001), Microthyriales. 2 gen., 31 spp.
Lit.: Batista (*Publções Inst. Micol. Recife* 56, 1959), McKenzie & Foggo (*N.Z. J. Bot.* 27: 91, 1989), Petrini *et al.* (*Mycol. helv.* 3: 263, 1989).
- Aulographella** Höhn. (1917) = *Morenoina* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Aulographina** Arx & E. Müll. (1960), ? Asterinaceae. Anamorph *Thyrinula*. 3, widespread. See Wall & Keane (*TBMS* 82: 257, 1984).
- Aulographopsis** Petr. (1938) nom. nud., anamorphic *Pezizomycotina*.
- Aulographum** Lib. (1834), Aulographaceae. 30, widespread. See Petrini *et al.* (*Mycol. Helv.* 3: 263, 1989).
- Aulospora** Speg. (1909), *Pezizomycotina*. 1, Argentina. See Eriksson & Hawksworth (*SA* 5: 120, 1986).
- Aurantiochytrium** R. Yokoy. & D. Honda (2007), Thraustochytriaceae. (marine). See Yokoyama, R.; Honda, D. (*Mycoscience* 48: 199, 2007).
- Aurantiosacculus** Dyko & B. Sutton (1979), anamorphic *Pezizomycotina*, St.0fH.1. 1 (on *Eucalyptus*), Australia. See Dyko & Sutton (*Mycol.* 71: 922, 1979).
- Aurantiosporium** M. Piepenbr., Vánky & Oberw. (1996), Ustilentylomataceae. 4 (on *Cyperaceae*), widespread (tropical). See Piepenbring *et al.* (*Pl. Syst. Evol.* 199: 62, 1996), Aime *et al.* (*Mycol.* 98: 896, 2006; phylogeny).
- Aurantiporellus** Murrill (1905) = *Pycnoporellus* fide Pegler (*The polypores [Bull. BMS Suppl.]*, 1973).
- Aurantiporus** Murrill (1905), Polyporaceae. 5, north temperate. See Ryvarden (*Syn. Fung.* 5: 363 pp., 1991).
- Aurapex** Gryzenh. & M.J. Wingf. (2006), anamorphic *Cryphonectriaceae*. 1, Colombia. See Gryzenhout *et al.* (*Mycol.* 98: 112, 2006), Gryzenhout *et al.* (*FEMS Microbiol. Lett.* 258: 161, 2006).
- Auraspora** J. Weiser & Purrini (1980), Microsporidia. 1.
- Aureobasidiaceae** Cif. (1958) = Dothioraceae.
- Aureobasidium** Viala & G. Boyer (1891), anamorphic *Discosphaerina*, Hsy.0eP.16. 7, widespread. *A. pullulans*, a variable sp. with many syn. See Cooke (*Mycopathologia* 17: 1, 1962), Joly (*BSMF* 81: 402, 1965; 149 refs), Pugh & Buckley (*TBMS* 57: 227, 1971; endophytic in trees), Hermanides-Nijhof (*Stud. Mycol.* 15: 141, 1977; 14 spp., distinction from *Hormonema* and *Sarcinomyces*), Park (*TBMS* 78: 385, 1982; Y-M dimorphism), Yoshikawa & Yokoyama (*Ann. phytopath. Soc. Japan* 53: 606, 1987; *A. microstictum* on *Hemerocallis*), Elinov *et al.* (*Mikol. Fitopatol.* 23: 425, 1989; physiology and biochemistry), Mokrousov & Bulast (*Genetika* 28: 31, 1992; DNA unhybridizable UP-PCR patterns in *A. pullulans*), Untereiner & Naveau (*Mycol.* 91: 67, 1999; phylogeny), Urzi *et al.* (*J. Microbiol. Meth.* 36: 95, 1999; infraspecific diversity), Yurlova *et al.* (*Stud. Mycol.* 43: 63, 1999), Nelson *et al.* (*BioTechniques* 29: 874, 2000; image analysis), Bolignano & Criseo (*J. Clin. Microbiol.* 41: 4483, 2003; clinical strain), Abliz *et al.* (*FEMS Immunol. Med. Microbiol.* 40: 41, 2004; molecular diagnostics), Hsiao *et al.* (*J. Clin. Microbiol.* 43: 3760, 2005; arrays), Rakeman *et al.* (*J. Clin. Microbiol.* 43: 3324, 2005; molecular diagnostics), Ruibal *et al.* (*Mycol. Progr.* 4: 23, 2005; rock-inhabiting fungi), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny), Sterflinger (*The Yeast Handbook* [1]: 501, 2006; ecology).
- Aureobasis** Clem. & Shear (1931) = *Aureobasidium*.
- Aureoboletus** Pouzar (1957), Boletaceae. 5, widespread. See Wolf (*Biblthca Mycol.* 69, 1980), Watling *et al.* (*British Fungus Flora. Agarics and Boleti Rev. & Enl. Edn* 1: 173 pp., 2005; Brit. spp.).
- Aureofungus** Hibbett, Binder & Wang (2003), Agaricales. 1, Dominican Republic. See Hibbett *et al.* (*Mycol.* 95: 685, 2003).
- Aureohyphozyma** Hosoya & Y. Otani (1995) = *Gelatinipulvinella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Aureomyces** Ruokola & Salonen (1970) = *Cephaloascus* fide von Arx *et al.* (*Antonie van Leeuwenhoek* 38: 289, 1972).
- Auricula** Battarra ex Kuntze (1891) [non *Auricula* Castrac. 1873) nom. cons., *Algae*] = *Auricularia*.
- Auricula** Lloyd (1922) = *Punctularia* fide Donk (*Taxon* 6: 21, 1957).
- Auricularia** Bull. ex Juss. (1789), Auriculariaceae. c. 8, widespread. The edible *A. polytricha* is cultured on

- poles of *Quercus* in China; *A. auricula-judae*, Jew's ear fungus, is sometimes parasitic, esp. on *Sambucus*. See Lowy (*Mycol.* 43: 351, 1951; key), Lowy (*Mycol.* 44: 656, 1952), Donk (*Taxon* 7: 168, 1958), Donk (*Persoonia* 4: 154, 1966; nomencl.), McLaughlin (*Am. J. Bot.* 67: 1225, 1980; meta basidium ultrastr.), Yan *et al.* (*Mycosystema* 21: 47, 2002; RAPD), Cao & Pan (*Mycosystema* 24: 53, 2005; ERIC).
- Auriculariaceae** Fr. (1838), Auriculariales. 7 gen. (+ 12 syn.), 112 spp.
Lit.: Wong & Wells (*Mycol.* 79: 847, 1987), Corner (*Beih. Nova Hedwigia* 96: 218 pp., 1989; as *Aporpiaceae*), Lü & McLaughlin (*Mycol.* 83: 322, 1991), Ryvarden (*Syn. Fung.* 5: 363 pp., 1991), Reid (*Persoonia* Suppl. 14: 465, 1992), Roberts (*MR* 97: 473, 1993), Lü & McLaughlin (*CJB* 73: 315, 1995), Núñez (*Mycotaxon* 61: 177, 1997), Begerow *et al.* (*CJB* 75: 2045, 1998), Núñez (*Folia cryptog. Estonica* 33: 99, 1998), Roberts (*Mycotaxon* 69: 209, 1998; key), Yan *et al.* (*Mycosystema* 18: 206, 1999), Weiss & Oberwinkler (*MR* 105: 403, 2001), Larsson *et al.* (*MR* 108: 983, 2004), Weiss *et al.* (*MR* 108: 1003, 2004), Wells *et al.* (*Frontiers in Basidiomycote Mycology*: 237, 2004).
- Auriculariales** J. Schröt. (1887). Agaricomycetes. 1 fam., 32 gen., 198 spp. Basidiocarps hemiangiocarpous and sessile; metabasidium cylindrical and horizontally septate, 1-4 cells each bearing a sterigma and basidiospore; hyphae with septal dolipores. Fam.: **Auriculariaceae** (syn. *Exidiaceae*)
Lit.: Donk (1951-63) VIII; (1966: 208), Bandoni (*Trans. mycol. Soc. Japan* 25: 521, 1984).
- Auriculariella** (Sacc.) Clem. (1909) = *Auricularia* fide Donk (*Persoonia* 4: 158, 1966).
- Auriculariopsidaceae** Jülich (1982) = *Schizophyllaceae*.
- Auriculariopsis** Maire (1902), *Schizophyllaceae*. 1, widespread. See Donk (*Persoonia* 1: 76, 1959).
- Auriculibuller** Samp. & Fonseca (2004), *Tremellaceae*. Anamorph *Bullera*. 1, Portugal. See Sampaio *et al.* (*Int. J. Syst. Evol. Microbiol.* 54: 988, 2004).
- Auriculora** Kalb (1988), *Lecanorales* (L.). 1, S. America. See Henssen & Titze (*Bot. Acta* 101: 131, 1990), Ekman (*Op. bot.* 127: 148 pp., 1996).
- Auriculoscypha** D.A. Reid & Manim. (1985), *Septobasidiaceae*. 1, India. See Lalitha *et al.* (*MR* 98: 64, 1994; basidiosp. germin.), Kumar *et al.* (*MR* 111: 268, 2007; phylogeny).
- Aurificaria** D.A. Reid (1963), *Hymenochaetaceae*. 1, widespread. See Reid (*Kew Bull.* 17: 278, 1963).
- Auriporia** Ryvarden (1973), *Fomitopsidaceae*. 3, north temperate. See Parmasto (*Mycotaxon* 11: 173, 1980; key), Coelho (*Mycol.* 97: 263, 2005; Brazil spp.).
- Auriscalpiaceae** Maas Geest. (1963), *Russulales*. 6 gen. (+ 4 syn.), 38 spp.
Lit.: Donk (*Taxon*: 245, 1951-63) See also *Lit.* under *Hydnaceae*, Berbee & Wells (*Mycol.* 81: 20, 1989), Wu & Petersen (*Mycosystema* Suppl. 4: 33, 1991), Petersen & Cifuentes (*MR* 98: 1427, 1994), Hibbett & Donoghue (*CJB* 73: S853, 1995), Stalpers (*Stud. Mycol.* 40: 185 pp., 1996), Ginns (*Mycol.* 90: 19, 1998), Pine *et al.* (*Mycol.* 91: 944, 1999), Miller & Methven (*Mycol.* 92: 792, 2000), Desjardin & Ryvarden (*Sydowia* 55: 153, 2003), Larsson & Larsson (*Mycol.* 95: 1037, 2003), Lickey *et al.* (*Sydowia* 55: 181, 2003), Binder *et al.* (*Systematics and Biodiversity* 3: 113, 2005).
- Auriscalpium** Gray (1821), *Auriscalpiaceae*. 8, widespread. See Maas Geesteranus (*Persoonia* 9: 493, 1978; key), Stalpers (*Stud. Mycol.* 35: 29, 1996; key), Ryvarden (*Harvard Pap. Bot.* 6: 193, 2001; monogr.).
- Auritella** Matheny & Bougher (2006), *Inocybaceae*. 7, Australia. See Matheny & Bougher (*Mycotaxon* 97: 232, 2006), Matheny & Bougher (*Mycol. Progr.* 5: 2, 2006).
- Aurophora** Rifai (1968), *Sarcoscyphaceae*. 1, widespread (pantropical). See Cabello (*Boln Soc. argent. Bot.* 25: 395, 1988; numerical taxonomy), Zhuang & Wang (*Mycotaxon* 69: 339, 1998; China).
- Australasian Mycological Association**. Founded in 1995; recognized as the Committee for Australasia within the International Mycological Association (q.v.); structure comprises individual members, and an elected executive; organizes occasional conferences. Publications: *Australasian Mycologist*. Website: <http://bugs.bio.usyd.edu.au/AustMycolSoc/Home/ams.html>.
- Australiaena** Matzer, H. Mayrhofer & Elix (1997), *Caliciaceae* (L.). 1, Australia; N. America. See Matzer *et al.* (*Lichenologist* 29: 35, 1997), Sheard & May (*Bryologist* 100: 159, 1997; N. Am.), Scheidegger *et al.* (*Lichenologist* 33: 25, 2001; evolution).
- Australiasca** Sivan. & Alcorn (2002), *Chaetosphaeriaceae*. Anamorph *Dischloridium*. 1, Australia. See Sivanesan & Alcorn (*Aust. Syst. Bot.* 15: 741, 2002).
- Australicum** Hjortstam & Ryvarden (2002), *Phanerochaetaceae*. 2, widespread. See Hjortstam & Ryvarden (*Syn. Fung.* 15: 19, 2002), Hjortstam *et al.* (*Syn. Fung.* 20: 42, 2005; Venezuela).
- Australohydnum** Jülich (1978), ? *Phanerochaetaceae*. 1, Australia; Europe. See Jülich (*Persoonia* 10: 138, 1978), Melo & Hjortstam (*Nova Hedwigia* 74: 527, 2002; Europe).
- Australoporus** P.K. Buchanan & Ryvarden (1988), *Polyporaceae*. 1, Australia. See Buchanan & Ryvarden (*Mycotaxon* 31: 5, 1988).
- Austrella** P.M. Jørg. (2004), *Pannariaceae* (L.). 1, Australasia. See Jørgensen (*Biblthca Lichenol.* 88: 230, 2004).
- Austrobasidium** Palfner (2006), *Exobasidiaceae*. 1 (causing galls on *Hydrangea serratifolia*), Chile. See Palfner (*Aust. Syst. Bot.* 19: 431, 2006).
- Austroblastenia** Sipman (1983), ? *Megalosporaceae* (L.). 2, Australasia. See Kantvilas (*Lichenologist* 26: 349, 1994).
- Austroboletus** (Corner) Wolfe (1980), *Boletaceae*. c. 30, America; Australia. See Wolfe (*Biblthca Mycol.* 69, 1980), Watling (*Aust. Syst. Bot.* 14: 407, 2001; diversity and possible origins).
- Austrocenangium** Gamundí (1997), *Helotiaceae*. Anamorph *Endomelanconium*. 2, S. America. See Gamundí (*Mycotaxon* 63: 261, 1997), Gamundí & Romero (*Fl. criptog. Tierra del Fuego* 10, 1998).
- Austroclitocybe** Raithelh. (1972), ? *Tricholomataceae*. 1, S. America (temperate). See Raithelhuber (*Metrodiana* 3: xxvii, 1972).
- Austrogaster** Singer (1962), *Paxillaceae*. 3, S. America (temperate); New Zealand. Basidioma gasteroid. See Singer (*Boln Soc. argent. Bot.* 10: 57, 1962).
- Austrogautieria** E.L. Stewart & Trappe (1985), *Gomphaceae*. 6, Australia. See Stewart & Trappe (*Mycol.* 77: 674, 1985; key).
- Austrolecia** Hertel (1984), *Catillariaceae* (L.). 1, Ant-

- arctica. See Hertel (*Nova Hedwigia* Beih. 79: 452, 1984), Rambold (*Bibliotheca Lichenol.* 34: 345 pp., 1989).
- Austroleentinus** Ryvarden (1991), Polyporaceae. 1, Australia; Solomon Islands. See Ryvarden (*Syn. Fung.* 5: 115, 1991).
- Austroomphaliaster** Garrido (1988), Tricholomataceae. 1, S. America (temperate). See Garrido (*Bibliotheca Mycol.* 120: 199, 1988).
- Austropaxillus** Bresinsky & Jarosch (1999), Serpulaceae. 9, widespread (southern temperate). See Bresinsky *et al.* (*Pl. Biol.* 1: 327, 1999; phylogeny).
- Austropeltum** Henssen, Döring & Kantvilas (1992), Sphaerophoraceae (L). 1, Australasia. See Wedin & Döring (*MR* 103: 1131, 1999; phylogeny), Wedin *et al.* (*Lichenologist* 32: 171, 2000; phylogeny), Lin *et al.* (*Plant Pathology Bulletin* Taichung 13: 91, 2004; ascus evolution).
- Austropezia** Spooner (1987), Hyaloscyphaceae. 1, New Zealand. See Spooner (*Bibliotheca Mycol.* 116, 1987).
- Austrosmittium** Lichtw. & M.C. Williams (1990), Legeriomycetaceae. 4 (in *Diptera*), Australia; New Zealand. See Williams & Lichtwardt (*CJB* 68: 1045, 1990), Lichtwardt & Williams (*Mycol.* 84: 384, 1992), White (*MR* 110: 1011, 2006; phylogeny).
- autecology**, ecological studies on a single species and its relationship to the biological and physiochemical aspects of its environment.
- aut-eu-form**, an autoecious rust having all the spore stages.
- authentic** (of specimens, cultures, etc.), identified by the author of the name of the taxon to which they are referred.
- author citations**, see Nomenclature.
- Authors' names.** It is customary to cite Authors' names as authorities for the scientific names of taxa, to provide a clue where the name was published. There is frequently much variation and ambiguity in the ways such names are cited by different writers and uniformity in usage is desirable. For the fungi, Kirk & Ansell (*Authors of fungal names. Index of Fungi Supplement*, 1992) provided a list of over 9,000 authors of scientific names of fungi with recommended forms of their names, including abbreviations. This source, also available on-line in an updated form (see Internet), is now generally accepted as providing the standard. The format adopted by Kirk & Ansell for an author is the surname, or an abbreviation of it, or rarely a contraction of it, with or without initials or other distinguishing appendages. Among the more important criteria used in determining a standard form are: (1) names are in Roman characters; (2) every standard form must be unique to one person; (3) the same surname (i.e. identical spelling) must always be given in the same form, unless it is part of a compound name, and different surnames must not be given the same form; (4) all abbreviations and contractions are terminated by a full-stop but the full-stop does not make a standard form different from the same spelling without a full-stop; (5) the standard forms recommended in *TL-2* (see Literature) are retained in most cases, one of a few exceptions being conflict with particularly well established abbreviations used elsewhere; (6) names are never abbreviated before a consonant; (7) names are usually not abbreviated unless more than two letters are eliminated and replaced by a full-stop.

The above cited list was produced in collaboration with a similar scheme for botanists (Brummitt & Powell (Eds), *Authors of plant names*, 1992) and covers names of authors of all fungal taxa whose nomenclature is governed by the international code of nomenclature used for fungi (see Nomenclature).

The following list of deceased authors for which there are **biographical notices** in this *Dictionary* provides a representative series of examples of author abbreviations. Letters after the authors' dates refer to *Index Herbariorum* codes for the major location of the collections.

- Ach(arius, E. 1757-1819); **H** (BM, LD, PH, UPS)
 S. Ahmad (1910-1983); **BPI, IMI**
 Ainsw(orth, G.C. 1905-1998); **IMI**
 Ajello (L. 1916-2004)
 Alexop(oulos, C.J. 1907-1986); **P** (BPI)
 Arthur (J.C. 1850-1942); **PUR**
 Arx (J.A. von 1922-1988); **CBS**
 Asahina (Y. 1881-1975); **TNS**
 G.F. Atk(inson, 1854-1918); **CUP**
- M.E. Barr (Bigelow 1923-2008); **NY** (DAOM)
 Bat(ista, A.C. 1916-1967); **URM**
 Berk(eley, M.J. 1803-1889); **K** (E)
 Berl(ese, A.N. 1864-1903); **PAD**
 E.A. Bessey (1877-1957); **MSC, NEB**
 Bilgrami (K.S. 1933-1996); **IMI**
 Bisby (G.R. 1889-1958); **DAOM, IMI, WIN**
 Bolton (J. 1750-1799)
 Bondartsev (A.S. 1877-1968); **LE**
 Boud(ier, J.L.É. 1828-1920); **PC**
 Bourdot (H. 1861-1937); **PC**
 Bref(eld, J.O. 1839-1925); **B**
 Bres(àdola, G. 1847-1929); **S** (BPI, L, TO)
 W. Br(own, 1888-1975)
 Buller (A.H.R. 1874-1944); **WIN**
 Bull(iard, J.B.F. 1752-1793); **PC**
 J.H. Burnett (1922-2007)
 Burt (E.A. 1859-1939); **BPI, FH**
 E.J. Butler (1874-1943); **HCIO**
- Chardón (C.E. 1897-1965); **BPI, RPPR**
 Cif(erri, R. 1897-1964); **BPI** (PAV)
 Cooke (M.C. 1825-1914); **K** (E, PAV, PC)
 Corda (A.K.J. 1809-1849); **PR** (K)
 Corner (E.J.H. 1906-1997); **E**
 Costantin (J.N. 1857-1936)
 G.(H.) Cunn(ingham 1892-1962); **IMI, K, PDD**
 M.A. Curtis (1808-1872); **FH** (BPI, BRU, K, NEB, NYS)
- P.(C.)A. Dangeard (1862-1947); **PC**
 Dearn(ess, J. 1852-1954); **DAOM** (BPI, CAN, CUP, IAC, NY)
 de Bary (H.A. 1831-1888); **BM, STR**
 Deighton (1903-1992); **IMI**
 Dennis (1910-2003); **K**
 De Not(aris, G. 1805-1877); **RO** (BM, GE, PAD, PC, TO)
 Desm(azières, J.B.H.J. 1786-1862); **BR, PC**
 Dietel (P. 1860-1947); **B, K, S**
 Dill(enius, J.J. 1684-1747); **OXF**
 Dodge (C.W. 1895-1988); **FH**
 Doidge (E.M. 1887-1965); **PRE**
 Donk (M.A. 1908-1972); **L** (BO)

Ellis (J.B. 1829-1905); **NY (BPI, FH)**
 M.B. Ellis (1911-1996); **IMI**
 Erikss(on, J. 1848-1931); **S**

Farl(ow, W.G. 1844-1919); **FH**
 Fée (A.L.A. 1789-1874); **BM, FI, PC, STR**
 E. Fisch(er, 1861-1939); **BERN (B, BAS, KIEL, PC)**
 Fitzp(atrick, H.M. 1886-1949); **CUP (FH, IAC, NY)**
 Friedmann (E.I. 1921-2007)
 Fr(ies, E.M. 1794-1878); **UPS (B, LD)**
 Th.(M.) Fr(ies, 1832-1913); **UPS (LD)**
 Fuckel (K.W.G.L. 1821-1876); **G**

Gäum(ann, E.A. 1893-1963); **BERN**
 Golovin (P.N. 1897-1968); **LE**
 Gonz(ález) Frag(oso, R. 1862-1928)
 Gorlenko (M.V. 1908-1994)
 Grev(ille, R.K. 1794-1866); **E (GL)**
 Grove (W.B. 1848-1938); **K**
 J.W. Groves (1906-1970); **DAOM**
 Gruby (D. 1810-1898)
 Guillierm(ond, M.A.A. 1876-1945); **PC**
 Gyeln(ik, V.K. 1906-1945); **BP**

Hale (M.E. 1928-1990); **US**
 Hansf(ord, C.G. 1900-1966); **EA (IMI, K)**
 E.C. Hansen (1842-1909); **C (K)**
 (H.J.A.)R. Hartig (1839-1901)
 R. Heim (1900-1979); **PC**
 Henn(ings, P.C. 1841-1908); **B (HBG, K, KIEL, L, S, W)**
 Hirats(uka) f. (Naohide 1903-2000); **TMI (PUR)**
 Höhn(el, F.X.R. von 1852-1920); **FH (K)**

Jacz(ewski, A.L.A. 1863-1932); **LE**

P.(A.) Karsten (1834-1917); **H (BPI, UPS)**
 Kauffman (C.H. 1869-1931); **MICH (NY)**
 Kniep (K.J.H. 1881-1930)
 Körb(er, G.W. 1817-1885); **L (G, W, WRSL)**
 J.G. Kühn (1825-1910)
 Kusano (S. 1874-1962); **B, NY**

I.M. Lamb (1911-1990); **FH**
 J.E. Lange (1864-1941); **C**
 Langeron (M.C.P. 1874-1950); **PC**
 Léveillé, J.-H. 1796-1870); **K (E, G, L, PC)**
 Lindau (G. 1866-1923); **B (C, L)**
 Linds(ay, W.L. 1829-1880); **E (BM)**
 Link (J.H.F. 1767-1851); **B (L)**
 L(innaeus, C. 1709-1778); **LINN (S)**
 Liro (J.I. 1872-1943); **H (IMI)**
 Lister (A. 1830-1908); **BM**
 G. Lister (1860-1949); **BM**
 Lloyd (C.G. 1859-1926); **BPI**
 Luttr(ell, E.S. 1916-1988)

McAl(pine, D. 1849-1932); **VPRI**
 (A.)H. Magn(usson 1885-1964); **UPS**
 Maire (R.C.J.E. 1878-1949); **AL (MPU)**
 G.W. Martin (1886-1971); **BPI, IA**
 E.W. Mason (1890-1975); **IMI**
 Massal(ongo, A.B. 1824-1862); **VER (PAD)**
 Massee (G.E. 1850-1917); **K, NY**
 P.(A.) Micheli (1679-1737); **FI**
 Millardet (P.M.A. 1838-1902)
 Mont(agne, J.P.F.C. 1784-1866); **PC (BM, L, UPS)**

Morochk(ovsky, S.F. 1897-1962); **KW**
 M.M. Moser (1924-2002); **IB**
 S.T. Moss (1943-2001)
 Müll(er) Arg(oviensis, J. 1828-1896); **G (BM)**
 E. Müll(er 1920-2008); **ZT**
 Mundk(ur, B.B. 1896-1952)
 Murrill (W.A. 1869-1957); **NY**

Nann(enga)-Bremek(amp, N.E. 1916-1996)
 Nannf(eldt, J.A. 1904-1985); **UPS**
 Naumov (N.A. 1888-1959); **LEP**
 Nees (von Esenbeck, C.G.D. 1776-1858); **STR (L, UPS)**
 T.(F.L.) Nees (von Esenbeck 1787-1837); **GZU, STR**
 Nevod(ovsky, G.S. 1874-1952); **AA (LE)**
 Niessl (von Meyendorf, G. 1839-1919); **M**
 Nyl(ander, W. 1822-1899); **H (BM, NY, STR, UPS)**

Oudem(ans, C.A.J.A. 1825-1906); **L**

Pasteur (L. 1822-1895)
 Pat(ouillard, N.T. 1854-1926); **FH (PC)**
 Peck (C.H. 1833-1917); **NYS**
 Pers(oon, C.H. 1761-1836); **L (G, GOET, PC, STR, TO)**
 Petch (T. 1870-1948); **K**
 Petr(ak, F. 1886-1973); **W (S)**
 Pilát (A. 1903-1974); **PRM**
 Poelt (J. 1924-1995); **W**
 Potebnia (A.A. 1870-1919); **CWU**
 Preuss (C.G.T. 1795-1855); **B**

Quélet (L. 1832-1899); **PC**

Rabenh(orst, G.L. 1806-1881); **B**
 Racib(orski, M. 1863-1917); **KRAM (FH, ZT)**
 Ramsb(ottom, J. 1885-1974)
 Rehm (H. 1826-1916); **S (B)**
 Rick (J.E. 1869-1946); **PACA (B, BPI, CUP, FH, IAC, IACM, K, MICH, R, RB, S, SFPA and SI)**
 Mig(uel) Rodr(íguez Hernández 1949-2003); **H AJB**
 Rogerson (C.T. 1918-2001); **NY**
 Rostaf(iński, J.T. 1850-1928)
 Rostrup (E. 1831-1907); **C, CP**

Sabour(aud, R. 1864-1938)
 Sacc(ardo, P.A. 1845-1920); **PAD**
 Savile (D.B.O. 1909-2000)
 Săvul(escu, T. 1889-1963); **BUCM**
 Schwein(itz, L.D. von 1780-1830); **PH (BPI, FH, K)**
 Schwend(ener, S. 1829-1919)
 Seaver (F.J. 1877-1970); **NY**
 Shear (C.L. 1865-1956); **BPI**
 Shvarzman (S.R. 1912-1975); **AA**
 Singer (R. 1906-1994); **F**
 A.H. Sm(ith 1904-1986); **MICH**
 A.L. Sm(ith 1854-1937); **BM (K)**
 E.F. Sm(ith 1854-1927); **BPI**
 W.G. Sm(ith 1935-1917)
 Sorauer (P.C.M. 1839-1916)
 Sowerby (J. 1757-1822); **BM, K (LINN)**
 Sparrow (F.K. 1903-1977); **MICH**
 Speg(azzini, C.L. 1858-1926); **LPS**
 Stakman (E.C. 1885-1979); **MPPD**
 Syd(ow, H. 1879-1946); **S (B)**
 P. Syd(ow 1851-1925); **S (B, DAR)**

Teng (S.-c. 1902-1970)
 Teterevn(ikova-Babayana D.N 1904-1988); **ERE**
 Thaxter (R. 1858-1932); **FH**
 Theissen (F. 1877-1919); **W (FH)**
 Thind (K.S. 1917-1991); **PAN**
 Thom (C. 1872-1956)
 Tode (H.J. 1733-1797); fungal reference collection
 and herbarium destroyed
 Tomilin (B.A. 1928-2008); **LE**
 Tranzschel (W.A. 1868-1942); **LE (CWU)**
 Trevisan (V. 1818-1887); **PAD**
 Tubaki (K. 1924-2005)
 Tuckerman (E. 1817-1886); **FH (US)**
 Tulasne (L.R. 1815-1885); **PC**
 C. Tulasne 1816-84); **PC**

Uljan(ishchev, V.I. 1898-1996) **BAK**
 Unger (F. 1800-1870); **W**

Vainio (E.A. 1853-1929); **TUR (BM, BR, C, STE, US)**
 Vele(ňovský, J. 1858-1949) **PRM**
 Viégas (A.R. 1906-1986)
 Vuillemin (P. 1861-1932); **PAD, PAV**

Wakefield (E.M. 1886-1976); **K**
 H.M. Ward (1854-1906)
 Westerdijk (J. 1883-1961)
 Weston (W.H. 1890-1978); **FH**
 Whetzel (H.H. 1877-1944); **CUP**
 (H.)G. Winter (1848-1887); **B**
 Wormald (H. 1879-1953)
 Woronin (M.S. 1838-1903)
 J.E. Wright (1922-2005); **BAFC**

Zahlbruckner (A. 1860-1938); **W (PAD, STE, US)**
 Zopf (W. 1846-1909); **B**

For further information on particular authors see also History (Literature), Internet, Literature (Bibliographies), Medical and veterinary mycology, Reference Collections. Currently active mycologists are listed in society membership lists and regional compilations (e.g. Anon, *Revista Iberoamericana Micología* 10: ix, 1993 [Latin Am.]; Bakloushinskaya & Minter Vorontsov's *Who's Who in Biodiversity Sciences*, 2001 [countries formerly in the Soviet Union]; Buyck & Hennebert, *Directory of African Mycology*, 1993).

auto- (prefix), self-inducing, -producing, etc.

autobasidium, see basidium.

autochthonous (1) indigenous; cf. allochthonous; (2) (of soil organisms), continuously active, as opposed to **zymogenous** organisms which become active when a suitable substrate becomes available (Winoogradsky, 1924); cf. exochthonous (Park, 1957).

autodeliquescent (of lamellae and pileus of *Coprinus*), becoming liquid by **-digestion**.

autoecious, completing the life cycle on one host (esp. of rusts; cf. heteroecious); ametoecious (de Bary).

autogamy, the fusion of nuclei in pairs within the female organ, without cell fusion having taken place.

Autoicomycetes Thaxt. (1908), Ceratomyetaceae. 27, widespread. See Majewski (*Acta Mycologica Warszawska* 34: 7, 1999; Poland), Santamaría (*Fl. Mycol. Iberica* 5, 2003; Iberian peninsula), Ye & Shen (*Mycosystema* 22: 2, 2003; China).

autolysis, self digestion of a cell or tissue by endogenous enzymes.

automictic sexual reproduction, karyogamy between daughter nuclei of different meioses in the same gametangium (Dick, 1972).

automixis, self-fertilization by the fusion of two closely related sexual cells or nuclei; cf. amphimixis, apomixis, pseudomixis.

Autophagomyces Thaxt. (1912), Laboulbeniaceae. 24, widespread. See Tavares (*Mycol. Mem.* 9: 627 pp., 1985), Benjamin (*Aliso* 19: 99, 2000).

autotroph (adj. **autotrophic**) (of a living organism), one not using organic compounds as primary sources of energy, i.e. using energy from light or inorganic reactions as do green plants, lichen-forming fungi, and the photosynthetic iron and sulphur bacteria. See Fry & Peel (Eds) (*Autotrophic micro-organisms*, 1954), Lees (*Biochemistry of autotrophic bacteria*, 1955); cf. heterotrophic.

auxanogram, the differential growth of a yeast in Petri dishes prepared by the auxanographic method of Beijerinck (as modified by Lodder, *Die anaskosporogenen Hefen*, 1934, and Langeron, 1952: 430) for determining the carbon and nitrogen requirements of the organism. See also Lodder & van Rij (1952), Pontecorvo (*J. gen. Microbiol.* 3: 122, 1949; auxanographic techniques in biochemical genetics).

Auxarthron G.F. Orr & Kuehn (1963), Onygenaceae. Anamorph *Malbranchea*-like. 15, widespread. See Samson (*Acta Bot. Neerl.* 21: 517, 1972), Sugiyama *et al.* (*Mycoscience* 40: 251, 1999; DNA), Kuraishi *et al.* (*Antonie van Leeuwenhoek* 77: 179, 2000; ubiquinones), Sugiyama & Mikawa (*Mycoscience* 42: 413, 2001; phylogeny), Sigler *et al.* (*Stud. Mycol.* 47: 111, 2002; anamorphs), Solé *et al.* (*MR* 106: 388, 2002; phylogeny), Solé *et al.* (*Stud. Mycol.* 47: 103, 2002), Skinner *et al.* (*Mycol.* 98: 447, 2006; ontogeny).

auxiliary zoospore, first-formed zoospore, formed and flagellate within the sporangium, in a species with dimorphic zoospores (Dick, 1973); flagellar insertion apical or sub-apical.

auxotroph, a biochemical mutant which will only grow on the minimal medium (q.v.) after the addition of one or more specific substances.

avenacein, see enniatin.

avenacin, a fungus inhibitor from oats (*Avena*) (Turner, *Nature* 186: 325, 1960).

aversion, the inhibition of growth at the adjacent edges of colonies of microorganisms, esp. in a culture of one species. Cf. antagonism; barrage.

Avesicladiella W.P. Wu, B. Sutton & Gange (1997), anamorphic *Pezizomycotina*, Hso.?.?. 2, Europe; China. See Wu *et al.* (*Mycoscience* 38: 11, 1997).

Avetiaea Petr. & Syd. (1927), anamorphic *Pezizomycotina*, Cpd.0eP.15. 3, widespread. See Abbas & Sutton (*TBMS* 90: 491, 1988).

Avrainvillea Decne. (1842), Algae. Algae.

Awasthia Essl. (1978), Physciaceae (L.). 1, India. See Esslinger (*Bryologist* 81: 445, 1978).

Awasthiella Kr.P. Singh (1980), Verrucariaceae (L.). 1, India. See Singh (*Norw. J. Bot.* 27: 34, 1980), Singh & Sinha (*Lichen Flora of Nagaland*, 1994; India).

axenic (of cultures), consisting of one organism; uncontaminated; a pure culture. Cf. gnotobiotic.

axeny, inhospitality; 'passive' as opposed to 'active' resistance of a plant to a pathogen (Gäumann, 1946).

axial canal (- mass), see ascus.

Axisporonites Kalgutkar & Janson. (2000), Fossil Fungi. 1, India. See Kalgutkar & Jansonius (*AASP*

- Contributions Series 39*: 36, 2000).
- axoneme**, the main core of a flagellum composed of 2 central microtubules surrounded by 9 double microtubules.
- Aylographum**, see *Aulographum*.
- Ayria** Fryar & K.D. Hyde (2004), ? Annulatascaceae. 1, Brunei. See Fryar & Hyde (*Cryptog. Mycol.* 25: 248, 2004), Vijaykrishna *et al.* (*Fungal Diversity* 23: 351, 2006).
- Azbukinia** Lar.N. Vassiljeva (1989), Pezizomycotina. 1, Europe; Russia. Possibly belongs to the Thyridiaceae, but identity of the type is uncertain. See Vasil'eva (*Mycotaxon* 35: 395, 1989), Eriksson & Hawksworth (*SA Reprint of Volumes 1-4* (1982-1985) 8: 97, 1990; typific.).
- Azosma** Corda (1831) = *Cladosporium* fide Fries (*Syst. mycol.* 3 Index: 55, 1832).
- azotodesmic**, nitrogen-fixing (Pike & Carroll, in Alexopoulos & Mims, *Introductory mycology*, edn 3, 1980).
- Azureothecium** Matsush. (1989), ? Eurotiomycetes. 1 (from soil), Australia. See Matsushima (*Mycol. Mem.* 6, 1989).
- Azygites** Fr. (1832) = *Syzygites* fide Hesseltine (*Mycol.* 47: 344, 1955).
- azygospore**, a parthenogenetic zygospore; characteristic of some *Mucorales*. See Benjamin (*Aliso* 5: 235, 1963; list).
- Azygozygum** Chesters (1933) = *Mortierella* fide Plaats-Niterink *et al.* (*Persoonia* 9: 85, 1976).
- Azymocandida** E.K. Novák & Zsolt (1961) = *Candida* fide Lodder (*Yeasts, a taxonomic study* 2nd edn, 1970).
- Azymohansenula** E.K. Novák & Zsolt (1961) = *Pichia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Azymomyces** E.K. Novák & Zsolt (1961) = *Torulaspora* fide Lodder (*Yeasts, a taxonomic study* 2nd edn, 1970), Batra in Subramanian (Ed.) (*Taxonomy of fungi* 1: 187, 1978).
- Azymoprocandida** E.K. Novák & Zsolt (1961) = *Candida* fide Lodder (*Yeasts, a taxonomic study* 2nd edn, 1970).
- B**, Botanischer Garten und Botanisches Museum Berlin-Dahlem (Berlin, Germany); founded 1815; from 1995 part of the Free University of Berlin; see Kohlmeier (*Willdenowia* 3: 63, 1962).
- Babjevia** Van der Walt & M.T. Sm. (1995) = *Dipodascopsis* fide Smith *et al.* (*Antonie van Leeuwenhoek* 67: 177, 1995), Smith in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 141, 1998), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny), Kurtzman *et al.* (*FEMS Yeast Res.* 7: 1027, 2007; phylogeny).
- baccate**, soft throughout like a berry.
- baccatin**, a wilt toxin from *Gibberella baccata* (Gäumann *et al.*, *Phytopath. Z.* 36: 114, 1959); antibacterial.
- Bachmannia** Zschacke (1934) [non *Bachmannia* Pax 1897, *Capparaceae*] = *Verrucaria* Schrad. fide Swinscow (*Lichenologist* 4: 34, 1968).
- Bachmanniomyces** D. Hawksw. (1981), anamorphic *Pezizomycotina*, Cpd.0eH.19. 1 (on lichens, *Cladonia*), Europe; N. America. See Hawksworth (*Bull. Br. Mus. nat. Hist. Bot.* 9: 10, 1981), Zhurbenko & Alstrup (*Symb. bot. upsal.* 34 no. 1: 477, 2004).
- Bacidia** De Not. (1846), Ramalinaceae ($\pm$ L). c. 229, widespread. Molecular data suggest placement within *Ramalinaceae*. See Vězda (*Cas. Slez. Mus. Ser. A, Hist. Nat.* 10: 103, 1961), Vězda (*Folia geobot. phytotax.* 15: 75, 1980; key foliicolous spp.), Awasthi & Mathur (*Proc. Indian Acad. Sci. Pl. Sci.* 97: 481, 1987; key 8 spp. India), Sérusiaux (*Nordic Jl Bot.* 13: 447, 1993; differentiation 9 segr. gen.), Ekman (*Op. Bot.* 127, 1996; N. Am.), Farkas *et al.* (*Sauteria* 9: 133, 1998; Hungary), Aptroot & Herk (*Lichenologist* 31: 121, 1999), Llop & Gómez-Bolea (*Mycotaxon* 72: 79, 1999), Ekman & Wedin (*Pl. Biol.* 2: 350, 2000), Kalb *et al.* (*Mycotaxon* 75: 281, 2000; segregate), Ekman (*MR* 105: 783, 2001; phylogeny), Lücking *et al.* (*Lichenologist* 33: 189, 2001), Haug (*Mycol. Progr.* 1: 167, 2002; key to Iberian spp.), Aragón & Martínez (*Bryologist* 106: 143, 2003), Miądlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Llop *et al.* (*Nova Hedwigia* 85: 445, 2007; *B. rubella* group).
- Bacidiaceae** Walt. Watson (1929) = Ramalinaceae.
Lit.: Bellemère & Letrouit-Galinou (*Biblhca Lichenol.* 25: 137, 1987), Brako (*Mycotaxon* 35: 1, 1989), Brako (*Fl. Neotrop. Monogr.*: 67 pp., 1991), Boom (*Nova Hedwigia* 54: 229, 1992), Rambold (*Sendtnera* 1: 281, 1993), Kalb & Elix (*Biblhca Lichenol.* 57: 265, 1995), Kantvilas & Elix (*Biblhca Lichenol.* 58: 199, 1995), Ekman (*Op. bot.* 127, 1996), Ekman (*Op. bot.* 127: 148 pp., 1996), Ekman (*Symb. bot. upsal.* 32: 17, 1997), Feige *et al.* (*Biblhca Lichenol.* 67: 25, 1997), Aptroot & Herk (*Lichenologist* 31: 121, 1999), Ekman & Wedin (*Pl. Biol.* 2: 350, 2000), Kalb *et al.* (*Mycotaxon* 75: 281, 2000), Ekman (*MR* 105: 783, 2001), Lumbsch *et al.* (*Mol. Phylogen. Evol.* 31: 822, 2004).
- Bacidiactis** M. Choisy (1931) ? = *Lecanactis* Körb. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Bacidina** Vězda (1991), Ramalinaceae (L). 11, widespread. Probably congeneric with *Woessia*, but *Bacidina* is the more familiar name. See Santesson (*Lichens and lichenicolous fungi of Sweden and Norway*, 1993), Sérusiaux (*Biblhca Lichenol.* 58: 411, 1995), Ekman (*Op. Bot.* 127, 1996), Ekman (*MR* 105: 783, 2001; phylogeny, reln with *Woessia*), Miądlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Bacidiomyces** Cif. & Tomas. (1953) = *Bacidia*.
- Bacidiopsis** Bagl. (1861) = *Pachyphiale* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Bacidiopsora** Kalb (1988), Ramalinaceae (L). 1, S. America. See Ekman (*Op. Bot.* 127, 1996), Aptroot *et al.* (*J. Hattori bot. Lab.* 100: 617, 2006; Costa Rica).
- bacillar (bacilliform)**, rod-like in form (Fig. 23.4a).
- Bacillaria** Mont. (1840) [non *Bacillaria* J.F. Gmel. 1791, *Angiospermae*] nom. nud. $\equiv$ *Camillea*.
- Bacillidium** Janda (1928), Microsporidia. 5.
- Bacillina** Nyl. (1897) = *Toninia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Bacillispora** Sv. Nilsson (1962) = *Cylindrocarpon* fide Marvanová & Descals (*TBMS* 89: 499, 1987).
- Bacillopeltis** Bat. (1957), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, Brazil. See Batista (*An. Soc. Biol. Pernambuco* 15: 400, 1957).
- Bacillopsis** Petsch. (1908) nom. dub., ? Saccharomycetales.
- Backusella** Hesselt. & J.J. Ellis (1969), Mucoraceae. 3, widespread. See Benny & Benjamin (*Aliso* 8: 301, 1975; key), Stalpers & Schipper (*Persoonia* 11: 39, 1980), Roux *et al.* (*Proc. Microsc. Soc. S. Afr.* 27: 56,

- 1997; ultrastr.), O'Donnell *et al.* (*Mycol.* 93: 286, 2001; phylogeny), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny), Nyilasi *et al.* (*Clin. Microbiol. Infect.* 14: 393, 2008; molecular identification).
- Backusia** Thirum., M.D. Whitehead & P.N. Mathur (1965) = *Monascus* fide Cole & Kendrick (*CJB* 46: 987, 1968).
- Bacteria**. Heterogeneous group of (usually) unicellular prokaryotic organisms. In the three-domain classification of life, two prokaryotic domains were proposed the *Archaea* (formerly *Archaeobacteria*) and *Bacteria* (formerly *Eubacteria*) (Woese *et al.*, *Proc. Natl. Acad. Sci.* 87: 4576, 1990). The informal name 'bacteria' is occasionally used loosely in the literature to refer to all of the prokaryotes, and care should be taken to interpret its meaning in any particular context. See Woese (*Proc. Natl. Acad. Sci.* 97: 8392, 2000). Some bacteria are pathogenic for plants, a few are pathogenic for fungi: *Bacillus polymyxa* (bacterial pit) of cultivated mushroom; *Pseudomonas agarici* (drippy gill) of cultivated mushroom (see Geels *et al.*, *J. Phytopathol.* 140: 249, 1994); *Pseudomonas tolaasi* (brown blotch) of cultivated mushroom (see Cole & Skellerup, *TBMS* 87: 314, 1986); *Pantoea agglomerans* pv. *uredovora* (syn. *Erwinia uredovora*) a parasite of rust uredinia. Bacteria, in particular *Actinomycetes*, *Bacillus* spp. and *Pseudomonas* spp. produce a variety of biologically active molecules (antibiotics, enzymes etc.) and have been used as biological control agents against fungal plant diseases.
- bacteriostatic**, of a substance, or a concentration of a bactericide, which will not let growth of bacteria take place but which is not bactericidal.
- bactivory**, bacteria-feeding; known in fungi only amongst certain marine *Thraustochytriales* (Raghukumar, *Mar. Biol.* 113: 165, 1992).
- bactobiont**, see photobiont.
- Bactrexipula** Höhn. (1918) ? = *Rhizothyrium* fide Petrak (*Sydowia* 15: 185, 1962).
- Bactridiopsis** Gonz. Frag. & Cif. (1927) = *Phillipsiella* fide Rossman *et al.* (*Sydowia* 46: 66, 1994).
- Bactridium** Kunze (1817), anamorphic *Pezizomycotina*, Hsp.≡ eH.1. 5, widespread. See Hughes (*N.Z. Jl Bot.* 4: 522, 1966), Berch (*Mycotaxon* 14: 227, 1982), Yuan *et al.* (*Mycosystema* 17: 376, 1998; China), Kendrick (*CJB* 81: 75, 2003; morphogenesis).
- Bactroboletus** Clem. (1909) ≡ *Filoboletus*.
- Bactrodesmiastrum** Hol.-Jech. (1984) ? = *Janetia*.
- Bactrodesmiella** M.B. Ellis (1959), anamorphic *Pezizomycotina*, Hsp.≡ eP.19/40. 2, British Isles; NZ. See Ellis (*Mycol. Pap.* 72: 14, 1959), Hughes (*N.Z. Jl Bot.* 27: 449, 1989), Dianese & Câmara (*Sydowia* 46: 225, 1994).
- Bactrodesmiites** Babajan & Tasl. (1977), Fossil Fungi. 1 (Tertiary), former USSR.
- Bactrodesmium** Cooke (1883), anamorphic *Stuartella*, Hsp.≡ eP.1. 30, widespread. See Ellis (*Mycol. Pap.* 72, 1959; key), Hughes & White (*Fungi Canad.*, 1983), Rao & Hoog (*Stud. Mycol.* 28, 1986; India), Matsushima (*Matsush. Mycol. Mem.* 5, 1987), Zucconi & Lunghini (*Mycotaxon* 63: 323, 1997).
- Bactropycnis** Höhn. (1920) = *Coleophoma* fide Sutton (*Mycol. Pap.* 141, 1977).
- Bactrosphaeria** Penz. & Sacc. (1897), *Pezizomycotina*. 1, Java.
- Bactrospora** A. Massal. (1852), *Roccellaceae* (L.). 20, widespread (esp. temperate). See Egea & Torrente (*Lichenologist* 25: 211, 1993; key), Letrouit-Galinou *et al.* (*Bull. Soc. linn. Provence* 45: 389, 1994; ultrastr.), Nordin (*Lichenologist* 28: 287, 1996; Scandinavia), Kantvilas (*Symb. bot. upsal.* 34 no. 1: 183, 2004), Ponzetti & McCune (*Bryologist* 109: 85, 2006; N Am.), Sparrius *et al.* (*Lichenologist* 38: 27, 2006; SE Asia).
- Bactrosporaceae** Rabenh. (1870) = *Roccellaceae*.
- Bactrosporomyces** Cif. & Tomas. (1953) ≡ *Bactrospora*.
- baculate** (1) (**baculiform**) (of spores), rod-shaped; (2) (of surface ornamentation), rod-shaped (Fig. 20.8).
- Baculea** Loubès & Akbarieh (1978), *Microsporidia*. 1.
- Baculifera** Marbach & Kalb (2000), *Caliciaceae* (L.). 14, pantropical. See Marbach (*Biblthca Lichenol.* 74: 113, 2000).
- Baculospora** Zukal (1887), *Pezizomycotina*. 1, Europe. See Lundqvist (*SA* 7: 62, 1988).
- Badarisama** Kunwar, J.B. Manandhar & J.B. Sinclair (1986), anamorphic *Pezizomycotina*, Hso.#eP.1. 1 (bulbil-forming), USA. See Kunwar *et al.* (*Mycotaxon* 27: 120, 1986).
- Badimia** Vězda (1986) nom. cons., *Ectolechiaceae* (L.). 11 (on leaves), widespread (tropical). See Lücking *et al.* (*Bot. Acta* 107: 393, 1994), Lücking & Vězda (*Taxon* 44: 227, 1995), Aptroot *et al.* (*Biblthca Lichenol.* 64: 220 pp., 1997; New Guinea), Lücking (*Trop. Bryol.* 15: 45, 1998; Guyana), Lücking (*Cryptog. Mycol.* 27: 121, 2006; French Guiana).
- Badimiella** Malcolm & Vězda (1994), *Ectolechiaceae* (L.). 2, south temperate. See Malcolm & Vězda (*Nova Hedwigia* 59: 518, 1994), Garnock-Jones & Malcolm (*Biblthca Lichenol.* 78: 65, 2001), Lücking *et al.* (*Global Ecology and Biogeography* 12: 21, 2003; ecology).
- Baeoderma** Vain. (1922) = *Sphaerophorus* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Baeodromus** Arthur (1905), *Pucciniosiraceae*. 8 (on *Compositae*, *Urticaceae*, *Ranunculaceae* (0, III)), America; Russian Far East. Probably heterogeneous. See Buriticá (*Rev. Acad. Colomb. Cienc.* 18: 131, 1991), Hernández (*Mycotaxon* 76: 329, 2000).
- Baeomyces** Pers. (1794), *Baeomycetaceae* (L.). c. 9, widespread. See Thomson (*Bryologist* 70: 285, 1967), Jahns (*Herzogia* 2: 133, 1971; ontogeny), Honegger (*Lichenologist* 15: 57, 1983; asci), Sérusiaux (*Taxon* 32: 646, 1983; gen. nomencl.), Kumar (*Geophytology* 15: 159, 1985; key 4 spp. India), Gierl & Kalb (*Herzogia* 9: 593, 1993; concept), Rambold *et al.* (*Biblthca Lichenol.* 53, 1993), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998), Platt & Spatafora (*Lichenologist* 31: 409, 1999), Stenroos *et al.* (*Mycol. Progr.* 1: 267, 2002; phylogeny), Peršoh *et al.* (*Mycol. Progr.* 3: 103, 2004; asci), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Lumbsch *et al.* (*MR* 111: 257, 2007; phylogeny).
- Baeomycetaceae** Dumort. (1829), *Baeomycetales* (L.). 2 gen. (+ 6 syn.), 14 spp.
Lit.: Christensen & Alstrup (*Nova Hedwigia* 51: 469, 1990), Gierl & Kalb (*Herzogia* 9: 593, 1993), Rambold *et al.* (*Biblthca Lichenol.* 53, 1993), Ihlen (*Nova Hedwigia* 64: 137, 1997), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998), Platt & Spatafora (*Lichenologist* 31: 409, 1999), Galloway (*Lichenologist* 32: 294, 2000), Kauff & Lutzoni (*Mol. Phylogen. Evol.* 25: 138, 2002), Lumbsch *et al.* (*Mol. Phylogen. Evol.* 31: 822, 2004), Peršoh *et al.* (*Mycol. Progr.* 3:

- 103, 2004), Wedin *et al.* (*MR* 109: 159, 2005), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny).
- Baeomycetales** Lumbsch, Huhndorf & Lutzoni (2007). Ostropomycetidae. 2 fam., 3 gen., 16 spp. Ascomata sessile or stalked, apothecial, discoid, the true exciple hyaline or pigmented, annular or cupulate. Interascal tissue composed of branched paraphyses, the hymenium not blueing in iodine. Asci thin-walled, with a non-amyloid or slightly amyloid apical portion, 8-spored. Ascospores hyaline, septate or aseptate, sometimes with a sheath. Fam.:
- (1) **Baeomycetaceae**
 (2) **Trapeliaceae**
Lit.: Hibbett *et al.* (*MR* 111: 509, 2007); Lumbsch *et al.* (*MR* 111: 1133, 2007).
- Baeomycetomyces** E.A. Thomas ex Cif. & Tomas. (1953) $\equiv$ Dibaeis.
- Baeomycomyces**, see *Baeomycetomyces*.
- Baeopodium** Trevis. (1857) = Gomphillus fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Baeospora** Singer (1938), ? Marasmiaceae. 10, widespread (north temperate; tropical). See Singer (*Revue Mycol. Paris* 3: 193, 1938), Cléménçon (*Persoonia* 18: 411, 2004; basidiome development).
- Baeostratoporus** Bondartsev & Singer (1944) = Flaviporus fide Donk (*Persoonia* 1: 173, 1960).
- Baetimyces** L.G. Valle & Santam. (2002), Legeriomycetaceae. 1 (in *Baetis*), Spain. See Valle & Santamaria (*Mycol.* 94: 321, 2002).
- Baeumleria** Petr. & Syd. (1927), ? Phyllachoraceae. 2, widespread. See Clements & Shear (*Gen. Fung.*, 1931), Sutton (*Mycol. Pap.* 141, 1977), von Arx (*SA* 6: 213, 1987), Johnston (*N.Z. J. Bot.* 37: 703, 1999).
- Bagcheea** E. Müll. & R. Menon (1954), Valsaceae. 3, India; Taiwan. See Hsieh & Li (*MR* 95: 895, 1991).
- Baggea** Auersw. (1866), ? Patellariaceae. 1, Europe. See Kutorga & Hawksworth (*SA* 15: 1, 1997), Magness *et al.* (*Mycotaxon* 68: 321, 1998).
- Bagliettoa** A. Massal. (1853), Verrucariaceae (L.). 1, widespread (esp. temperate). Perhaps synonymous with *Verrucaria*. See Santesson (*Lichens and lichenicolous fungi of Sweden and Norway*, 1993), Halda (*Acta Musei Richnoviensis Sect. Natur.* 10, 2003), Gueidan & Roux (*Bull. Soc. linn. Provence* 58: 181, 2007), Gueidan *et al.* (*MR* 111: 1145, 2007; phylogeny).
- Bagliettoaceae** Servít (1954) = Verrucariaceae.
- Bagnisiella** Speg. (1880), ? Dothioraceae. 20, S. America; India. See Patil & Patil (*Indian J. Mycol. Pl. Path.* 13: 169, 1985), Rajak *et al.* (*J. Econ. Taxon. Bot.* 18: 546, 1995), Hyde & Cannon (*Mycol. Pap.* 175, 1999), Barr (*Harvard Pap. Bot.* 6: 25, 2001).
- Bagnisimitrula** S. Imai (1942), ? Helotiales. 1, Japan. Position uncertain; previously placed in the *Geoglossaceae*.
- Bagnisiopsis** Theiss. & Syd. (1915), Phyllachoraceae. 10 (on living leaves of *Melastomataceae*), S. America. See Hyde & Cannon (*Mycol. Pap.* 175, 1999).
- Bahianora** Kalb (1984), Lecideaceae (L.). 1, Brazil. See Kalb (*Lichenes Neotropici Fascicle VIII* (nos 301-350) 8: 4, 1984).
- Bahuchashaka** Subram. (1978), anamorphic *Pezizomycotina*, Hso. $\equiv$ eP.1. 1, Japan. See Subramanian (*Kavaka* 5: 97, 1977).
- Bahugada** K.A. Reddy & V.G. Rao (1984) ? = *Monodictys*.
- Bahukalasa** Subram. & Chandrash. (1979), anamorphic *Pezizomycotina*, Hso.0eH.10/12. 1, India. See Subramanian & Chandrashekara (*Kavaka* 6: 42, 1978).
- Bahupaathra** Subram. & Lodha (1964) = *Cladorrhinum* fide Mouchacca & Gams (*Mycotaxon* 48: 415, 1993).
- Bahusaganda** Subram. (1994) nom. inval., anamorphic *Pezizomycotina*, Hso. $\equiv$ eP.3. 2, India; Panama. See Subramanian & Srivastava (*Proc. Indian natn Sci. Acad. Part B. Biol. Sci.* 60: 277, 1994), Kirschner & Piepenbring (*Fungal Diversity* 21: 93, 2006).
- Bahusakala** Subram. (1958), anamorphic *Dothideomycetes*, Hso. $\equiv$ eP.39/40. 7, widespread (esp. tropical). See Sigler & Carmichael (*Mycotaxon* 4: 349, 1976), Matsushima (*Matsush. Mycol. Mem.* 6, 1989).
- Bahusandhika** Subram. (1956), anamorphic *Pezizomycotina*, Hso. $\equiv$ eP.3. 2, India. See Subramanian (*J. Indian bot. Soc.* 35: 469, 1956).
- Bahusutrabeeja** Subram. & Bhat (1977), anamorphic *Pezizomycotina*, Hso.0eH.15. 5, Australia; India. See Subramanian & Bhat (*CJB* 55: 2204, 1977), McKenzie (*Mycotaxon* 61: 303, 1997).
- Bainieria** Arnaud (1952) nom. inval., anamorphic *Pezizomycotina*, Hso.0eH.19. 1, Europe.
- Bakanae disease**, of rice (*Gibberella fujikuroi*); see gibberellin.
- Bakeromyces** Syd. & P. Syd. (1917) = *Trichosphaeria* fide Höhnelt (*Annls mycol.* 16: 77, 1918).
- Bakerophoma** Died. (1916) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Balaniopsis** P.M. Kirk (1985), anamorphic *Pezizomycotina*, Hso.0eP.40. 3, paleotropical. See Kirk (*Mycotaxon* 23: 308, 1985), Whitton *et al.* (*Mycoscience* 43: 67, 2002).
- Balanium** Wallr. (1833), anamorphic *Pezizomycotina*, Hso.1eP.8. 1, Europe. See Hughes (*CJB* 39: 1505, 1961), Whitton *et al.* (*Mycoscience* 43: 67, 2002), Kendrick (*CJB* 81: 75, 2003; morphogenesis).
- balanoid**, acorn-shaped.
- Balansia** Speg. (1885), Clavicipitaceae. Anamorph *Ephelis*. 27 (on grasses), widespread (subtropical). See Diehl (*USDA agric. Monogr.* 4, 1950), Morgan-Jones & White (*Mycotaxon* 44: 89, 1992; culture), Phelps & Morgan-Jones (*Mycotaxon* 50: 61, 1994; anamorph), White *et al.* (*Mycol.* 87: 172, 1995; development), White *et al.* (*Mycol.* 88: 89, 1996; endophytes), Reddy *et al.* (*Mycol.* 90: 108, 1998; DNA), White *et al.* (*Stud. Mycol.* 45: 95, 2000), Lewis *et al.* (*Mycol.* 94: 1066, 2002; Mexico), Lewis *et al.* (*Mycology Series* 19: 151, 2003), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Balansiella** Henn. (1904) = *Claviceps* fide Rogerson (*Mycol.* 62: 865, 1970).
- Balansina** G. Arnaud (1918) = *Dothidasteromella* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Balansiopsis** Höhn. (1910), Clavicipitaceae. 3 (on grasses), America. See Diehl (*USDA agric. Monogr.* 4, 1950), Reddy *et al.* (*Mycol.* 90: 108, 1998; DNA).
- Balazucia** R.K. Benj. (1968), Laboulbeniaceae. 2, Mexico; Japan. See Terada (*TMSJ* 21: 193, 1980), Tavares (*Mycol. Mem.* 9: 627 pp., 1985).
- Balladyna** Racib. (1900), Parodiopsidaceae. Anamorph *Tretospora*. c. 16 (on *Rubiaceae*), widespread (tropical). See Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962), Eboh & Cain (*CJB* 51: 61, 1973).
- Balladynastrum** Hansf. (1941) = *Balladynopsis* fide

- Sivanesan (*Mycol. Pap.* 146, 1981).
- Balladynella** Theiss. & Syd. (1918) = *Dysrhynchis* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Balladynocallia** Bat. (1965), Parodiopsidaceae. 3, pantropical. See Sivanesan (*Mycol. Pap.* 146, 1981; key), Hosagoudar & Abraham (*New Botanist* 20: 109, 1993).
- Balladynopsis** Theiss. & Syd. (1918), Parodiopsidaceae. Anamorph *Tretospora*. 13, widespread (tropical). See Sivanesan (*Mycol. Pap.* 146, 1981; monogr., key), von Arx & Müller (*Sydowia* 37: 6, 1984; synonym of *Balladyna*).
- ballistospore**, a forcibly abjected basidiospore. See Nyland (*Mycol.* 41: 688, 1950); - **discharge**, see Buller (*Researches* 2-6, 1922-34), Olive (*Science*, N.Y. 146: 524, 1964), Ingold (*Friesia* 9: 66, 1969; review). See also Buller's drop, *Itersonilia*.
- Ballistosporomyces** Nakase, G. Okada & Sugiy. (1989), anamorphic *Sporidiobolales*. 2 (ballistosporic yeasts), Japan. See Nakase *et al.* (*J. gen. appl. Microbiol.* Tokyo 35: 289, 1989).
- Ballocephala** Drechsler (1951), Meristacraceae. 3 (on tardigrades), widespread. See Richardson (*TBMS* 55: 307, 1970), Pohlád & Bernard (*Mycol.* 70: 130, 1978), Tucker (*Mycotaxon* 13: 481, 1981; key), Saikawa & Oyama (*TMSJ* 33: 305, 1992; EM of infection of tardigrades), Saikawa & Sakuramata (*TMSJ* 33: 237, 1992; zygosporos).
- Balsamia** Vittad. (1831), Helvellaceae. 6, widespread. See Gilkey (*N. Amer. Fl.* 2, 1954; key N. Am. spp.), Hawker (*Phil. Trans. R. Soc. Lond.* 237: 429, 1954; key Eur. spp.), Pegler *et al.* (*British truffles*, 1993), O'Donnell *et al.* (*Mycol.* 89: 48, 1997; phylogeny), Harrington *et al.* (*Mycol.* 91: 41, 1999; phylogeny), Percudani *et al.* (*Mol. Phylogen. Evol.* 13: 169, 1999; phylogeny), Agerer (*Mycol. Progr.* 5: 67, 2006; mycorrhizas), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny).
- Balsamiaceae** E. Fisch. (1897) = Helvellaceae.
- Baltomyces** Cafaro (1999), ? Asellariaceae. 1 (in *Isopoda*), USA. See Cafaro (*Mycol.* 91: 517, 1999), White *et al.* (*Mycol.* 98: 872, 2006; phylogeny).
- Balzania** Speg. (1899), Thyridiaceae. 1 (from dead wood), S. America. See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Bangia** Lyngb. (1819), Algae. Algae.
- Banhgyia** Zeller & Tóth (1960), Patellariaceae. 1, Europe. See Kohlmeyer & Kohlmeyer (*Icones fung. maris*, 1968), Kutorga & Hawksworth (*SA* 15: 1, 1997; posn).
- Bankera** Coker & Beers ex Pouzar (1955), Bankeraceae. 2 (mycorrhizal), widespread. See Stalpers (*Stud. Mycol.* 35: 29, 1993; key), Dickson (*Field Mycology* 1: 99, 2000; key British spp.), Arnolds (*Coolia* 46 3, Suppl.: 96 pp., 2003; Netherlands and Belgium).
- Bankeraceae** Donk (1961), Thelephorales. 6 gen. (+ 2 syn.), 98 spp.
Lit.: Donk (*Persoonia* 3: 199, 1964) see also under *Hydnaceae*, Baird (*Biblthca Mycol.* 104: 156 pp., 1986), Baird & Khan (*Brittonia* 30: 171, 1986), Harrison & Grund (*Mycotaxon* 28: 419, 1987), Arnolds (*Atti del IV Convegno Internazionale di Micologia, Borgo val di Taro - I, Funghi Atque Loci Natura (Funghi ed Ambiente)*: 163, 1989), Agerer (*Nova Hedwigia* 55: 501, 1992), Stalpers (*Stud. Mycol.* 35: 168 pp., 1993), Hibbett *et al.* (*Nature Lond.* 407: 506, 2000), Kõljalg & Renvall (*Karstenia* 40: 71, 2000), Hibbett & Binder (*Proc. R. Soc. Lond. B. Biol. Sci.* 269: 1963, 2002), Ainsworth (*English Nature Research Reports* 600: 115 pp., 2004; conservation status in UK), Larsson *et al.* (*MR* 108: 983, 2004), Hrouda (*Czech Mycol.* 57: 57, 2005; Europe), Hrouda (*Czech Mycol.* 57: 279, 2005; Europe).
- Banksiamyces** G.W. Beaton (1982), ? Helotiaceae. 4 (on *Banksia* cones), Australia. See Zhuang (*Mycotaxon* 32: 97, 1988; ? = *Encoelia* (Sclerotin.)), Fuhrer & May (*Victorian Nat.* 110: 73, 1993; host specificity).
- Bannoa** Hamam. (2002), anamorphic *Erythrobasidiales*. 1, Japan. See Hamamoto *et al.* (*Int. J. Syst. Evol. Microbiol.* 52: 1027, 2002).
- Bapalmuia** Sérus. (1993), Pilocarpaceae (L.). 17, widespread (tropical). See Ekman (*Op. bot.* 127: 148 pp., 1996), Kalb *et al.* (*Lichenologist* 75: 281, 2000; key).
- Barbariella** Middelh. (1949) = *Asaphomyces* fide Benjamin (*Mycol.* 47, 1955).
- Barbarosporina** Křivulís (1942), anamorphic *Pezizomycotina*, Cac.0eH.?. 1 (on *Rhytisma*), former USSR.
- barbate**, having one or more groups of hairs; bearded.
- Barbatosphaeria** Réblová (2008), Sordariomycetes. Anamorphs *Sporothrix*-like, *Ramichloridium*-like. 1, Europe; N. America. See Réblová (*Mycol.* 99: 723, 2007).
- Barbatospora** M.M. White, Siri & Lichtw. (2006), Legeriomycetaceae. 1 (in *Simuliidae*), USA. See White *et al.* (*Mycol.* 98: 335, 2006).
- Barcheria** T. Lebel (2004), Agaricaceae. 1, Australia. See Lebel *et al.* (*MR* 108: 210, 2004).
- Barclayella** Dietel (1890) = *Chrysomyxa* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- Bargellinia** Borzí (1888) = *Wallemia* fide von Arx (*Gen. Fungi Sporul. Cult.* Edn 3, 1981).
- Barklayella** Sacc. (1892) [non *Barclayella* Dietel 1890] = *Neobarclaya* fide Nag Raj (*CJB* 56: 706, 1978).
- Barlaea** Sacc. (1889) [non *Barlaea* Rchb. 1876, *Orchidaceae*] ≡ *Barlaeina*.
- Barlaeina** Sacc. & P. Syd. (1899) = *Lamprospora* fide Eckblad (*Nytt Mag. Bot.* 15: 1, 1968).
- barm** (1) the froth on the surface of fermenting malt liquids; (2) baker's yeast.
- Barnettella** D. Rao & P. Rag. Rao (1964), anamorphic *Pezizomycotina*, St.#eP.43. 3, India. See Satyanarayana & Rao (*Mycopath. Mycol. appl.* 45: 267, 1971), Rao & Rao (*Indian Phytopath.* 26: 233, 1973; key).
- Barnettia** Bat. & J.L. Bezerra (1962) = *Microcallis* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Barr Bigelow** (Margaret Elizabeth; 1923-2008; Canada, later USA). BS (1950 then MS (1952), University of British Columbia; PhD under Wehmeyer, University of Michigan (1957); Instructor (1957) then Professor and, eventually, Ray Ethan Torrey Professor (1986-1989), University of Massachusetts, Amherst. An outstanding systematist and expert on the bitunicate ascomycetes, with enormous experience of the diversity of that group; contributed to activities of the Mycological Society of America with time and money, as Editor-in-Chief of *Mycol.* (1976-1980), Vice President (1979-1980) and President (1980-1981). Specimens are mostly in the fungal reference collection of New York Botanic Garden (NY) with some in DAOM. *Publs.* The Diaporthales in North America with emphasis on *Gnomonia* and its segregates. *Mycologia Memoir* (1978); *Prodromus to*

- Class Loculoascomycetes* (1987); Some dictyosporous genera and species of Pleosporales in North America. *Memoirs of the New York Botanical Garden* (1990); Prodrum to nonlichenized, pyrenomycetous members of class Hymenoascomycetes. *Mycotaxon* (1990); Melanommatales (Loculoascomycetes). *North American Flora Series II* (1990).
- barrage**, the space between two mycelia which have an aversion for one another (Vandendries & Brodie, 1933). Cf. zone lines.
- Barrella** Ahn & Shearer (1995) = *Pseudoyuconia* fide Eriksson & Hawksworth (*SA* 15: 139, 1997).
- Barria** Z.Q. Yuan (1994), ? Phaeosphaeriaceae. 1, China. See Yuan (*Mycotaxon* 51: 313, 1994), Jaklitsch *et al.* (*Öst. Z. Pilzk.* 11: 93, 2002).
- Barrina** A.W. Ramaley (1997), Coniochaetaceae. Anamorph *Phialophora*-like. 1, USA. See Ramaley (*Mycol.* 89: 962, 1997), Huhndorf *et al.* (*Mycol.* 96: 368, 2004), García *et al.* (*MR* 110: 1271, 2006; phylogeny).
- Barrmaelia** Rappaz (1995), Xylariaceae. Anamorph *Libertella*-like. 6, Europe; N. America. See Rappaz (*Mycol. Helv.* 7: 99, 1995; monogr.), Winka & Eriksson (*Mycoscience* 41: 97, 2000; DNA).
- Barssia** Gilkey (1925), Helvellaceae. 2, widespread. Close to *Balsamia*. See Ławrynowicz & Skirgiełło (*Acta Mycologica Warszawa* 20: 277, 1986), Kimbrough *et al.* (*Mycol.* 88: 38, 1996; ultrastr.), O'Donnell *et al.* (*Mycol.* 89: 48, 1997; phylogeny), Landvik *et al.* (*Mycol.* 91: 278, 1999), Percudani *et al.* (*Mol. Phylogen. Evol.* 13: 169, 1999; phylogeny), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny).
- Bartalinia** Tassi (1900), anamorphic *Amphisphaeriaceae*, Hso.≡ eH.19. 16, widespread. See Morgan-Jones *et al.* (*CJB* 50: 877, 1972), Roux & Van Warmelo (*MR* 94: 109, 1990; conidioma ontogeny), Jee-won *et al.* (*MR* 107: 1392, 2003; phylogeny), Wong *et al.* (*CJB* 81: 1083, 2003; ultrastr.).
- Bartaliniopsis** S.S. Singh (1974) = *Doliomyces* fide Sutton (*Mycol. Pap.* 141, 1977).
- Bartheletia** Arnaud (1954) nom. inval., anamorphic *Pezizomycotina*, Hsp.?.?. 1, France.
- Bartlettella** D.J. Galloway & P.M. Jørg. (1990), Lecanorales (L). 1, New Zealand. See Galloway & Jørgensen (*N.Z. J. Bot.* 28: 5, 1990).
- Barubria** Vězda (1986), Ectolechiaceae (L). 1 (on leaves), Africa; C. America. See Vězda (*Folia geobot. phytotax.* 21: 207, 1986), Lücking (*Phyton Horn* 39: 131, 1999).
- Barya** Fuckel (1864) [non *Barya* Klotzsch 1854, *Begoniaceae*] ≡ *Neobarya*.
- Baryeidamia** H. Karst. (1888) = *Papulaspora* fide Saccardo (*Syll. fung.* 9: 339, 1891).
- Baryella** Rauschert (1988) ≡ *Neobarya*.
- basal body** (1) (of *Blastocladiaceae*), the part of the thallus fixed to the substratum by rhizoids at the lower end (Indoh, 1940); (2), see blepharoplast.
- basal frill** (of a spore), the apical part of a conidiogenous cell, or basal part of a cell which is carried away with the detached conidium following rhexolytic secession (Sutton, *CJB* 45: 1251, 1967). Cf. marginal frill.
- Basauxia** Subram. (1995), anamorphic *Pezizomycotina*, Hso.≡ eP.1/21. 1, Malaysia. See Subramanian (*Kavaka* 20/21: 58, 1992/1993).
- basauxic** (of conidiophores), elongating by a basal growing point (Hughes, *CJB* 31: 650, 1953). See meristem arthrospore.
- Basavamyces** V.B. Hosag. (2005), Meliolaceae. 1, India. See Biju *et al.* (*Nova Hedwigia* 80: 480, 2005).
- base ratio**, see Molecular biology.
- Basiascella** Bubák (1914) ? = *Piggotia* fide Sutton (*Mycol. Pap.* 141, 1977).
- Basiascus** Cava (1888) = *Spilocaea* fide Hughes (*CJB* 36: 727, 1958).
- Basididyma** Cif. (1962), anamorphic *Pezizomycotina*, Hso.0eH.10. 1, Dominican Republic. See Ciferri (*Atti Ist. bot. Univ. Lab. crittog. Pavia sér.* 5 19: 94, 1962).
- Basidiella** Cooke (1878) = *Aspergillus* fide Subramanian (*Hyphomycetes*, 1971) See, Seifert (*TBMS* 85: 123, 1985).
- Basidioascus** Matsush. (2003), Dipodascaceae. Anamorph *Geotrichum*-like. 1, Australia. See Matsushima (*Matsush. Mycol. Mem.* 10: 98, 2001).
- Basidioblastomycetes**. Class used by Moore (*Bot. Mar.* 23: 361, 1980; key 13 gen.) for *Malasseziales* and *Sporobolomycetales*, and placed by him in *Blasatomyota*.
- Basidiobolaceae** Engl. & E. Gilg (1924), Basidiobolales. 1 gen. (+ 1 syn.), 4 spp.
Lit.: Dykstra (*Mycol.* 86: 494, 1994), Dykstra & Bradley-Kerr (*Mycol.* 86: 336, 1994), Humber (*J. gen. Microbiol.*, 1995), Nagayama *et al.* (*Mycol.* 87: 203, 1995), Jensen *et al.* (*Fungal Genetics Biol.* 24: 325, 1998), Tanabe *et al.* (*Mol. Phylogen. Evol.* 30: 438, 2004).
- Basidiobolales** Caval.-Sm. (1998). Zygomycota. 1 fam., 1 gen., 4 spp. Fam.:
Basidiobolaceae
The order may belong in the *Chytridiales*.
Lit.: Nagahama *et al.* (*Mycol.* 87: 203, 1995), Cavalier-Smith (*Biol. Rev.* 73: 230, 1998), James *et al.* (*Mycol.* 98: 860, 2006; molecular phylogeny), Hibbett *et al.* (*MR* 111: 109, 2007).
- Basidiobolus** Eidam (1886), Basidiobolaceae. 4, widespread. *B. ranarum*, a widespr. saprobe; causal agent of subcutaneous phycomycosis in humans. See Drechsler (*Mycol.* 48: 655, 1956), Benjamin (*Aliso* 5: 223, 1962; key), Greer & Friedman (*Sabouraudia* 4: 231, 1966), Srinivasan & Thirumalachar (*Mycopath. Mycol. Appl.* 33: 56, 1967), Coremans-Pelseneer (*Acta Zool. Path.* 60: 1, 1974; biology), Chien (*TMSJ* 28: 445, 1987), Cochrane *et al.* (*Mycol.* 81: 504, 1989; isozymes), Nelson *et al.* (*Exp. Mycol.* 14: 197, 1990; ribosomal DNA), Dykstra (*Mycol.* 86: 494, 1994; spore formation), Dykstra & Bradley-Kerr (*Mycol.* 86: 336, 1994; ultrastr.), James *et al.* (*Nature* 443: 818, 2006; phylogeny), Liu *et al.* (*BMC Evolutionary Biology* 6: 1, 2006; phylogeny), van den Berk *et al.* (*BMC infectious diseases* 6: 140, 2006; basidiobolomycosis).
- Basidiobotrys** Höhn. (1909) = *Xylocladium* fide Jong & Rogers (*Tech. Bull. Wash. agric. Exp. Stn* 71, 1972).
- basidiocarp**, see basidioma.
- Basiodendron** Rick (1938), Auriculariales. c. 15, widespread. See Wells (*Mycol.* 51: 541, 1960; key), Luck-Allen (*CJB* 41: 1033, 1963; key N. temp. spp.), Oberwinkler (*Ber. bayer. bot. Ges.* 36: 42, 1963; Bavarian spp.), Wells & Raitviir (*Mycol.* 67: 909, 1975), Weiss & Oberwinkler (*MR* 105: 403, 2001; phylogeny), Kotiranta & Saarenoksa (*Annales Botanici Fennici* 42: 11, 2005; Finland).
- basidiograph**, the straight-line graph obtained by plotting the ratio of the length (*l*) to the width (*w*) against

the length of the basidia of a species of agaric (Corner, 1947: 214). Cf. sporograph.

basidiole, a basidium-like hymenial element that lacks sterigmata because it is either young or permanently sterile; best restricted to immature basidia fide Singer (1962).

Basidiolum Cienk. (1861), ? Zoopagales. 1. See White (MR 107: 245, 2003).

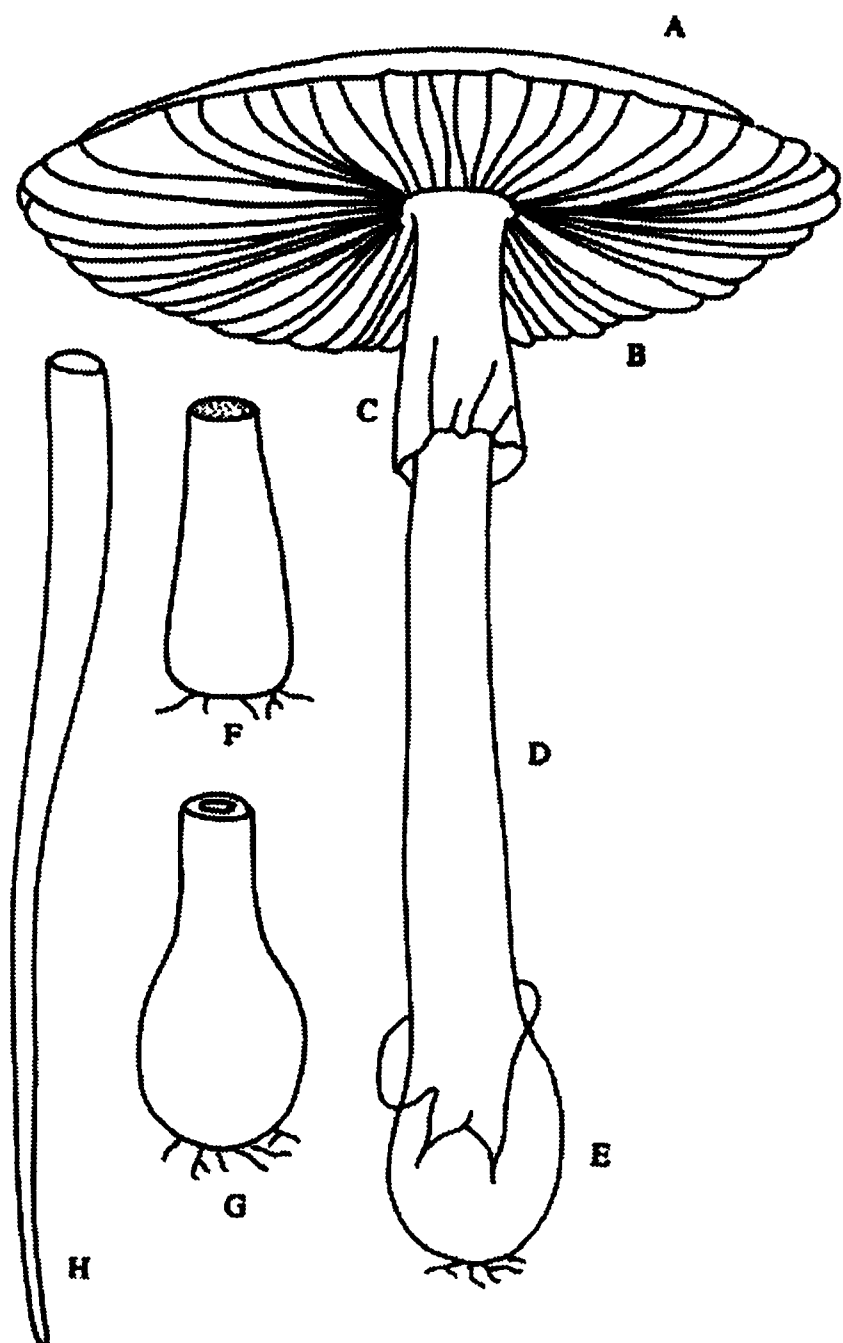


Fig. 6. Basidioma (sporophore) of *Amanita phalloides*. A, pileus (cap); B, lamellae (gills); C, annulus (ring); D, stipe (stalk); E, volva. Other types of stipe: F, stuffed, with base truncate; G, hollow, with base bulbous; H, solid with base radicate.

basidioma (pl. -ata), a basidium-producing organ; basidiome (Donk, *Taxon* 18: 666, 1969); basidiocarp; carpophore; fruit-body; hymenophore; sporophore. See Fig. 4.

basidiomycete, one of the *Basidiomycota*.

Basidiomycetes G. Winter (1880), see *Agaricomycotina*.

Basidiomycota R.T. Moore (1980). Fungi. 16 class., 52 ord., 177 fam., 1589 gen., 31515 spp. (Basidiomycotina, basidiomycetes). 3 subphyla and 6 'unassigned' classes, cosmop. The diagnostic character of this phylum is the presence of a basidium (q.v.) bearing basidiospores. A typical basidium is aseptate and has four 1-celled haploid basidiospores (ballisto- or statismospores) dispersed by air currents but the basidium may be transversely or longitudinally septate and the number of spores (which may be statismospores) are occasionally fewer or more than four. Other diagnostic characters are clamp connexions (Fig. 9), dolipore septa (Fig. 13), and a double-layered wall, lamellate and electron-opaque in electron microscopy. *Basidiomycota* are typically myce-

lial but some are yeasts (or have a yeast-like state). Such yeasts may be distinguished from ascomycetous yeasts by the morphology of the bud scars, giving a red colour with diazonium blue B, being urease +, having a high GC percentage (see base ratio), and other ultrastructural characters (see Moore, *Bot. Mar.* 23: 361, 1980; vonArx, 1987) some of which may apply to basidiomycetes in general; molecular sequence data can also clearly place other fungi in the phylum.

The typical life cycle (on which there are variations) involves the germination of the basidiospore to give a septate primary (haploid) mycelium which may produce 'oidia' but anamorphic states (except for yeasts, rusts, and smuts) have been neglected (see Kendrick & Watling, in Kendrick (Ed.), *The whole fungus* 2: 473, 1979). Later by diploidization, the homo- or heterothallic primary mycelium becomes a secondary (dikaryotic) mycelium which frequently has clamp connexions. There is nuclear fusion in the young basidium and meiosis before basidiospore development. The mycelium may be perennial in soil or wood and may form 'fairy rings', sclerotia, rhizomorphs or mycorrhizas. The basidiomata are typically macroscopic and take a variety of forms.

While there is widespread agreement on the use of certain families within the *Basidiomycota* there is less uniformity in grouping the families into orders and esp. supraordinal taxa because of the lack of good differential characters. During recent years the acceptance of supraordinal taxa by specialists has been based on microscopical basidial characters. Talbot (*Taxon* 17: 620, 1968; 1971), after separating the *Uredinales* and *Ustilaginales* as the *Teliomycetes* grouped the remaining orders as the *Phragmobasidiomycetes* and *Holobasidiomycetes* and distinguished 'gasteromycetes' within the last. Donk (*Proc. K. nederl. Akad. Wet. C* 75: 365; 76: 109, 1972-73) separated the *Ustilaginales* as the *Hemibasidiomycetes* and classified the remaining forms as the *Heterobasidiomycetes* (which included the *Uredinales*) and the *Homobasidiomycetes*. Shaffer (*Mycol.* 67: 1, 1975) advocated no supraordinal groupings of the 14 orders (59 fams.) of *Basidiomycetes* which he recognized. Khan & Kimbrough (*Mycotaxon* 15: 103, 1982) proposed the adoption of four classes based mainly on septal ultrastructure: *Teliomycetes*, *Hemibasidiomycetes*, *Phragmobasidiomycetes* and *Holobasidiomycetes*.

The classification in this edition of the *Dictionary* is based on a series of major phylogenetic studies of fungi under the umbrella of the 'Deep Hypha' and AFTOL ('Assembling the Fungal Tree of Life') projects. See esp. Blackwell *et al.* (*Mycol* 98: 829, 2006), Hibbett *et al.* (MR : 111: 509, 2007), James *et al.* (*Nature* 443: 818, 2006). The pragmatic subdivisions in the 9th Edition can no longer be supported. The presence or absence of a macroscopic basidioma, the life-form and life-style (including host specialization) and the traditional 'hymenomycetes' and 'gasteromycetes' can only be regarded as informal and not monophyletic categories; a consequence of this is that some of the older literature cited may be in conflict with the taxon it is cited under.

Three Subphyla are accepted here. However, the *Entorrhizomycetes* and *Wallemiomycetes* are not referred to any of these subphyla, and a number of

BASIDIAL REMNANTS	PERREAU (1967)	BESSON (1972)	CLEMENÇON (1970)			CLEMENÇON (1973)		KELLER (1974)
	ECTOSPORIUM	MYXOSPORIUM	SPOROTHECIUM		EPITUNICA	SPOROTHECIUM	MYXOSPORIUM	SPOROTHECIUM
	PERISPORIUM					MUCOSTRATUM		MYXOLEMMA
SPORE PROPER	EXOSPORIUM	EPITUNICA	TECTUM			PODOSTRATUM		
		MEDIOSTRATUM						
	EPISPORIUM	SCLEROSPORIUM	CORIOTUNICA		TUNICA <td rowspan="4">CORIOTUNICA</td> <th>B2</th> <td rowspan="4">EUSPORIUM</td> <th>TUNICA</th>	CORIOTUNICA	B2	
	ENDOSPORIUM	ENDOSPORIUM		CORIUM	B1		CORIOTUNICA	
					A2		CORIUM	
	A1	ENDOCORIUM						

Fig. 7. Basidiospore wall-layer terminology, based on transmission electron microscopy (TEM) sections.

genera could not be assigned with confidence to any family.

Subphyl.:

(1) **Agaricomycotina**

(2) **Pucciniomycotina**

(3) **Ustilaginomycotina**

Basidiomycotina Ainsw. (1966), see *Basidiomycota*, *Agaricomycotina*, *Pucciniomycotina*, *Ustilaginomycotina*.

basidiophytes, Cain's (1972) term for hypothetical autotrophic ancestors of basidiomycetes; see Phylogeny. Cf. ascophyte.

Basidiopycnis Oberw., R. Kirschner, R. Bauer, Bege-row & Arenal (2006), Phleogenaceae. 1, Germany. See Oberwinkler *et al.* (*Mycol.* 98: 639, 2006), Haus-ner *et al.* (*Mycotaxon* 103: 279, 2008).

Basidioradulum Nobles (1967), Schizoporaceae. 1, Europe; N. America. See Nobles (*Mycol.* 59: 192, 1967), Legon (*Mycologist* 19: 81, 2005) Also consid-ered a syn. of *Hyphodontia* s.l.

basidiospore, a propagative cell (typically a ballisto-spore but in gasteromycetes a statismospore) contain-ing one or two haploid nuclei produced, after meio-sis, on a basidium (Fig. 8). The colour, form and or-namentation of the basidiospore are fundamental to basidiomycete classification and an essential part of any specific description. Greater use of electron mi-croscopy has revealed an increasing complexity of the wall layers or teguments (for a comparison of the terminologies applied to these layers see Fig. 5). Also see Spore wall.

Lit.: Perreau (*Ann. Sci. nat., Bot.* sér. 12, 8: 639, 1967; homobasidiomycetes), Clemençon (*Z. Pilzkde* 36: 113, 1970; wall ultrastr.), Pegler & Young (*Beih. Nova Hedw.* 35, 1971; morphology in *Agaricales*), Kühner (*Persoonia* 7: 217, 1973), Locquin (*Bull. Soc. bot. Fr., Coll. Palyn.*: 135, 1975).

Basidiosporites Elsik (1968), Fossil Fungi. 1 (Paleo-cene), USA.

basidium (pl. -ia), (1) the cell or organ, diagnostic for

basidiomycetes, from which, after karyogamy and meiosis, basidiospores (generally 4) are produced ex-ternally each on an extension (sterigma, q.v.) of its wall (Fig. 8); (2) a conidiophore or phialide (obsol.).

The confused terminology applied to basidia (sense 1) and their parts has been traced by Cléménçon (*Z. Mykol.* 54: 3, 1988) and is analyzed by Talbot (*TBMS* 61: 497, 1973) whose recommended usage (basically that of Donk) and synonymy is adopted in the series of definitions which follow (see Fig. 8): **pro-**, the morphological part or developmental stage of the basidium in which karyogamy occurs; primary basidial cell; probasidial cyst; **hypo-** (Martin) p.p.; teliospore of Uredinales. **meta-**, (1) the morphologi-cal part or developmental stage in which meiosis oc-curs; hypo- (Martin) p.p.; **epi-** (Martin) p.p.; promy-celium of *Pucciniales*. (When the whole meta- in-cludes pro- remnants the distal and functional part may be distinguished as a **pario-** (Talbot, 1973).) (2) See proto- below. **holo-**, a basidium (e.g. of *Agari-cus*) in which the meta- is not divided by primary septa (see septum) but may become adventitiously septate (see septum) (Talbot, *Taxon* 17: 625, 1968). A holo- may be a **sticho-**, cylindrical, with nuclear spindles longitudinal and at different levels, or a **chi-asto-**, clavate, with nuclear spindles across the basidium and at the same level (see Fig. 8A,B). **phragmo-**, a basidium in which the meta- is divided by primary septa, usually cruciate (e.g. *Tremella*) or transverse (e.g. *Auricularia*) (Talbot, 1968).

Among other terms applied to basidia are: **apo-**, one with non-apiculate spores borne symmetrically on the sterigmata and not forcibly discharged (Rogers, *My-col.* 39: 558, 1947); **auto-**, one with spores borne asymmetrically and forcibly discharged; **endo-**, one developing within the basidioma, as in gasteromy-cetes; **epi-**, Martin's term for protosterigma, see sterigma; **hetero-**, a basidium of the *Heterobasidio-mycetes*, usually a phragmo-; **homo-**, a

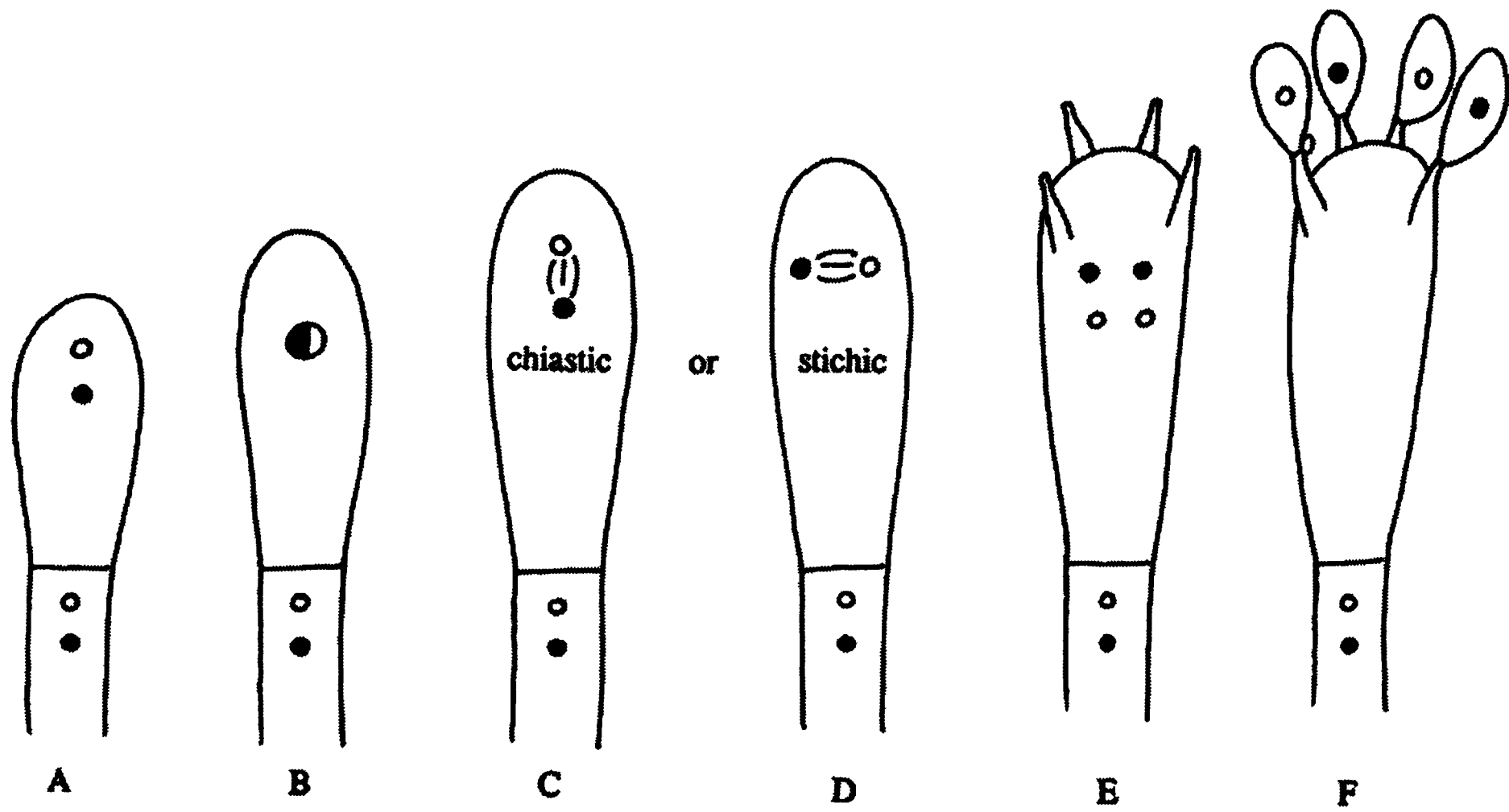


Fig. 8. Basidiospore development (diagrammatic). A-E meiosis (C, stichic, and D, chiasitic). E, diploid pro-basidium; F, basidium (metabasidium) with four basidiospores on sterigmata.

Donk (1931, 1954)	Neuhoff (1924) Rogers (1934) Martin (1938)	Martin (1957)
Sterigma { Spiculum ---- Protosterigma ---- }	Sterigma ---- No Name ---- }	Sterigma ---- Epibasidium ---- }
Metabasidium -- {	Epibasidium -- {	Metabasidium -- { Hypobasidium } }
Probasidium {	Hypobasidium {	Probasidium or cyst {

Fig. 9. Basidium terminology, to compare the terminology of different authors, illustrated with reference to the *Septobasidium*-type (Talbot, 1973). Note that in this extreme case the metabasidium of Donk coincides with that of Martin.

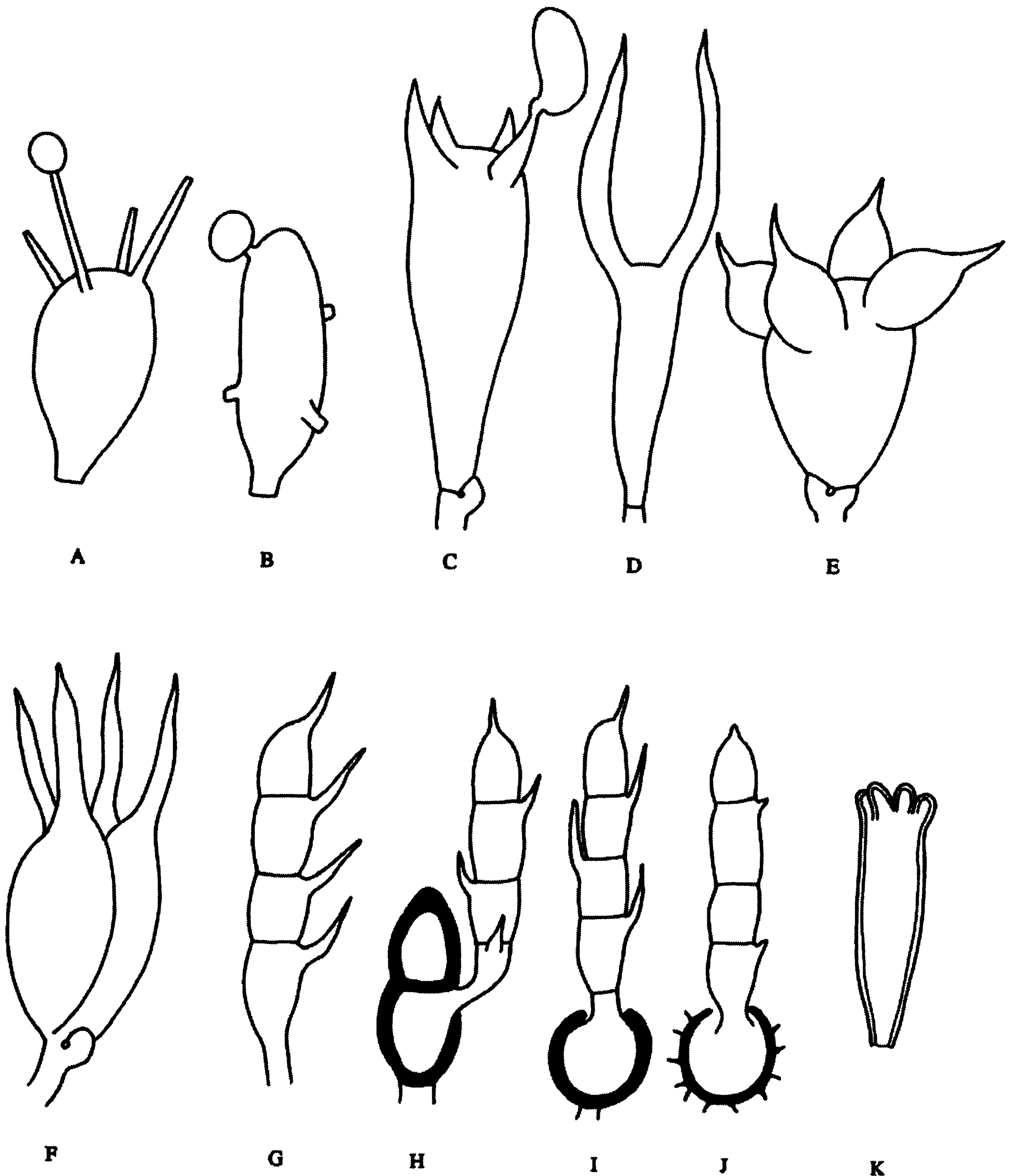


Fig. 10. Basidial types. A-E, holobasidial (A-B, apobasidial; C-E, autobasidial). A, *Lycoperdales*; B, *Tulostomatales*; C, *Agaricales*; D, *Dacrymycetales*; E, *Tulasnellales*. F-K, phragmobasidial (F-G, *Basidiomycetes*; H-I, *Teliomycetes*; J-K, *Ustomycetes*). F, *Tremellales*; G, *Auriculariales*; H, *Uredinales*; I, *Septobasidiales*; J, *Ustilaginales*; K, *Cryptobasidiales*.

basidium of the *Homobasidiomycetes*, usually a holo-; **hypo-**, = pro- (Donk), meta- (Martin); (of *Septobasidium*) = basidium (Martin); **pleuro-**, one relatively broad at the base and with bifurcated spreading 'roots', as in *Pleurobasidium* (Donk); **proto-**, a

primitive basidium; the opposite of meta- in the sense of changed or degenerate basidium; **repeto-**, see Chadeaud (*Rev. mycol.* 39: 173, 1975); **sclero-**, the thick-walled, encysted, gemma-like pro- of the *Pucciniales* (teliospore) and the *Auriculariales* (Janichen,

- 1923). See also Wells & Wells (*Basidium and basidiocarp evolution, cytology, function and development* 1982).
- Basidopus** Earle (1909) = *Mycena* fide Singer (*Agaric. mod. Tax.* edn 3, 1975).
- Basifimbria** Subram. & Lodha (1968), anamorphic *Xylariales*, Hso.0eH.13. 1 (coprophilous), India. See von Arx (*Sydowia* 35: 10, 1982; syn. with *Dicyma*).
- basifugal**, development from the base up, acropetal.
- Basilocula** Bubák (1914) ? = *Ceuthospora* Grev. fide Sutton (*Mycol. Pap.* 141, 1977).
- basionym** (basinym, basonym) (in nomenclature, q.v.), the name-bringing or epithet-bringing synonym on which a new transfer or new combination is based. Donk (*Bull. Jard. bot. Buitenz. sér. 3* 18: 274, 1949) uses **isonym** for a name derived from a basionym. Cf. synonym, synonym.
- basipetal**, describes a chain of conidia in which new spores are formed at the base, the oldest at the apex, cf. acropetal.
- Basipetospora** G.T. Cole & W.B. Kendr. (1968), anamorphic *Monascus*, Hso.0eH.36. 1, widespread. See Cole & Kendrick (*CJB* 46: 991, 1968), Stchigel *et al.* (*Stud. Mycol.* 50: 299, 2004).
- Basipilus** Subram. (1961) = *Seimatosporium* fide Sutton (*Mycol. Pap.* 88, 1963), Shoemaker (*CJB* 42: 411, 1964).
- Basisporium** Molliard (1902) = *Nigrospora* fide Mason (*Mycol. Pap.* 3: 60, 1933).
- Basitorula** Arnaud (1954) = *Gliomastix* fide Dickinson (*Mycol. Pap.* 115, 1968).
- basket fungi**, *Clathrus* spp.
- basocatenate** (of conidia), formed in chains with the youngest conidium at the basal or proximal end of the chain.
- Basramyces** Abdullah, Abdulk. & Goos (1989), anamorphic *Pezizomycotina*, Hso.0= hP.1. 1, Germany; Iraq. See Abdullah *et al.* (*Int. J. Mycol. Lichenol.* 4: 182, 1989).
- Bassi** (Agostino; 1773-1856; Italy). A lawyer who later became a farmer. He elucidated the etiology of muscardine disease of silkworms (*Beauveria bassiana*) and was thereby the first to demonstrate by experiment pathogenicity of a fungus for an animal. *Publs. Del Mal del Segno* (1835-1836) [for English translation of part I, 1835, see *Phytopathological Classics* 10, 1958, portrait]; *Opere do Agostino Bassi*, Pavia (1925) [collected works]. *Biogs, obits etc.* [bicentenary tributes] Verona (*Agostino Bassi nel 200 Anno dalla Nascita*, 1973) [bibliography, portrait]; Porter (*Bacteriological Reviews* 37: 284, 1973) [portrait].
- Bastien treatment**, treatment for amanitin poisoning, involving: (1) twice-daily injection of 1g vitamin C, (2) 2 capsules of nifurazide, three times a day, (3) 2 tablets of dihydrostreptomycin, three times a day, (4) penicillin therapy, (5) maintenance of fluid and electrolyte balance.
- Batarrea**, see *Battarrea*.
- Batcheloromyces** Marasas, P.S. van Wyk & Knox-Dav. (1975), *Teratosphaeriaceae*. 4, widespread. See Sutton & Pascoe (*MR* 92: 210, 1989), Taylor *et al.* (*MR* 103: 1478, 1999), Taylor *et al.* (*MR* 107: 653, 2003), Crous *et al.* (*CBS Diversity Ser.* 2, 2004), Crous *et al.* (*Stud. Mycol.* 58: 1, 2007; phylogeny).
- Bathelium** Ach. (1803) nom. rej. = *Trypethelium*.
- Bathelium** Trevis. (1861) nom. cons., *Trypetheliaceae*. c. 30. fide Harris (*More Florida Lichens*, 1995), Prado *et al.* (*MR* 110: 511, 2006; phylogeny), Ap-
troot *et al.* (*Biblthca Lichenol.* 97, 2008; Costa Rica).
- Bathyascus** Kohlm. (1977), *Halosphaeriaceae*. 5 (marine), widespread. See Ravikumar & Vittal (*MR* 95: 370, 1991).
- Bathystomum** Füsting (1868) ? = *Massaria* fide Saccardo (*Syll. fung.* 326 19: 142, 1910).
- Batista** (Augusto Chaves; 1916-1967; Brazil). Professor of Phytopathology, Escola Superior de Agricultura; founder and Director, Instituto de Micologia da Universidade do Recife [now Universidade Federal de Pernambuco]. A visit to IMI in 1951 (Batista, *Boletim da Secretaria de Agricultura, Industria e Comercio do Estado de Pernambuco* 22: 29, 1953) influenced his decision to establish the Instituto de Micologia in Recife. Pioneered study of tropical ascomycetes in Brazil. Most collections in Recife (URM), some in IMI. *Publs.* Author of more than 600 papers and monographs, mainly accounts and revisions of Brazilian ascomycetes, often with various co-workers; most of these works appeared as a numbered series, *Publicações. Instituto de Micologia da Universidade do Recife* [IMUR] (1954 on), some published in a range of journals, others in a long series of offset printed pamphlets published by the IMUR itself [*Publicação* 301 lists the titles of nos 1-300; *Publicação* 674 the titles of nos 301-673]. *Biogs, obits etc.* Carneiro (*Mycol.* 60: 1137, 1969) [portrait]; Singer (*Sydowia* 22: 343, 1969); Aguilar (*Acta Amazonica* 18: 39, 1988 [list of Batista types in INPA]); Da Silva & Minter (*Mycological Papers* 169, 1995 [checklist of 3,340 species, with host, substratum and state indexes, and a bibliography]; Grumann (1974: 771).
- Batistaella** Cif. (1962) = *Phaeosaccardinula* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Batistamnus** J.L. Bezerra & Cavalc. (1967) nom. dub., *Fungi*. See von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Batistia** Cif. (1958), *Batistiaceae*. Anamorph *Acrostroma*. 1, Brazil. See Samuels & Rodrigues (*Mycol.* 81: 52, 1989), Huhndorf *et al.* (*Mycol.* 96: 368, 2004; phylogeny).
- Batistiaceae** Samuels & K.F. Rodrigues (1989), ? *Sordariomycetes* (inc. sed.). 2 gen., 2 spp.
Lit.: Samuels & Rodrigues (*Mycol.* 81: 52, 1989), Huhndorf *et al.* (*Mycol.* 96: 368, 2004), Lumbsch & Huhndorf (*MR* 111: 1064, 2007).
- Batistina** Peres (1961), anamorphic *Pezizomycotina*, Cpt.1eH.?. 1, Brazil. See Peres (*Publções Inst. Micol. Recife* 317: 6, 1961).
- Batistinula** Arx (1960), *Asterinaceae*. Anamorph *Triposporium*. 1, Brazil. See von Arx (*Publções Inst. Micol. Recife* 287: 4, 1960), Hosagoudar *et al.* (*Journal of Mycopathological Research* 39: 61, 2001).
- Batistopsora** Dianese, R.B. Medeiros & L.T.P. Santos (1993), *Phakopsoraceae*. 1 (on *Annona* (*Annonaceae*)), neotropics. Very similar to *Phakopsora*. See Hernández *et al.* (*Sydowia* 57: 189, 2005; Guyana), Aime (*Mycoscience* 47: 112, 2006).
- Batistospora** J.L. Bezerra & M.P. Herrera (1964), *Pezizomycotina*. 1, Brazil. See von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Batkoa** Humber (1989), *Entomophthoraceae*. 9 (pathogens of *Homoptera*, *Hemiptera* and other *Insecta*), widespread. See Villacarlos & Keller (*Phillip. Ent.* 11: 81, 1997), Keller & Petrini (*Sydowia* 57: 23, 2005; key), Keller (*Sydowia* 58: 38, 2006; Switzerland), Huang *et al.* (*Mycotaxon* 100: 227, 2007; USA).

- Batrachochytrium** Longcore, Pessier & D.K. Nichols (1999), Rhizophydiales. 1 (pathogen of amphibian skin), widespread. See Berger *et al.* (*Proc. natn Acad. Sci. U.S.A.* **95**: 9031, 1998), Pessier *et al.* (*Vet. Diagn Invest.* **11**: 194, 1999), Morehouse *et al.* (*Mol. Ecol.* **12**: 395, 2003), Boyle *et al.* (*Diseases of Aquatic Organisms* **60**: 141, 2004; PCR detection), Weldon *et al.* (*Emerging Infectious Diseases* **10**: 2100, 2004; origin).
- Batschiella** Kirschst. (1938) = *Clypeoporthella* fide Barr (*Mycol. Mem.* **7**: 232 pp., 1978).
- Battareopsis**, see *Battarreopsis*.
- Battarraea**, see *Battarraea*.
- Battarraeastrum** R. Heim & T. Herrera (1960) = *Battarreoides*.
- Battarraeoides**, see *Battarreoides*.
- Battarraea** Pers. (1801), Agaricaceae. 3, widespread (esp. warmer areas). The volvate stipe to 30 cm. See Maublanc & Malençon (*BSMF* **46**: 43, 1930), Rea (*Mycol.* **34**: 563, 1942), Long (*Mycol.* **35**: 546, 1943), Esqueda *et al.* (*Mycotaxon* **82**: 207, 2002; Mexico).
- Battarreaceae** Corda (1842) = Agaricaceae.
- Battarreoides** T. Herrera (1953), Agaricaceae. 1, N. America (deserts). See Petrak (*Sydowia* **9**: 591, 1955).
- Battarreopsis** Henn. (1902) = *Dictyocephalos* fide Long & Plunkett (*Mycol.* **32**: 696, 1940).
- Battarrina** (Sacc.) Clem. & Shear (1931), Hypocreales. 1, Europe. Probably in the *Bionectriaceae*, but the only available material is in poor condition. See Rossman *et al.* (*Stud. Mycol.* **42**: 248 pp., 1999).
- Bauch test**, A macroscopic test for determining whether monosporidial lines of smuts are compatible (the mixed culture has white aerial mycelium) or incompatible (aerial mycelium absent) (Bauch, *Biol. Zbl.* **42**: 9, 1922).
- Baudoinia** J.A. Scott & Unter. (2007), Capnodiales. 1, widespread. *B. compniacensis*, causing black growth on walls of distilleries etc. See Ewaze *et al.* (*MR* **111**: 1422, 2007; physiology), Scott *et al.* (*Mycol.* **99**: 592, 2007).
- Bauerago** Vánky (1999), Microbotryaceae. 8 (in seeds of *Commelinaceae*, *Cyperaceae*, *Juncaceae*), widespread. See Vánky (*Mycotaxon* **70**: 44, 1999; key), Denchev (*Mycotaxon* **87**: 127, 2003), Aime *et al.* (*Mycol.* **98**: 896, 2006; phylogeny).
- Bauhinus** R.T. Moore (1992) = *Microbotryum* fide Vánky (*Mycotaxon* **48**: 41, 1993), Bauer & Oberwinkler (*Mycotaxon* **64**: 312, 1997) but see, Denchev *et al.* (*Mycol. Balcan.* **3**: 71, 2006).
- Baumanniella** Henn. (1897) = *Physalacria* fide Corner (*Ann. Bot. Mem.* [A monograph of *Clavaria* and allied genera] **1**, 1950).
- Baumiella** Henn. (1903) = *Leptosphaeria* fide von Arx & Müller (*Stud. Mycol.* **9**, 1975).
- Bayrhofferia** Trevis. (1857) = *Lecania* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Bdellospora** Drechsler (1935), Cochlonemataceae. 1, N. America. See Drechsler (*Mycol.* **27**: 25, 1935).
- beaded** (of a lamella), having a line of small drops of liquid on the edge.
- beak** (of ascoma or conidioma), an elongated neck through which the spores are discharged. See rostrum.
- beard moss**, species of *Alectoria*, *Bryoria*, *Ramalina* and *Usnea*.
- Beauveria** Vuill. (1912), anamorphic *Cordycipitaceae*, Hso.0eH.10. 9 (on *Insecta*), widespread. One of the most important genera for biocontrol (q.v.) of insects. See McLeod (*CJB* **32**: 818, 1954), de Hoog (*Stud. Mycol.* **1**, 1972), Riba *et al.* (*Fundamental and Applied Aspects of Invertebrate Pathology*: 205, 1986; isoesterase variability), von Arx (*Mycotaxon* **25**: 153, 1986), Shimizu & Aizawa (*J. Invert. Path.* **52**: 348, 1988; serological classification of *B. bassiana*), Mugnai *et al.* (*MR* **92**: 199, 1989; chemotaxonomic evaluation), Bridge *et al.* (*Mycopathologia* **111**: 85, 1990; chemotaxonomy of *B. bassiana*), Kosir *et al.* (*Can. J. Microbiol.* **37**: 534, 1991; RFLPs of virulent and avirulent *B. bassiana*), Rakotonirainy *et al.* (*J. Invert. Path.* **57**: 17, 1991; rRNA sequence comparison with *Tolypocladium*), St Leger *et al.* (*MR* **96**: 1007, 1992; genetic variation), Pfeifer & Khachatourians (*J. Invert. Path.* **61**: 231, 1993; electrophoretic karyotyping), Couteaudier & Viaud (*FEMS Microbiology Ecology* **22**: 175, 1997; population structure on *Melolontha*), Cravanzola *et al.* (*Lett. Appl. Microbiol.* **25**: 289, 1997; genetic polymorphism by RAPD-PCR on *B. brongniartii*), Neuvéglise *et al.* (*Mol. Ecol.* **6**: 373, 1997; rDNA introns), Couteaudier *et al.* (*Molecular Variability of Fungal Pathogens*: 95, 1998; genetic structure), Glare & Inwood (*MR* **102**: 250, 1998; NZ strains), Kück *et al.* (*Molecular Variability of Fungal Pathogens*: 73, 1998; transposons), McCullough *et al.* (*J. Clin. Microbiol.* **36**: 1035, 1998; strains on *Alphitobius*), Piatti *et al.* (*Lett. Appl. Microbiol.* **26**: 317, 1998; molecular characterization), Todorova *et al.* (*MR* **102**: 81, 1998; carbohydrate utilization), Castrillo *et al.* (*J. Invert. Path.* **73**: 269, 1999; population genetics), Enkerli *et al.* (*MR* **105**: 1079, 2001; microsatellite markers), Bidochka *et al.* (*Archs Microbiol.* **178**: 531, 2002; population biology), Coates *et al.* (*Curr. Genet.* **41**: 414, 2002; rDNA introns), Coates *et al.* (*MR* **106**: 40, 2002; rDNA), Gaitan *et al.* (*MR* **106**: 1307, 2002; strains on *Hypothenemus*), Henke *et al.* (*J. Clin. Microbiol.* **40**: 2698, 2002; clinical strain), Huang *et al.* (*Mycotaxon* **81**: 229, 2002; teleomorph of *B. bassiana*), Liu *et al.* (*MR* **106**: 1100, 2002; teleomorph connexions), Padmavathi *et al.* (*MR* **107**: 572, 2003; telomere fingerprinting), Pernfuss *et al.* (*IOBC/WPRS Bulletin* **26**: 121, 2003; species distinction), Wang *et al.* (*Environmental Microbiology* **5**: 908, 2003; population structure), Castrillo *et al.* (*J. Invert. Path.* **86**: 26, 2004; VCGs and recombination), Tucker *et al.* (*J. Clin. Microbiol.* **42**: 5412, 2004; human infection), Uribe & Khachatourians (*MR* **108**: 1070, 2004; mitochondrial RFLPs), Entz *et al.* (*MR* **109**: 1302, 2005; PCR diagnostics), Muro *et al.* (*MR* **109**: 294, 2005; strains on *Eurygaster*), Rehner (*Insect-Fungal Associations Ecology and Evolution*: 3, 2005; phylogeny), Rehner & Buckley (*Mycol.* **97**: 84, 2005; cryptic speciation), Wang *et al.* (*MR* **109**: 1364, 2005; population structure), Gürcan *et al.* (*Mycoses* **49**: 246, 2006; human infection).
- Beauveriphora** Matsush. (1975), anamorphic *Pezizomycotina*, Hso.0eH.10. 1, Japan. See Matsushima (*Icon. microfung. Matsush. lect.*: 14, 1975), Matsushima (*Matsush. Mycol. Mem.* **8**: 1, 1995).
- Beccaria** Massee (1892) [non *Beccaria* Müll. Hal. 1872, *Musci*] = *Beccariella*.
- Beccariella** Ces. (1879) = *Cymatoderma* fide Donk (*Taxon* **6**: 17, 1957).
- Beccopycnidium** F. Stevens (1930), anamorphic *Pezizomycotina*, Cpd.0fH.?. 1, S. America.
- Beckhausia** Hampe ex Körb. (1865) nom. inval. =

- Tomasellia fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- beef-steak fungus** (or **liver fungus**), basidioma of the edible *Fistulina hepatica*; cf. brown oak.
- Beejadwaya** Subram. (1978), anamorphic *Pezizomycotina*, Hso.0eP.3. 1, Japan. See Subramanian (*Kavaka* 5: 97, 1977).
- Beejasamuha** Subram. & Chandrash. (1977) = *Beauveria*.
- Beeli formulae**, Numerical designations for coding the ascospore, perithecial, setae, and hyphopodial characteristics of *Meliola* spp. together with their sizes devised by Beeli (*Bull. Jard. bot. Brux.* 8: 89, 1920) and modified by Stevens (*Ann. Myc.* 25: 405, 1927) Hansford (*Sydowia* 2, 1961), Farr (*Mycopath.* 43: 161, 1971) and Mibey & Hawksworth (*Mycol. Pap.* 174, 1997); e.g. *Asteridiella westermanni* 3101.5340.
- Beelia** F. Stevens & R.W. Ryan (1925), *Elsinoaceae*. 1, Hawaii. See Petrak (*Sydowia* 7: 321, 1953).
- Beenakia** D.A. Reid (1956), *Clavariadelphaceae*. 7, widespread (tropical). See Núñez & Ryvar den (*Sydowia* 46: 321, 1994; key), Nakasone (*Cryptog. Mycol.* 24: 131, 2003), Borgarino *et al.* (*BSMF* 121: 187, 2005).
- Beenakiaceae** Jülich (1982) = *Clavariadelphaceae*.
- beer**, an alcoholic drink obtained by the fermentation of wort. The two main series of beers are the **ales** (produced by top-yeast (*Saccharomyces cerevisiae*) fermentation) and the **lagers** (produced by bottom-yeast (*S. carlsbergensis*) fermentation). See also Brewing, cider, porter, wine, yeast.
- behind** (of lamellae), the end nearest the stipe.
- Belaina** Bat. & Peres (1961) = *Polynema* fide Punithalingam (*Nova Hedwigia* 49: 297, 1989).
- Belainopsis** Bat. & H. Maia (1965) nom. dub., anamorphic *Pezizomycotina*. See Punithalingam (*Nova Hedwigia* 49: 297, 1989).
- Belemnospora** P.M. Kirk (1981), anamorphic *Pezizomycotina*, Hso.0-1eP.19. 5, widespread. See Sutton *et al.* (*MR* 92: 354, 1989; key).
- Belizeana** Kohlm. & Volkm.-Kohlm. (1987), *Dothideomycetes*. 1 (marine), Belize. See Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 30: 195, 1987), Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 34: 1, 1991).
- Bellemerea** Hafellner & Cl. Roux (1984), *Porpidiaceae* (L). 8, esp. montane and polar. See Hafellner & Roux (*Bull. Soc. bot. Centre-Ouest Nouv. sér.* 15: 129, 1984), Buschbom & Mueller (*Mol. Phylogen. Evol.* 32: 66, 2004; phylogeny), Peršoh *et al.* (*Mycol. Progr.* 3: 103, 2004; asci and photobionts).
- Bellemerella** Nav.-Ros. & Cl. Roux (1997), *Verrucariaceae* (L). 3 (lichenicolous), France; Spain. See Navarro-Rosinés & Roux (*Mycotaxon* 61: 443, 1997), Calatayud & Navarro-Rosinés (*Nova Hedwigia* 72: 473, 2001).
- Bellulicauda** B. Sutton (1967), anamorphic *Pezizomycotina*, St.0eH.19. 1, Africa. See Sutton (*CJB* 45: 1254, 1967).
- Belonia** Körb. (1856), ? *Gyalectaceae* (L). 12, widespread. See Vězda (*Prirodov. Čas. slezsky* 20: 241, 1959), Henssen in Brown *et al.* (Eds) (*Lichenology: progress and problems*: 107, 1976; ontogeny), Jørgensen *et al.* (*Lichenologist* 15: 45, 1983; Eur.), Jørgensen *et al.* (*SA* 5: 121, 1986; posn), Hafellner & Kalb (*Biblthca Lichenol.* 57: 161, 1995; posn), Malcolm & Coppins (*Australasian Lichenology* 41: 30, 1997; NZ), McCarthy & Kantvilas (*Lichenologist* 29: 489, 1997; Tasmania), Navarro-Rosinés & Llimona (*Lichenologist* 29: 15, 1997; Spain), Coppins & Malcolm (*Lichenologist* 30: 563, 1998; NZ), Messuti *et al.* (*Bryologist* 102: 314, 1999; S America), Grube *et al.* (*MR* 108: 1111, 2004; phylogeny), Kauff & Büdel (*Bryologist* 108: 272, 2005; ontogeny).
- Belonidium** Mont. & Durieu (1846) = *Lachnum* fide Raitviir (*Eesti NSV Tead. Akad. Toim. Biol. seer* 36: 313, 1987), Spooner (*Biblthca Mycol.* 116, 1987), Leenurm & Raitviir (*Folia cryptog. Estonica* 36: 57, 2000; ultrastructure).
- Beloniella** (Sacc.) Boud. (1885) = *Odontura*.
- Beloniella** Rehm (1892) = *Calloria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Beloniella** Th. Fr. (1877) = *Belonia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Beloniomyces** Cif. & Tomas. (1953) = *Belonia*.
- Belonioscypha** Rehm (1892) = *Cyathicula* fide Baral & Krieglstainer (*Beih. Sydowia* 6, 1985).
- Belonioscyphella** Höhn. (1918), *Helotiaceae*. 1 (on mosses), Europe. See Carpenter (*Mem. N. Y. bot. Gdn* 33, 1981; ? synonymy with *Gloeopeziza*), Döbbeler (*Ber. bayer. bot. Ges.* 57: 153, 1986).
- Belonium** Sacc. (1884) = *Pyrenopeziza*. The genus is in need of revision. fide Baral (*SA* 13: 113, 1994; synonymy with *Pyrenopeziza*), Nauta & Spooner (*Mycologist* 14: 21, 2000; UK).
- Belonopeziza** Höhn. (1917) ? = *Calloria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Belonopsis** (Sacc.) Rehm (1891), *Dermateaceae*. Anamorph *Cystodendron*. 7, Europe. See Aebi (*Nova Hedwigia* 23: 49, 1972), Nannfeldt (*Sydowia* 38: 194, 1986), Nauta & Spooner (*Mycologist* 14: 21, 2000; UK), Raitviir & Leenurm (*Folia cryptog. Estonica* 38: 63, 2001; Estonia), Raitviir (*Mycotaxon* 87: 359, 2003; Greenland), Nauta (*Coolia* 47: 8, 2004; Netherlands), Pärtel & Raitviir (*Mycol. Progr.* 4: 149, 2005; ultrastructure).
- Belospora** Clem. (1909) = *Hymenoscyphus*.
- Beltraminia** Trevis. (1857) = *Dimelaena* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Beltrania** Penz. (1882), anamorphic *Pezizomycotina*, Hso.0eP.10. 13, widespread. See Hughes (*Mycol. Pap.* 47, 1951), Pirozynski (*Mycol. Pap.* 90, 1963; key), Pirozynski & Patil (*CJB* 48: 567, 1970), Ouan-you & Rambelli (*Micol. Ital.* 19: 33, 1990; substrate and morphology), Rambelli & Pasqualetti (*G. bot. ital.* 124: 753, 1990; variability), Morelet (*Cryptog. Mycol.* 22: 29, 2001; key).
- Beltraniella** Subram. (1952), anamorphic *Pseudomasaria*, Hso.0eP.10. 15, India. See Pirozynski (*Mycol. Pap.* 90, 1963), Kabi (*Micol. Ital.* 16: 27, 1987; substrate and morphology), Castañeda Ruiz *et al.* (*Mycotaxon* 58: 243, 1996; Cuba), Kendrick (*CJB* 81: 75, 2003; morphogenesis), Gusmão (*Mycol.* 96: 150, 2004).
- Beltraniomyces** Manohar., Agarwal & Rao (2003) = *Beltrania* fide Manoharachary *et al.* (*Indian Phytopath.* 56: 418, 2003).
- Beltraniopsis** Bat. & J.L. Bezerra (1960), anamorphic *Pezizomycotina*, Hso.0eP.10. 7, S. America. See Pirozynski (*Mycol. Pap.* 90, 1963), Gusmão *et al.* (*MR* 104: 251, 2000; key), Kendrick (*CJB* 81: 75, 2003; morphogenesis), Castañeda Ruiz *et al.* (*Mycotaxon* 96: 151, 2006; Cuba).
- Benedekiella** Negru & Verona (1964) = *Physalospora* fide Müller & von Arx in Ainsworth *et al.* (Eds) (*The*

- Fungi* 4A: 87, 1973).
- Benekia** Bat. & J.L. Bezerra (1960) ? = *Geastrum* fide Sutton (*Mycol. Pap.* 141, 1977).
- Benguetia** Syd. & P. Syd. (1917), ? Helotiales. 1, Philippines.
- Beniowskia** Racib. (1900), anamorphic *Pezizomycotina*, Hso.0eP.1. 1, widespread (tropical). See Mason (*Mycol. Pap.* 2: 26, 1928), Hanlin (*Mycotaxon* 28: 219, 1987), Kirschner *et al.* (*Mycoscience* 43: 15, 2002).
- Benjaminella** I.I. Tav. (1981) = *Benjaminimyces* fide Eriksson & Hawksworth (*SA* 5: 122, 1986; nomencl.), Tavares (*Mycotaxon* 75: 205, 2000).
- Benjaminia** Pidopl. & Milko (1971) [non *Benamina* Vell. 1835, *Rutaceae*] = *Benjaminiella*.
- Benjaminia** S. Ahmad (1967), anamorphic *Pezizomycotina*, Cpd.#eP.?. 1, Pakistan. See Ahmad (*Biologia Lahore* 13: 21, 1967).
- Benjaminiella** Arx (1981), Mucoraceae. 3, Canary Islands; India; USA. See Cole *et al.* (*Can. J. Microbiol.* 26: 35, 1980; dimorphism & wall chemistry), Benny *et al.* (*Mycotaxon* 22: 119, 1985), Forst & Pillinger (*Z. Mykol.* 54: 139, 1988; dimorphism), Kirk (*Mycotaxon* 35: 121, 1989), O'Donnell *et al.* (*Mycol.* 93: 286, 2001; phylogeny), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny).
- Benjaminimyces** I.I. Tav. (2000), Laboulbeniaceae. 4 (on insects), N. & S. America. See Tavares (*Mycotaxon* 75: 205, 2000).
- Benjpalia** Subram. & Bhat (1989), anamorphic *Pezizomycotina*, Hso.1eP.10/12/13. 1, India. See Subramanian & Bhat (*Kavaka* 15: 43, 1987).
- benomyl** ('Benlate'), the first systemic fungicide: one of the benzimidazoles, has very low toxicity to plants and animals, and controls ascomycetous fungal plant pathogens (incl. their anamorphs) by interfering with spindle formation during nuclear division.
- Bensingtonia** Ingold (1986), anamorphic *Agaricostilbaceae*. 11, widespread. See Nakase *et al.* (*J. gen. appl. Microbiol.* Tokyo 39: 107, 1993; mol. phylogeny), Takashima *et al.* (*J. gen. appl. Microbiol.* Tokyo 41: 131, 1995; mol. phylogeny), Barnett *et al.* (*Yeasts: Characteristics and Identification* 3rd edn, 2000), Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 1351, 2000; mol. phylogeny), Wang *et al.* (*Int. J. Syst. Evol. Microbiol.* 53: 2085, 2003), McLaughlin *et al.* (*Am. J. Bot.* 91: 808, 2004; mitosis).
- Berengeria** Trevis. (1853) = *Rinodina* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Berggrenia** Cooke (1879), ? *Pezizales*. 1 or 2, New Zealand. See Buchanan & May (*N.Z. Jl Bot.* 41: 407, 2003; NZ conservation).
- Bergorea** Nieuwl. (1916) = *Robergea*.
- Berkelella** (Sacc.) Sacc. (1891), *Clavicipitaceae*. Anamorph *Polycephalomyces*. 2 (on *Myxomycetes*), widespread. See Seifert (*Stud. Mycol.* 27, 1985; as *Byssostilbe*), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Bischoff *et al.* (*Mycotaxon* 86: 433, 2003).
- Berkeley** (Miles Joseph; 1803-1889; England). Studied at Cambridge University; became a priest, working first in Margate and later Northamptonshire, living at King's Cliffe till 1868, then at Sibbertoft. A great mycologist, once described as 'the last of the old race', Berkeley's chief work was with fungi (including lichen-forming species), though his interests in natural history were very wide: he also wrote about molluscs, mosses, algae, and gardening. He recognized that potato blight was caused by a fungus (1846). He was in touch with Fries, Montagne, and other mycologists, and from 1848 did much work with Broome. Berkeley's early work was done with great care but later, because of the large number of microfungi sent to him, there were more errors. In 1879 his collections were amalgamated with those of the Royal Botanic Gardens, Kew (K). *Publs.* His first printed mycological work was *British Fungi* (for which he distributed exsiccati) in Smith's *English Flora* (5 (2), 1836) [= Hooker's *British Flora*, 2 (2)]; he supplemented this (in collaboration with Broome) by *Notices of British Fungi* (1837-1885) [index in *TBMS* 17: 308, 1933; reprint, 1967]; in other papers he provided accounts of fungi from the then British colonies, the USA (especially collections of Curtis, q.v.), and other countries, and names for about 6,000 new species; of his 400 papers on mycology, some were short notes, such as those in the *Gardeners' Chronicle* (1845 onwards, including the group of papers on 'vegetable pathology', 1854-1857 [see *Phytopathological Classics* 8, with biography and portrait]), and others books, e.g. *Introduction to Cryptogamic Botany* (1857) and *Outlines of British Fungology* (1860). *Biogs, obits etc.* Ainsworth (*Mycologist* 21: 126, 1987) [portrait]; Buczacki (*British Mycological Society Symposium Series* 17: 1, 1991); Grumann (1974: 368); Stafleu & Cowan (*TL-2* 1: 192, 1976); Stafleu & Mennega (*TL-2, Suppl.* 2: 98, 1993).
- Berkeleyna** Kuntze (1898) = *Cephalotrichum* Link.
- Berkleasium** Zobel (1854), anamorphic *Pleosporales*, Hsp.#eP.1. 21, widespread. See Moore (*Mycol.* 51: 734, 1961; key), Ellis (*Dematiaceous Hyphomycetes*, 1971), Ellis (*More Dematiaceous Hyphomycetes*, 1976), Yip (*Australas. Pl. Path.* 17: 31, 1988), Bussaban *et al.* (*Fungal Diversity* 8: 73, 2001; Thailand), Somrithipol & Jones (*Fungal Diversity* 12: 169, 2003), Zhao & Zhang (*Mycotaxon* 89: 241, 2004; China), Pinnoi *et al.* (*Mycol.* 99: 378, 2007; phylogeny), Wang *et al.* (*MR* 111: 1268, 2007; phylogeny).
- Berlese** (Augusto Napoleone; 1864-1903; Italy). Professor of Plant Pathology, School of Agriculture, Milan. Responsible for parts of Saccardo's *Sylloge* and for starting (with his brother, Antonio Berlese, the zoologist) the *Rivista di Patologia Vegetale* (1892 onwards). *Publs.* *Fungi Moricollae* (1885-1889); *Icones Fungorum ad usum Sylloges Saccardianae Adcommodatae* (1890-1905); papers on *Pleospora* (1888), the *Lophiostomataceae* (1890), *Dematophora* and *Rosellinia* (1892), *Cladosporium* and *Dematium* (1895), and many more. *Biogs, obits etc.* Antonio Berlese (*Rivista di Patologia Vegetale* 10: 347, 1904); Cavara (*Annales Mycologici* 1: 178, 1903); Grumann (1974: 513); Stafleu & Cowan (*TL-2* 1: 197, 1976); Stafleu & Mennega (*TL-2, Suppl.* 2: 101, 1993).
- Berlesiella** Sacc. (1888) = *Capronia* fide Müller *et al.* (*TBMS* 88: 63, 1987; synonymy), Barr (*Mycotaxon* 41: 419, 1991), Untereiner & Naveau (*Mycol.* 91: 67, 1999).
- Berteromyces** Cif. (1954) = *Passalora* fide Deighton (*Mycol. Pap.* 112, 1967), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003).
- Bertia** De Not. (1844), *Bertiaceae*. 14 (from wood), widespread. See Corlett & Krug (*CJB* 62: 2561, 1985), Subramanian & Sekar (*Kavaka* 18: 19, 1993;

- Indian spp.), Huhndorf *et al.* (*MR* 108: 1384, 2004; phylogeny), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Bertiaceae** Smyk (1981), Coronophorales. 1 gen., 14 spp.
- Lit.*: Subramanian & Sekar (*Kavaka* 18: 19, 1993), Huhndorf *et al.* (*MR* 108: 1384, 2004; phylogeny).
- Bertiella** (Sacc.) Sacc. & P. Syd. (1899) = *Massarina* fide Eriksson & Yue (*Mycotaxon* 27: 247, 1986).
- Bertiella** Kirschst. (1906) = *Kirschsteinia*.
- Bertossia** Cif. & Tomas. (1953) = *Mycoglaena* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Bertramia** Mesnil & Caullery (1897), Chytridiomycota. 1, widespread. See Weiser & McCauley (*Z. Parasitkde* 43: 299, 1974).
- Bertrandia** R. Heim (1936) = *Hygrocybe* fide Kuyper (*in litt.*).
- Bertrandiella** R. Heim (1966) = *Lactocollybia* fide Singer (*Agaric. mod. Tax.* edn 3, 1975).
- Berwaldia** J.I.R. Larsson (1981), Microsporidia. 2. See Larsson (*Parasitology* 83: 325, 1981).
- Bessey** (Ernst Athearn; 1877-1957; USA). Professor of Botany and Mycology, Michigan Agricultural College, East Lansing, 1910-1946. Author of the first American textbook of mycology (1935, 1950 [edn 2]) [see Literature]. *Biogs, obits etc.* Barnett (*Mycol.* 50: 1, 1958) [bibliography, portrait]; Grumann (1974: 204); Stafleu & Cowan (*TL-2* 1: 219, 1976); Stafleu & Mennega (*TL-2, Suppl.* 2: 141, 1993).
- beta-spore** (**B-spore**, **β-spore**), a fertile, usually hamate, spore of an anamorph of the *Valsaceae* (*Phomopsis*). Cf. alpha-spore.
- Bettsia** Skou (1972), Ascosphaeraceae. Anamorph *Chrysosporium*-like. 1 (in pollen on honeycomb), Europe. See Skou (*Friesia* 11: 62, 1975), Maghrabi & Kish (*Mycol.* 78: 676, 1986), Maghrabi & Kish (*Mycol.* 79: 519, 1987; isozymes), Kuraishi *et al.* (*Antonie van Leeuwenhoek* 77: 179, 2000; ubiquinones), James & Skinner (*J. Invert. Path.* 90: 98, 2005; molecular diagnostics).
- Betulina** Velen. (1947), Hyaloscyphaceae. 2, Europe. See Graddon (*TBMS* 63: 477, 1974), Huhtinen (*Karstenia* 29: 45, 1990).
- Beverwykella** Tubaki (1975), anamorphic *Pezizomycotina*, Hso.#eH.1. 3 (aquatic), widespread. See Tubaki (*TMSJ* 16: 138, 1975), Nawawi & Kuthubutheen (*TBMS* 90: 487, 1988), Voglmayr & Delgado-Rodríguez (*MR* 107: 236, 2003; key).
- Bharatheeya** D'Souza & Bhat (2002), anamorphic *Pezizomycotina*, H??.?. 2, India. See D'Souza & Bhat (*Mycotaxon* 83: 399, 2002).
- Bhargavaella** Sarj. Singh & K.S. Srivast. (1980), anamorphic *Pezizomycotina*, Hso.#eP.3. 1, India. See Singh & Srivastava (*J. Indian bot. Soc.* 58: 391, 1979).
- bi-** (prefix), twice; having two; two-.
- biallelic** (of an incompatibility system), having 2 alleles per locus; cf. multiallelic.
- Biannularia** Beck (1922) = *Catathelasma* fide Singer (*Agaric. mod. Tax.* edn 3, 1975).
- Biannulariaceae** Jülich (1982) nom. rej. = *Tricholomataceae*.
- Biatora** Ach. (1809) = *Stenhammarella* fide Hertel (*Beih. Nova Hedwigia* 24, 1967).
- Biatora** Fr. (1817), Ramalinaceae (L). c. 42, widespread (temperate). See Hafellner (*Herzogia* 8: 53, 1989), Printzen (*Biblhca Lichenol.* 60, 1995), Printzen (*Cryptog. bot.* 5: 105, 1995), Printzen & Tønsberg (*Bryologist* 102: 692, 1999; N Am.), Printzen *et al.* (*Lichenologist* 31: 491, 1999; RAPDs), Ekman (*MR* 105: 783, 2001; phylogeny), Printzen & Tønsberg (*Biblhca Lichenol.* 86: 133, 2003; pigments), Printzen & Tønsberg (*Symb. bot. upsal.* 34 no. 1: 343, 2004; N Am.), Printzen & Otte (*Graphis Scripta* 17: 56, 2005; key to European and Macaronesian spp.).
- Biatoraceae** A. Massal. ex Stizenb. (1862) = *Ramalinaceae*.
- Biatorella** De Not. (1846), Biatorellaceae (L). c. 31, widespread. See Magnusson (*Rabenh. Krypt.-Fl.* 9 5.1: 15, 1935), Magnusson (*Annals Cryptog. Exot.* 7: 115, 1935), Hafellner & Casares-Porcel (*Nova Hedwigia* 55: 309, 1992; typification), Weber & Nash (*Lichenologist* 24: 101, 1992; N Am.), Hafellner (*Cryptog. bot.* 5: 99, 1995).
- Biatorellaceae** M. Choisy ex Hafellner & Casares (1992), Lecanorales (L). 2 gen. (+ 3 syn.), 33 spp.
- Lit.*: Hafellner & Casares-Porcel (*Nova Hedwigia* 55: 309, 1992), Weber & Nash (*Lichenologist* 24: 101, 1992).
- Biatorellina** Henn. (1903) ? = *Tryblidiopsis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Biatorellopsis** C.W. Dodge (1965) = *Pleopsidium* fide Castello & Nimis (*Lichenologist* 26: 283, 1994).
- Biatoridina** Schcedr. (1964) = *Epithyrium* fide Sutton (*Mycol. Pap.* 141, 1977).
- Biatoridium** J. Lahm ex Körb. (1860), *Pezizomycotina* (L). 3, widespread (temperate). See Hafellner (*Acta Bot. Fenn.* 150: 39, 1994), Jørgensen (*Taxon* 53: 521, 2004; nomencl.), Reeb *et al.* (*Mol. Phylogen. Evol.* 32: 1036, 2004; phylogeny).
- Biatorina** A. Massal. (1852) nom. rej. = *Catinaria* fide Jørgensen & Santesson (*Taxon* 42: 881, 1993).
- biatorine** (of apothecia), of the lecideine type, pale or more or less coloured and soft in consistency.
- Biatorinella** Dechatres & Werner (1974) = *Fuscidea* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Biatorinopsis** Müll. Arg. (1881) = *Coenogonium* Ehrenb. fide Rivas Platas *et al.* (*Fungal Diversity* 23: 255, 2006).
- Biatoropsis** Räsänen (1934), Tremellaceae. Anamorph *Hormomyces*-like. 1 (causing galls, 'carpoids', on *Usnea*), widespread. See Diederich & Christiansen (*Lichenologist* 26: 47, 1994).
- Biatriospora** K.D. Hyde & Borse (1986), Dothideomycetes. 1 (on mangrove wood), Seychelles. See Hyde & Borse (*Mycotaxon* 26: 263, 1986), Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 34: 1, 1991).
- Bibanasiella** R.F. Castañeda & W.B. Kendr. (1991), anamorphic *Pezizomycotina*, Hsp.1bH.12. 1, Cuba. See Castañeda Ruiz & Kendrick (*Univ. Waterloo Biol. Ser.* 35: 14, 1991).
- Bibbya** J.H. Willis (1956) = *Toninia* fide Santesson (*Muelleria* 1: 91, 1959).
- Bibliography of Systematic Mycology**. Produced by CABI, and appearing twice annually since 1943, this lists new and recently published work on systematic mycology, arranged in categories which include the major taxonomic groups of fungi, biographies, checklists, obituaries, regional mycotas etc., and fungal generic name indexes. The great thesauri of mycological literature produced by Ciferri, Lindau and Sydow

- provided coverage of mycological literature up to the year 1930. The *Bibliography of Systematic Mycology* provides a current continuation of these works, from the early 1940s onwards. The years between still remain uncovered by any single publication. See also Literature.
- Bibulocystis** J. Walker, Beilharz, Pascoe & Priest (2006), Raveneliaceae. 2 (on on *Albizia*, *Daviesia* (*Leguminosae*)), Australia; New Caledonia. See Walker *et al.* (*Australas. Pl. Path.* 35: 11, 2006).
- bibulous** (of the surface of a pileus), able to take up water.
- bicampanulate**, like two bells arranged mouth to mouth (Fig. 23.20).
- Biciliopsis** Diederich (1997), ? Chaetothyriaceae. 1 (lichenicolous), Papua New Guinea. See Aptroot *et al.* (*Biblthca Lichenol.* 64, 1997), Hoffmann & Hafellner (*Biblthca Lichenol.* 77: 1, 2000).
- Biciliospora** Petr. (1952) = *Nitschkia* fide von Arx (*Sydowia* 34: 13, 1981), Subramanian & Sekar (*Kavaka* 18: 19, 1993).
- Biciliosporina** Subram. & Sekar (1993), Nitschkiaceae. 1 (from bark), India. See Subramanian & Sekar (*Kavaka* 18: 19, 1993).
- biconic** (of spores), like two cones attached base to base (Fig. 23.27).
- Biconiosporella** Schaumann (1972), Sordariomycetidae. 1 (from wood, marine), Europe. See Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 34: 1, 1991), Huhndorf *et al.* (*Mycol.* 96: 368, 2004).
- Bicornispora** Checa, Barrasa, M.N. Blanco & A.T. Martínez (1996), ? Coryneliaceae. Anamorph *Exophiala*. 1 (dead stems), Spain. See Checa *et al.* (*MR* 100: 500, 1996).
- Bicricium** Sorokin (1889) nom. conf., Chytridiales.
- Bicrouania** Kohlm. & Volkm.-Kohlm. (1990), Melanommataceae. 1 (marine), France. See Kohlmeyer & Volkmann-Kohlmeyer (*MR* 94: 685, 1990).
- Bidenticula** Deighton (1972) = *Fusarium* fide Booth & Sutton (*in litt.*).
- Bidonia** Adans. (1763) = *Hydnum* fide Donk (*Taxon* 5, 1956).
- bifarious**, in two lines or series; distichous.
- bifid**, having a crack or division near the middle; forked.
- Bifidocarpus** Cano, Guarro & R.F. Castañeda (1994), ? Onygenaceae. 2, Cuba. See Cano *et al.* (*Mycotaxon* 52: 53, 1994), Udagawa & Uchiyama (*Cryptog. Mycol.* 21: 75, 2000).
- Biflagellospora** Matsush. (1975), anamorphic *Pezizomycotina*, Hso.0eH.1/19. 1, Japan. See Matsushima (*Icon. microfung. Matsush. lect.*: 16, 1975), Sivichai & Hywel-Jones (*MR* 103: 908, 1999; Thailand).
- Biflagellosporella** Matsush. (1993), anamorphic *Pezizomycotina*, Hso.1bH.1. 1, Peru. See Matsushima (*Matsush. Mycol. Mem.* 7: 44, 1993).
- Biflua** Jørg. Koch & E.B.G. Jones (1989), *Pezizomycotina*. 1, Denmark. See Koch & Jones (*CJB* 67: 1187, 1989), Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 34: 1, 1991).
- Bifrontia** Norman (1872) = *Naetrocymbe* Körb. fide Keissler (*Rabenh. Krypt.-Fl.* 9, 1, 1933).
- Bifusella** Höhn. (1917), Rhytismataceae. Anamorph *Crandallia*. 10, widespread. *B. faullii* (needle-cast in *Abies*), *B. linearis* (on pine). See Cannon & Minter (*Mycol. Pap.* 155, 1986), Hansen & Lewis (*Compendium of Conifer Diseases*, 1997), Hou *et al.* (*CJB* 83: 37, 2005; Canada).
- Bifusepta** Darker (1963), Rhytismataceae. 1, N. America. See Darker (*Mycol.* 55: 816, 1963).
- Biharia** Thirum. & Mishra (1953) = *Stenella* fide Ellis (*Dematiaceous Hyphomycetes*, 1971), Braun (*Monogr. Cercospora, Ramularia Allied Genera* (*Phytopath. Hyphom.*) 2: 374, 1998), Braun *et al.* (*Mycol. Progr.* 2: 3, 2003).
- bilabiate** (1) two-lipped; (2) (of asci), ones in which the ectotunica splits in a lip-like manner to expose the endotunica (e.g. *Pertusaria*).
- bilaminate**, two-layered.
- Bilboque** Viégas (1960), anamorphic *Pezizomycotina*, Hso.1eP.?. 1, Brazil. See Viégas (*Bragantia* 19: 903, 1960).
- Bilgrami** (Krishna Sahai; 1933-1996; India). Student (1954-1957) then Lecturer (1958-1963), Allahabad University; Reader, Jodhpur University (1963-1970); Professor & Head, Botany Department, Bhagalpur University (1970-1993). Noted for his work on environmental pollution, mycotoxin contamination of animal and human food, and environmental biology, specifically in relation to ecology of the Ganga river and thermal springs of Bihar; compiled the first comprehensive checklist of India's fungi. *Publs.* (with Jamaluddin & Rizwi) *Fungi of India, Lists and References* edn 2 (1991). *Biogs, obits etc.* Tandon (*Indian Phytopathology* 50 (1): 159, 1997).
- Bilgramia** Panwar, Purohit & Chouhan (1974), anamorphic *Pezizomycotina*, Hso.#eP.3. 1, India. See Carmichael *et al.* (*Genera of Hyphomycetes*, 1980).
- Bilimbia** De Not. (1846), Lecanorales (L). Probably close to *Lecania*. See Veldkamp (*Lichenologist* 36: 191, 2004), Llop (*Lichenologist* 38: 279, 2006), Naesborg *et al.* (*MR* 111: 581, 2007; phylogeny).
- Bilimbiospora** Auersw. (1861) nom. rej. = *Leptosphaeria* fide Holm (*Taxon* 24: 475, 1975).
- Bimeris** Petr. (1949), anamorphic *Pezizomycotina*, Cpd.1eH.?. 1, Ecuador.
- Bimuria** D. Hawksw., Chea & Sheridan (1979), ? Montagnulaceae. 1 (from soil), New Zealand. See Hawksworth (*SA* 6: 238, 1987; posn), Kruys *et al.* (*MR* 110: 527, 2006; posn), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- binate**, in two parts.
- binding hyphae**, see hyphal analysis.
- binucleate-phase**, the dikaryo-phase.
- Binucleospora** A.M. Bronnvall & J.I.R. Larsson (1995), Microsporidia. 1. See Bronnvall & Larsson (*Eur. J. Protist.* 31: 63, 1995).
- bio-** (prefix), pertaining to life.
- biocide**, a substance which kills living organisms. Cf. biostat.
- Bioconiosporium** Bat. & J.L. Bezerra (1964), anamorphic *Pezizomycotina*, Hso.#eP.1. 3, widespread. See Batista & Bezerra (*Publicões Inst. Micol. Recife* 417: 4, 1964), Castañeda Ruiz & Heredia (*Mycotaxon* 76: 125, 2000).
- biocontrol**, see Biological control.
- bioconversion**, the conversion of one material, usually a waste, into a product of increased value (e.g. of lignocellulosic residues for ethanol production); see Saddler (Ed.) (*Bioconversion of forest and agricultural plant residues*, 1993), Biodegradation, Biodeterioration, Biotechnology.
- Biodegradation**. A term sometimes used synonymously with Biodeterioration (q.v.). However, it is more correctly employed to describe breakdown of materials in a manner beneficial to man, e.g. the re-

moval of and/or use of wastes. It has been defined as 'the harnessing, by man, of the decay abilities of organisms to render a waste material more useful or acceptable' (Allsopp & Seal, *Introduction to biodeterioration*, 1986), and as such covers use of fungi and other organisms (mainly bacteria) in solid or liquid state fermentations to improve digestibilities of, for example, lignocellulosic wastes to ruminants or to produce single cell proteins from wastes. Examples of economically beneficial fungal biodegradation (often in combination with other organisms) include: composting of straw, manure, agricultural waste and bark; mushroom cultivation, including biodegradation of logs by shiitake fungi; production of single cell proteins using alkanes, brewery wastes, molasses and sulphite waste liquids; solid waste treatment of sludge, sewage; pulp and paper mill effluent treatment; waste water treatment, particularly from distilleries and tanneries. Although the term 'biodegradable' is sometimes used to describe decay of natural materials such as forest leaf litter, the concept of biodegradability has come to be used more colloquially in recent years in connexion with detergents, plastics etc. which may break down when discarded into the environment. There is as yet no universally accepted definition of the term **biodegradable**, particularly when applied to these materials. There are outstanding questions regarding whether the term implies complete mineralization and hence removal of the waste from the environment or whether degradation to a small non-toxic molecule will suffice. Several bodies are working to produce a satisfactory definition, e.g. International Biodeterioration Research Group (IBRG), American Society for the Testing of Materials (ASTM).

See Bioconversion, Biodegradation, Bioremediation. See Bennett *et al.* (*Use of fungi in biodegradation* in Hurst [Ed.], *Manual of Environmental Microbiology* edn 2, 2002). See also: Biodeterioration, Bioremediation, Biotransformation.

Biodeterioration. Any undesirable change in the properties of a material caused by the vital activities of organisms (Hueck, 1965). Fungi play an important part in biodeterioration. Some representative examples of fungal damage are: to **animal feeding stuffs**, Snow *et al.* (*Ann. appl. Biol.* 31: 102, 1944); **building materials**, Batista *et al.* (*Atas Inst. Mycol. Recife* 5: 311, 1967; fungi, incl. lichens), Martin & Johnson (*Biodet. Abstr.* 6: 101, 1992; bibl. control lichens), May *et al.* (*Biodet. Abstr.* 7: 109, 1993; review), Richardson (*The vanishing lichens*, 1975), Singh (*Building mycology*, 1994), see also monuments (below), weathering; **stone**, May *et al.* (*Biodet. abstr.* 7: 109, 1993); **electrical equipment**, Wasserbauer (*Internat. Biodet. Bull.* 3: 1, 1967); **food**, see Food spoilage; **fuel**, see kerosene fungus; **glass and optical equipment**, Ohtsuki (*Bot. Mag. Tokyo* 75: 221, 1962), Nagamuttu (*Internat. Biodet. Bull.* 3: 25, 1967); **grain**, Christensen & Kauffman (*Grain storage. The role of fungi in quality and loss*, 1969); **gunpowder**, Lacey (*TBMS* 74: 195, 1980); **leather**, Musgrave (*Ann. appl. Biol.* 34, 1947), Gordon (*in* O'Flaherty *et al.* (Eds) (*The chemistry and technology of leather*, 4, 1965); **meat**, Jensen (*Microbiology of meats*, 1942); **monuments**, Nimis *et al.* (*Licheni i conservazione dei monumenti*, 1992), see also building materials (above), weathering; **paint**, Eveleigh (*Ann. appl. Biol.* 49: 403, 1961; *TBMS* 44: 573, 1961,

esp. *Phoma violacea*), 7th Paint Research Institute Symposium (*J. Coatings Technology* 50: 35, 1978); **paper**, Sée (*Les maladies du papier piqué*, 1919), Wang (*Tech. Publ. Sta. Univ. Coll. Forestry Syracuse* 87, 1965; fungi of pulp and paper; cellulolytic fungi); **polyurethane**, Pathirana & Seal (*Internat. Biodet.* 20: 163, 229, 1984); **structural timber**, see Wood-attacking fungi; **textiles**, Thaysen & Bunker (*The microbiology of cellulose, hemicellulose, pectins and gums*, 1927), Prindle (*Microbiology of textile fibres*, *Textile Rev.* 1933-6), Morris (*J. Text. Inst.* 18: T99, 1927), Galloway (*J. Text. Inst.* 26: T123, 1935); **to-bacco**, Papavassiliou *et al.* (*Mycopath.* 44: 117, 1971; cigarettes); **wood, archaeological**, Blanchette (*Biodet. Abstr.* 9: 113, 1995). See also Seaward & Brightman (*in* Seaward, *Lichen ecology*: 253, 1977; lichens on man-made substrata, etc.).

The International Biodeterioration and Biodegradation Society (www.biodeterioration.org) covers all aspects of the biodeterioration of materials and biodegradation of wastes and holds regular meetings and international symposia, with published proceedings.

Lit.: Allsopp *et al.* (*Introduction to biodeterioration*, edn 2, 2004; Japanese edn, 1991), Hueck (*Material und Organismen* 1: 5, 1965), Singh (Ed.) (*Building mycology*, 1994), *Biodeterioration Abstracts* (1987-2001; quarterly), *International Biodeterioration & Biodegradation* (1965-; originally as *International Biodeterioration Bulletin*). See also: Biodegradation, Bioremediation.

Biodiversity (Biological diversity). The variety and value of Life on Earth from the genetic through the organismal to the ecological levels.

The variety and value of fungi at all of those levels is no smaller than for animals or plants: for fungi, the very small proportion which are satisfactorily known (Cannon & Hawksworth, *Adv. Pl. Path.* 11: 277, 1995), the large numbers of species (see Numbers of fungi), and their importance in ecosystem functioning (Christensen, *Mycol.* 81: 1, 1989) are all factors arguing for prioritized attention in biodiversity studies. There is a pressing need for inventories (q.v.), which are one of the principal ways of assessing biodiversity, since in many parts of the world, many ecosystems remain almost unexplored for fungi, and biodiversity 'hotspots' for fungi may be different from those for animals or plants.

The UN Convention on Biological Diversity, negotiated in Rio de Janeiro in 1992, became effective at the end of 1993; by June 2008, 191 governments were parties to the convention (but not Andorra, the Holy See, Iraq, Somalia or the USA). The Convention has focused the subject of biodiversity in political circles; many countries have now developed or are developing programmes to survey and value their natural biotic resources and investigate how they can best be conserved and sustainably used. Initiatives such as the IUBS/UNESCO/SCOPE DIVERSITAS programme, the GEF/UNEP Global Biodiversity Assessment and the Species 2000 and Systematics Agenda 2000 projects are prominent elements of such research and development efforts.

Although the convention explicitly states that it covers all forms of biodiversity, it is worded in terms of 'animals, plants and microorganisms', categories into which fungi do not easily fit. Not surprisingly, therefore, many (perhaps most) of the reports and biodiversity strategy and action plans produced by

individual countries in response to the convention contain no mention of fungi. To date, the convention has not been subjected to critical evaluation by the mycological community in respect of its impact on conservation of fungal diversity and the sustainable use of fungi.

Lit.: Allsopp *et al.* (Eds) (*Microbial Diversity and Ecosystem Function*, 1995); Aptroot (*Fungal Diversity* 6: 1, 2001) [200 spp. on one tree]; Galloway (*Biodiv. Conserv.* 1: 312, 1992) [lichens]; Groombridge (Ed.) (*Global Biodiversity*, 1992); Hawksworth (*MR* 95: 641, 1991); Hawksworth (Ed.) (*Biodiversity: Measurement and Estimation*, 1995); Heywood (Ed.) (*Global Biodiversity Assessment*, 1995); Isaac *et al.* (Eds) (*Aspects of Tropical Mycology*, 1993); Oberwinkler (*Biodiv. Conserv.* 1: 293, 1992); Rossman *et al.* (*Protocols for an All Taxa Biodiversity Inventory of Fungi*, 1998); Schulze & Mooney (Eds) (*Biodiversity and Ecosystem Function*, 1994); Solbrig *et al.* (Eds) (*Biodiversity and Global Change*, edn 2, 1994).

biogenous, living on another living organism; parasitic.

Biographical notices, for list see Authors' names.

Bioindication. The use of organism(s) (**bioindicators**) expressing particular symptoms or responses to indicate changes in some environmental influence; various fungi, including leaf-inhabiting, mycorrhizal and lichen-forming species, are used as bioindicators of acid rain (q.v.), air pollution (q.v.), ammonium eutrophication (Brown, in Bates & Farmer, 1992: 259), dating surfaces (see Lichenometry), ecological continuity (see RIEC), fire (Wolseley *et al.*, *Global Ecol. Biogeogr. Lett.* 4: 116, 1995), heavy metals (Gordon *et al.*, *J. Trop. Ecol.* 11: 1, 1995; Sosak-Świdarska, *Geophysical Res. Abstracts* 10: EGU2008-A-11527, 2008), radionuclides (see air pollution), and water levels (see Aquatic fungi).

Lit.: Bates & Farmer (Eds) (*Bryophytes and lichens in a changing environment*, 1992), Boddy *et al.* (Eds) (*Fungi and ecological disturbance* [*Proc. R. Soc. Edinb. B* 94], 1988), Burton (*Biological monitoring of environmental contaminants: plants*, 1986), Ellenberg *et al.* (*Biological monitoring: signals from the environment*, 1991), Fellner (*Agriculture Ecosystems and Environment* 28, 115, 1989), Hawksworth (in Swaminathan & Jana, *Biodiversity: implications for global food security*: 184, 1992), Jeffrey & Madden (Eds) (*Bioindicators and environmental management*, 1991), Richardson (*Pollution monitoring with lichens*, 1992).

biologic form (Marshall Ward) or **race** (Klebahn), see physiologic race.

Biological control (Biocontrol). The use of one or more organisms (agents) to maintain another organism (pest) at a level at which it is no longer a problem. Fungal pathogens, parasites and antagonists are being exploited to control a range of agricultural pests, including arthropods, nematodes, weeds and crop diseases (Association of Applied Biologists, *The exploitation of micro-organisms in applied biology*, 1990; Burge, *Fungi in biological control systems*, 1988; Butt *et al.*, *Fungi as biocontrol agents: progress, problems and potential*, 2001); although rarely openly discussed, they have also been used in political and military contexts (see Bioterrorism and fungi). They may be used alone or as part of an integrated pest management scheme (see Maredia *et al.*, *Integrated pest management in the global arena*,

2003). Two distinct approaches can be adopted: classical, involving the release of a coevolved fungal pathogen into an exotic environment where the target pest is an alien or non-indigenous species; inundative, through the application of a mass-produced, typically necrotrophic fungus as a mycopesticide (q.v.). Entomopathogenic fungi in genera such as *Beauveria*, *Metarhizium*, *Paecilomyces* and *Verticillium*, are being used for inundative biological control (see mycopesticides), while *Entomophthora radicans* has been classically introduced into Australia for control of Lucerne aphid (Milner *et al.*, *J. Aust. Ent. Soc.* 21: 113, 1982).

Nematophagous fungi include the nematode trapping fungi (*Arthrobotrys*, *Dactylella*, *Geniculifera*, *Monacrosporium*), endoparasites (*Hirsutella*, *Catenaria*, *Meria*, *Nematoctonus*, *Nematophthora*) and highly specific egg parasites (*Dactylella oviparasitica*, *Paecilomyces lilacinus*, *Verticillium chlamydosporium*) (Stirling, in Burge, 1988). Immediate prospects for the exploitation of nematophagous fungi as biological control agents are uncertain since problems of formulation and application still have to be overcome (Stirling, *Biological control of plant parasitic nematodes*, 1992; Mankau, *J. Nematology* 12: 244, 1980).

Fungal pathogens for the biological control of weeds have been extensively investigated (Charudattan & Walker (Eds), *Biological control of weeds with plant pathogens*, 1982; TeBeest (Ed.), *Microbial control of weeds*, 1991), using both the classical approach with obligate pathogens such as rusts and smuts, and the inundative approach, with necrotrophic pathogens in the genera *Colletotrichum* and *Phytophthora* (see mycopesticides). Successful control of skeleton weed has been achieved in Australia following release of the European rust *Puccinia chondrillina* (Hasan, *Ann. appl. Biol.* 99: 119, 1981), and of mistflower in Hawaii with the white smut *Entyloma ageratinae* from the Caribbean (Trujillo, *Proc. VI Int. Symp. Biol. Control Weeds* 25, 1985; Barreto & Evans, *TBMS* 91: 81, 1988), and of blackberry in Chile with the imported rust *Phragmidium violaceum* (Oehrens, *FAO Pl. Prot. Bull.* 25: 26, 1977). For risk assessment see Evans (*Aust. Pl. Path.* 29: 1, 2000).

Mycoparasites and antagonistic fungi, particularly in the genera *Gliocladium*, *Sphaerellopsis*, *Trichoderma* and *Verticillium*, have been evaluated for biological control of crop diseases (Cook & Baker, *The nature and practice of biological control of plant pathogens* 1984; Hornby (Ed.), *Biological control of soil-borne plant pathogens*, 1990), Kubicek & Harman (*Trichoderma and Gliocladium* 1. Basic biology, taxonomy and genetics, 1998), Harman & Kubicek (*Trichoderma & Gliocladium* 2. Enzymes, biological control and commercial applications, 1998); see Mycopesticides for more details; bacteria and protozoa as well as other fungi have been tried against *Phytophthora cinnamomi* (Scott, *Adv. Pl. Path.* 11: 131, 1995).

Biological control is particularly important in forestry where economics rarely permit other options. A classic example is control of the conifer pathogen *Heterobasidion annosum* which colonizes stumps of freshly felled trees, then spreading to adjacent living trees, by stump application of spores of a competitor, *Phlebiopsis gigantea* (Rishbeth, *Ann. Appl. Biol.* 52:

63, 1963).

Fungal diseases may themselves be subject to biological control by other organisms. *Streptomyces* has been used to suppress fungi causing damping off of alfalfa seedlings (Jones & Samac, *Biological control* 7: 196, 1996) and transmissible hypovirulence using dsRNA viruses (q.v.) has been used with considerable success as a form of biological control for chestnut blight caused by *Cryphonectria parasitica* (see Diamandis & Perlerou, *Advances in hort. sci.* 20: 50, 2006).

Biological warfare and fungi. see Bioterrorism and fungi.

bioluminescence, see Luminescent fungi.

biomass, the quantity (vol., wt, etc.) of organisms (or living material) in a particular environment (e.g. fungi in soil); sometimes extended to the quantity of organic matter in a material (e.g. domestic refuse). See Boucher & Stone (*in* Carroll & Wicklow, *The fungal community*, edn 2 : 538, 1992; in lichens on trees), Frankland (*Soil Biol. Biochem.* 7: 339, 1975; 10: 323, 1978; estimation live biomass), Newell (*in* Carroll & Wicklow, 1992: 521; in litter), Ritz *et al.* (Eds) (*Beyond the biomass*, 1994).

biomass support particles (ESPs), large open structures made from knitted stainless steel and crushed into spheres or reticulated polyurethane foam cut into cubes used for immobilization (q.v.) of fungal cells.

Bionectria Speg. (1919), Bionectriaceae. Anamorph *Clonostachys*. 4 (on living and dead leaves, and old woody tissues), widespread. See Rossman *et al.* (*Mycol.* 85: 685, 1993), Schroers & Samuels (*Z. Mykol.* 63: 149, 1997), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Schroers *et al.* (*Mycol.* 91: 365, 1999), Schroers *et al.* (*Stud. Mycol.* 45: 63, 2000), Samuels *et al.* (*Tropical Mycology* 2: 13, 2002; key), Samuels *et al.* (*CBS Diversity Ser.* 4, 2006; USA), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny), Hirooka & Kobayashi (*Mycoscience* 48: 81, 2007; Japan).

Bionectriaceae Samuels & Rossman (1999), Hypocreales. 35 gen. (+ 24 syn.), 281 spp.

Lit.: Lowen (*A monograph of the Genera Nectriella, Nitschke and Pronectria* Clements. *With Reference to Charonectria, Cryptonectriella, Hydronectria and Pseudonectria* [Thesis (PhD) Graduate Faculty of Biology, City University, New York]: 331 pp., 1991), Kohlmeyer & Volkmann-Kohlmeyer (*MR* 97: 753, 1993), Rehner & Samuels (*CJB* 73: S816, 1995), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Schroers *et al.* (*Mycol.* 91: 375, 1999), Okuda *et al.* (*Mycoscience* 41: 239, 2000), Rossman (*Stud. Mycol.* 45: 27, 2000), Schroers (*Stud. Mycol.* 45: 63, 2000), Rossman *et al.* (*Mycol.* 93: 100, 2001; rDNA phylogeny), Schroers (*Stud. Mycol.* 46: 1, 2001), Castlebury *et al.* (*MR* 108: 864, 2004).

BioNET-INTERNATIONAL (BI). Established in June 1993 and with a secretariat hosted by CABI, BioNET is an international not-for-profit initiative dedicated to promoting taxonomy, especially in the biodiversity rich but economically poorer countries of the world. Focused on less industrialised countries and working via ten regional partnerships, BioNET provides a forum for collaboration for all taxonomists and other users of taxonomy. Working with partners locally and internationally, our work contributes to raising awareness of the importance of taxonomy to society, building and sharing of capacity, and meeting taxonomic needs via innovative tools and ap-

proaches. BioNET supports implementation of UNEP's Global Taxonomy Initiative having been cited as an actor over forty times in key decisions of the Convention on Biological Diversity. See also: www.bionet-intl.org (website).

biont, a living organism; commonly used as a suffix to a word indicating the nature or position of the biont; see Symbiosis.

biophagous, see biogenous.

biophilous, see biogenous.

Biophomopsis Petr. (1931), anamorphic *Pezizomycotina*, St.0eH.?. 1, West Indies.

Bioporthes Petr. (1929), Diaporthales. 1. See Müller & von Arx *in* Ainsworth *et al.* (Eds) (*The Fungi* 4A: 87, 1973), Barr (*Mycol. Mem.* 7, 1978), Cannon (*Fungal Diversity* 7: 17, 2001).

Bioprospecting. The action of surveying natural ecosystems for economically valuable biotic products. For fungi, such products might include novel edible fungi, valuable enzymes for biotechnology companies, metabolites for pharmaceutical investigation, or new biological control agents. The extent to which the provisions of the Convention on Biological Diversity (1992) will impinge on bioprospecting will depend on national legislation and regulation systems relating to indigenous intellectual property rights (yet to be developed by most countries); for aspects of the Convention relating to microbial groups see Kelley (*in* Allsopp *et al.* (Eds), *Microbial diversity and ecosystem function*: 415, 1995), Sands (*in* Kirsop & Hawksworth (Eds), *The biodiversity of microorganisms and the role of microbial resource centres*: 9, 1994), Reid *et al.* (Eds) (*Biodiversity prospecting*, 1993). Bioprospecting may also relate to use of organisms to detect and even extract valuable minerals. Some macrofungi are known to accumulate gold (Borovička *et al.*, *MR* 109: 951, 2005). See Bioindication, Patent protection.

Bioremediation. The use of fungi and other organisms to remove, reduce or ameliorate pollution or potentially polluting materials from the environment. This may be brought about by adding suitable nutrients or selected strains or mixtures of organisms to the substratum; they may be naturally occurring or genetically manipulated. There is an extensive literature on this topic. Fungi (particularly white rot fungi) have been used for degradation of lignocellulosic wastes and more recently for xenobiotics. There have also been studies of possible use of fungi for decomposing dyes in industrial effluents (e.g. Mutheszhilan *et al.*, *Res. J. Microbiol.* 3: 204, 2008; see also Marine fungi), for degrading chlorpyrifos (Fang *et al.*, *International Biodet. & Biodeg.* 61: 294, 2008) and polycyclic aromatic hydrocarbons (Wu *et al.*, *Biodegradation* 19: 247, 2008) in contaminated soils. The recent discovery that some fungi appear to be attracted by and grow better in the presence of nuclear radiation has aroused considerable interest with further possibilities for fungal bioremediation. See Alexander (*Biodegradation and bioremediation*, 1994), Baker & Herson (Eds) (*Bioremediation*, 1994), Gadd (*MR* 111: 3, 2007; review), Kerr (*Handbook of bioremediation*, 1994), Lamar *et al.* (*in* Leather (Ed.), *Frontiers in industrial mycology*: 127, 1992), Scheremaker *et al.* (*in* Betts (Eds), *Biodegradation: natural and synthetic materials*: 157, 1992), Zhdanova *et al.* (*MR* 108: 1089, 2004). See also: Biodegradation, Biodeterioration.

bios, a mixture of aneurin (thiamin, vitamin B1), 'biotin', and other substances in yeasts which, on addition to culture media, gives a better growth of yeast (Wildiers, 1901; see Bonner, *Bot. Rev.* 3: 616, 1937).

Bioscypha Syd. (1927), Helotiaceae. Anamorph *Chalara*-like. 2, C. America. See Carpenter (*Mem. N. Y. bot. Gdn* 33, 1981), Samuels & Rogerson (*Brittonia* 42: 105, 1990), Paulin & Harrington (*Stud. Mycol.* 45: 209, 2000; anamorph).

biostat, a substance which causes living organisms to stop growing. Cf. biocide.

Biostictis Petr. (1950), Stictidaceae. Anamorph *Rhino-cladiella*-like. 4, widespread. See Sherwood (*Occ. Pap. Farlow Herb. Crypt. Bot.* 15: 105, 1980; key).

biosystematics (1) biological systematics (see systematics); (2) (in botany), experimental taxonomy, including genetical, cytological and ecological aspects. The first usage has a wide currency amongst zoologists and is the preferred term for use in a general context.

biotechnology (1) (in mycology and microbiology), 'all lines of work by which products are produced from raw materials with the aid of living organisms' (Ereky, 1919); see Arora (*Fungal biotechnology in agriculture, food and environmental applications*, 2003), Bud (*Nature* 337: 10, 1989), Coombs (*Macmillan dictionary of biotechnology*, 1986), Hui & Khachatourians (Eds) (*Food biotechnology: microorganisms*, 1995), Tkacz & Lange (*Advances in fungal biotechnology for industry, agriculture and medicine*, 2004), Wainwright (*An introduction to fungal biotechnology*, 1992); (2) technology concerned with machines in relation to human needs (obsol.).

See Genetic engineering, Industrial mycology, Molecular biology.

Bioterrorism and fungi. Biological weapons are devices which disseminate disease-causing organisms or poisons to kill or harm humans, animals or plants. They generally comprise two parts – an agent and a delivery device. In addition to their military use as strategic weapons or on a battlefield, they can be used for assassinations (having a political effect), can cause social disruption (for example, through enforced quarantine), kill or remove from the food-chain livestock or agricultural produce (thereby causing economic losses), or create environmental problems.

Almost any disease-causing organism (such as bacteria, viruses, fungi, prions or rickettsiae) or toxin (poisons derived from animals, plants or microorganisms, or similar substances synthetically produced) can be used in biological weapons. Historical efforts to produce biological weapons have included: aflatoxin; anthrax; botulinum toxin; foot-and-mouth disease; glanders; plague; Q fever; rice blast; ricin; Rocky Mountain spotted fever; smallpox; and tularaemia. The agents can be altered from their natural state to make them more suitable for use as weapons.

Delivery devices can also take any number of different forms. Some more closely resemble weapons than others. Past programmes have constructed missiles, bombs, hand grenades and rockets. A number of programmes also constructed spray-tanks to be fitted to aircraft, cars, trucks, and boats. Efforts have also been documented to develop delivery devices for use in assassination or sabotage missions, including a variety of sprays, brushes, and injection systems as well as contaminated food and clothes.

As well as concerns that these weapons could be developed or used by states, modern technology is making it increasingly likely they could be acquired by private organisations, groups of people or even individuals. Biological weapons have been used in politically-motivated or criminal acts on a number of occasions (United Nations Office at Geneva, www.unog.ch). Fungi thus have known and potential applications as biological weapons. Their use in this way is not new (there are documented examples, both government-sponsored and by private individuals). But such use is now prohibited by the Biological Weapons Convention. Those now involved in weaponizing fungi are thus unsurprisingly secretive, public awareness is generally low, and the topic has received little public debate, although there are many websites devoted to the issue. *Lit.*: Casadevall & Pirofski (*Medical mycol.* 44: 689, 2006; weapon potential of human pathogenic fungi), Evans (*Phytopathol.* 97: 1640, 2007; use of plant pathogen by private individuals for political purposes), Klassen-Fischer (*Clinics in Lab. Medicine* 26: 387, 2006; review of fungi as bioweapons), Madden & Wheelis (*Ann. Rev. Phytopath.* 41: 155, 2005; review of plant pathogens as weapons), Meselson & Robinson (The yellow rain affair: lessons from a discredited allegation. In Clunan *et al*, *Terrorism, war or disease? Unraveling the use of biological weapons*, 2008; alleged use of *Fusarium* toxins in Indo-China), Paterson (*MR* 110: 1003, 2006; review of fungi and fungal toxins as weapons). See also Biological control, Hallucinogenic fungi, Mycopesticides, Mycotoxins.

Biotransformation. Also known as biological or microbial transformation, or more generally bioconversion; the use of fungi and other organisms to modify organic compounds to produce industrially, medically or environmentally important products. These are usually enzymatic reactions where the substrate may be metabolized or co-metabolized. The most useful reactions are quoted as oxidations, reductions, hydrolysis, condensation, isometisation, formation of new c-c bonds and introduction of hetero functions (Crueger & Crueger, 1990). Many transformations have been described but few are used industrially (e.g. transformations of antibiotics, steroids and sterols). *Rhizopus stolonifer* has been used to produce 11 α -hydroxyprogesterone from progesterone. *Chaetomium gracile* is widely used in the sugar industry to supply dextranase needed during processing of bagasse (Eggleston & Monge, *Process Biochemistry* 40: 1881, 2005). In several processes fungal spores are used directly to catalyze biotransformations. See Crueger & Crueger (*Microbial transformations in biotechnology: a textbook of industrial microbiology*, 1990), O'Sullivan (in Fogarty & Kelley (Eds), *Microbial enzymes and biotechnology*, edn 2: 295, 1990). See also: Biodegradation.

biotroph (adj. **-trophic**), an obligate parasite (cf. necrotroph, saprotroph), growing on another organism, in intimate association with its cytoplasm.

Biotyle Syd. (1929) = *Pseudomeliola* fide von Arx (*Acta Bot. Neerl.* 7: 503, 1958).

biotype (1) (Scheibe) = physiologic race; (2) one individual; a group of individuals having a like genetic make up (Christensen & Rodenhiser, *Bot. Rev.* 6: 389, 1940; Waterhouse & Watson, *Proc. Linn. Soc. NSW* 66: 269, 1941).

bipartite, having division into two.

bipolar (1) (of spore), at the two ends (poles); (2) (of an incompatibility system), having 1 locus; unifactorial; cf. tetrapolar; (3) occurring in both Arctic and Antarctic regions;.

Bipolaris Shoemaker (1959), anamorphic *Cochliobolus*, Hso.≡ eP.26. c. 73, widespread. See Luttrell (*Revue Mycol.* Paris **41**: 271, 1977), Alcorn (*Mycotaxon* **13**: 339, 1981), Alcorn (*Mycotaxon* **17**: 1, 1, 1983; gen. concepts), Sivanesan (*Mycol. Pap.* **158**, 1987; keys), Alcorn (*Ann. Rev. Phytopath.* **26**: 37, 1988; gen. taxonomy), Muchovej *et al.* (*Fitopatol. Brasil* **13**: 211, 1988; keys), Hanau *et al.* (*Exp. Mycol.* **13**: 337, 1989; conidiogenous cell development), Alcorn (*Mycotaxon* **39**: 361, 1990; additions to genus), Alcorn (*Mycotaxon* **41**: 329, 1991; n. combs and syns), Khasanov (*Opredelitel' Gribov-Vozbul. 'Gelmintosporiozov' Rasten. iz Rodov Bipolaris, Drechslera i Exserohilum*, 1992), Berbee *et al.* (*Mycol.* **91**: 964, 1999; teleomorph phylogeny), Schell *et al.* in Murray *et al.* (Eds) (*Manual of Clinical Microbiology*: 1295, 1999), Chen *et al.* (*Mycotaxon* **76**: 149, 2000; S Afr.), Olivier *et al.* (*Mycol.* **92**: 736, 2000; phylogeny), Emami & Hack (*Curr. Microbiol.* **45**: 303, 2002; xylanase genes), Buzina *et al.* (*J. Clin. Microbiol.* **41**: 4885, 2003; clinical), Chand *et al.* (*Z. PflKrankh. PflPath. PflSchutz* **110**: 27, 2003; variation), Gafur *et al.* (*Mycobiology* **31**: 19, 2003; infraspecific variation), Castelnovo *et al.* (*Mycoses* **47**: 76, 2004; clinical), Kim *et al.* (*Pl. Path. J.* **20**: 165, 2004; stem rot of cacti), Tsukiboshi *et al.* (*Mycoscience* **46**: 17, 2005; *B. heveae* on grass hosts).

Biporipsilonites Kalgutkar & Janson. (2000), Fossil Fungi. 1, widespread. See Kalgutkar & Jansonius (*AASP Contributions Series* **39**: 37, 2000).

Biporispora J.D. Rogers, Y.M. Ju & Cand. (1999), Xylariales. 1 (on wood), France. See Rogers *et al.* (*Nova Hedwigia* **68**: 421, 1999).

Biporisporites Ke & Shi (1978), Fossil Fungi. 1 (Tertiary), China.

birch canker, Siberian chaga fungus, sterile basidiomata of *Inonotus obliquus*; - **fungus**, *Piptoporus betulinus*.

bird's nest fungi, the *Nidulariaceae*.

Bireticulasporis R. Potonié & Sah (1960), Fossil Fungi. 1 (Miocene), India.

Birsiomyces F. Schaarschm. (1966), Fossil Fungi, Ascomycota. 1 (Triassic), Switzerland.

Bisby (Guy Richard; 1889-1958; USA, later Canada, England). Professor of Plant Pathology, Manitoba Agricultural College, Winnipeg (1920-1936); Mycologist, Commonwealth Mycological Institute, Kew (1937-1954). With Ainsworth (q.v.) co-founder of this Dictionary; noted for his ability to make good decisions quickly. *Biogs, obits etc.* Gregory (*TBMS* **42**: 129, 1959) [portrait]; Johnson (*Phytopathology* **49**: 323, 1959) [portrait]; Stafleu & Cowan (*TL-2* **1**: 219, 1976); Stafleu & Mennega (*TL-2, Suppl.* **2**: 174, 1993).

Bisbyella Boedijn (1951) ≡ *Agyriopsis*.

Bisbyopeltis Bat. & A.F. Vital (1957), anamorphic *Coccodiniaceae*, Cpt.0fH.?. 1, USA; Australia. See Batista & Vital (*An. Soc. Biol. Pernambuco* **15**: 402, 1957), Reynolds & Gilbert (*Aust. Syst. Bot.* **18**: 265, 2005; *Microxyphium* as synanamorph).

Biscladinomyces Cif. & Tomas. (1953) = *Cladonia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Biscogniauxia Kuntze (1891), Xylariaceae. Anamorphs

Nodulisporium, *Periconiella*-like. 25, widespread. See Martin (*J. S. Afr. Bot.* **35**: 267, 1969; as *Nummulariola*), Jong & Benjamin (*Mycol.* **63**: 862, 1971; N America, key, as *Nummularia*), Pouzar (*Česká Mykol.* **33**: 207, 1979), Callan & Rogers (*CJB* **64**: 842, 1986; anamorphs), Petrini & Müller (*Mycol. Helv.* **1**: 501, 1986; key 5 spp. Eur.), Pouzar (*Česká Mykol.* **40**: 1, 1986; Eur. spp.), Granmo *et al.* (*Op. Bot.* **100**: 59, 1989; Nordic country keys), Whalley *et al.* (*MR* **94**: 237, 1990), González & Rogers (*Mycotaxon* **47**: 229, 1993; key 13 spp. Mexico), Rogers *et al.* (*MR* **100**: 669, 1996), Ju *et al.* (*Mycotaxon* **66**: 1, 1998; monogr.), Ju & Rogers (*Mycotaxon* **73**: 343, 1999; Taiwan), Rogers *et al.* (*Nova Hedwigia* **71**: 431, 2000; Venezuela), Sánchez-Ballesteros *et al.* (*Mycol.* **92**: 964, 2000; phylogeny), Ju & Rogers (*MR* **105**: 1123, 2001; global key), Mazzaglia *et al.* (*MR* **105**: 670, 2001; phylogeny), Smith & Hyde (*Fungal Diversity* **7**: 89, 2001; on palms), Stadler *et al.* (*MR* **105**: 1191, 2001; chemistry), Hsieh *et al.* (*Mycol.* **97**: 844, 2005; phylogeny), Luchi *et al.* (*Lett. Appl. Microbiol.* **41**: 61, 2005; RT-PCR).

biseriate (biserial), in two series.

Biseucladinomyces Cif. & Tomas. (1953) = *Cladonia*.

Bispora Corda (1837), anamorphic *Pezizomycotina*, Hso.1eP.4. 7, widespread (temperate). See Sutton (*CJB* **47**: 609, 1969), Wang (*Mem. N. Y. bot. Gdn* **49**: 20, 1989; pleomorphism), Hawksworth & Cole (*Fungal Diversity* **11**: 87, 2002; exclusion of lichenicolous spp.).

Bispora Fuckel (1870) ≡ *Bisporella*.

Bisporella Sacc. (1884), Helotiales. Anamorph *Bloxamia*. 19, widespread. The taxonomic position is inconclusive in preliminary phylogenetic studies. See Korf & Carpenter (*Mycotaxon* **1**: 57, 1974), Dumont & Korf (*Caldasia* **12**: 339, 1978), Sharma & Korf (*Mycotaxon* **16**: 326, 1982), Korf & Bujakiewicz (*Agarica* **6**: 302, 1985), Seifert & Carpenter (*CJB* **65**: 1262, 1987; anamorph), Johnston (*Mycotaxon* **31**: 345, 1988; anamorph), Lizoň & Korf (*Mycotaxon* **54**: 471, 1995), Gamundí & Romero (*Fl. criptog. Tierra del Fuego* **10**, 1998), Wang *et al.* (*Mol. Phylogen. Evol.* **41**: 295, 2006; phylogeny), Wang *et al.* (*Mycol.* **98**: 1065, 2006; phylogeny).

Bisporomyces J.F.H. Beyma (1940) = *Chloridium* fide Hughes (*CJB* **36**: 727, 1958).

Bisporostilbella Brandsb. & E.F. Morris (1971), anamorphic *Microascales*, Hsy.1eP.?. 1, USA. See Brandsberg & Morris (*Mycol.* **63**: 1078, 1971), Seifert *et al.* (*Czech Mycol.* **53**: 297, 2002).

Bisseomyces R.F. Castañeda (1985), anamorphic *Pezizomycotina*, Hso.#eP.10. 1, Cuba. See Castañeda (*Deuteromycotina de Cuba Hyphomycetes* **II**: 3, 1985).

Bitancourtia Thirum. & Jenkins (1953) = *Elsinoë* fide von Arx & Müller (*Stud. Mycol.* **9**, 1975).

Bitrimonospora Sivan., Talde & Tilak (1974) = *Monosporascus* fide von Arx (*Kavaka* **3**: 33, 1976).

bitunicate (1) having two walls; (2) (of asci), with two functional layers, that may or may not rupture or extend at discharge; see ascus.

Bitunicostilbe M. Morelet (1971) = *Spiropes* fide Morelet (*Bulletin de la Société des Sciences naturelles et d'Archéologie de Toulon et du Var* **195**: 7, 1971), Deighton (*MR* **94**: 1096, 1990).

Bitzea Mains (1939) = *Chaconia* fide Thirumalachar & Cummins (*Mycol.* **41**: 523, 1949).

biuncinate, two-hooked.

- Bivallum** P.R. Johnst. (1991), Rhytismataceae. 6 (on conifers), Australasia; Chile. See Johnston (*Aust. Syst. Bot.* 4: 355, 1991), Johnston (*Aust. Syst. Bot.* 14: 377, 2001; Australasia).
- bivalvate** (1) (of spores), lens-shaped and having a hyaline rim, as in *Arthrinium*; (2) (of asci), see ascus.
- Biverpa** (Fr.) Boud. (1907) ? = *Helvella* fide Eckblad (*Nytt Mag. Bot.* 15: 1, 1968).
- biverticillate** (of a penicillus), having branching at two levels, i.e. having metulae bearing phialides.
- Bivonella** (Sacc.) Sacc. (1891) = *Thyridium* Nitschke fide Cannon (*SA* 8: 78, 1989).
- Bizzozeria**, see *Bizzozeria* Sacc. & Berl.
- Bizzozeria** Sacc. & Berl. (1885) = *Lasio-sphaeria* See Lundqvist (*Symb. bot. upsal.* 20 no. 1, 1972).
- Bizzozeria** Speg. (1889) = *Thaxteria* Sacc.
- Bizzozeriella** Speg. (1888), anamorphic *Pezizomycotina*, Hsp.0eH.?. 1, S. America. See Donk (*Persoonia* 1: 189, 1960; nomencl.).
- Bjerkandera** P. Karst. (1879), Meruliaceae. 2, widespread (north temperate). See Ryvarden & Gilbertson (*Europ. Polyp.* 1: 168, 1993), Anon. (*Mycologist* 18: 174, 2004; *Bjerkandera adusta*).
- Bjerkanderaceae** Jülich (1982) = *Hapalopilaceae*.
- black blotch**, of clovers (*Cymadothea trifolii*): - **crottle**, see crottle; - **dot** of potato (*Colletotrichum coccodes*); - **jelly fungus**, basidioma of edible *Auricularia* spp.; - **knot** of plum and cherry (*Apiosporina morbosa*); - **leg** of beet (*Phoma betae*, *Pythium*, etc.); of pelargonium (*Pythium* spp.); - **line**, see zone lines; - **mildews**, *Meliolales*; - **piedra**, infection of hair shafts by *Piedraia hortae*; - **pustule** of *Ribes* (*Plowrightia ribesia*); - **root rot** of tobacco and other plants (*Thielaviopsis basicola*); of grapes (*Vitis*) (*Guignardia bidwellii*); - **scurf** of potato (*Thanatephorus cucumeris*, syn. *Corticium solani*); - **slime** of hyacinth (*Sclerotinia bulborum*); - **spot** of apple, see scab, apple; of rose (*Diplocarpon rosae*); - **stem rust** of cereals (*Puccinia graminis*); - **tip** of banana (*Musa*) (*Deightoniella torulosa*); - **tree lichen** (*Bryoria fremontii*) (Turner, *Econ. Bot.* 31: 461, 1977); - **yeasts**, see yeasts.
- blackfellows' bread** (or native bread), the sclerotium (*Mytilitta australis*) of the Australian *Polyporus mylittae*. See McAlpine (*J. Dep. Agric. Vict.* 2, 1904), Willis (*Muelleria* 1: 203, 1967; bibliogr.), Macfarlane *et al.* (*TBMS* 71: 359, 1978; structure). There are similar sclerotia in India ('little mans' bread') and China.
- Blakeslea** Thaxt. (1914), Choanephoraceae. 2, widespread (esp. tropical). See Thaxter (*Bot. Gaz.* 58: 353, 1914), Mehrotra & Baijal (*J. Elisha Mitchell scient. Soc.* 84: 207, 1968), Kirk (*Mycol. Pap.* 152: 61 pp., 1984; key), Zheng & Chen (*Acta Mycol. Sin. Suppl.* 1: 40, 1986), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny), Ho & Chang (*Taiwania* 48: 232, 2003; Taiwan), Idnurm *et al.* in Heitman *et al.* (Eds.) (*Sex in Fungi*: 407, 2007; mating).
- Blarneya** D. Hawksw., Coppins & P. James (1980), anamorphic *Pezizomycotina*, Hso.1eH.38 (L). 1, Europe (western). See Hawksworth *et al.* (*J. Linn. Soc. Bot.* 79: 358, 1979).
- Blasdalea** Sacc. & P. Syd. (1902), Vizellaceae. Anamorph *Chrysogloeum*. 1, Brazil. See Petrak (*Sydowia* 7: 343, 1953).
- Blasiphalia** Redhead (2007), Agaricomycetes. 1, USA. *Hymenochaetales* or *Agaricales* (*Rickenella* clade). See Redhead (*Mycol.* 98: 934, 2007).
- Blastacervulus** H.J. Swart (1988), anamorphic *Pezizomycotina*, Cac.0eP.4. 1, Australia. See Swart (*TBMS* 90: 289, 1988).
- Blastenia** A. Massal. (1852) = *Caloplaca* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Blasteniomyces** Cif. & Tomas. (1953) = *Protoblastenia*.
- Blasteniospora** Trevis. (1853) nom. rej. = *Xanthoria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- blasteniospore**, a polarilocular (q.v.) ascospore.
- blastic** (of conidiogenesis), one of the two basic sorts of conidiogenesis (cf. thallic), characterized by a marked enlargement of a recognizable conidial initial before the initial is delimited by a septum. The conidium is differentiated from part of a cell (Kendrick, 1971: 255); **entero-**, when the inner wall (see tetric) or neither wall (see phialidic) of the blastic conidiogenous cell contributes to the formation of the **conidium** (blastic conidium) (cf. holoblastic); **holo-**, when both outer and inner walls of the blastic conidiogenous cell contribute to the formation of the conidium (cf. enteroblastic and see annellidic); **mono-**, when a conidiogenous cell has only one conidiogenous locus; **poly-**, when a conidiogenous cell has several conidiogenous loci.
- Blasticomyces** I.I. Tav. (1985), Laboulbeniaceae. 2, Asia. See Tavares (*Mycol. Mem.* 9: 155, 1985), Majewski (*TMSJ* 29: 249, 1988).
- blastidium**, a lichen propagule produced by the budding of thalli in a yeast-like manner (Poelt, *Flora, Jena* 169: 23, 1980). Fig. 22E.
- Blastobasidiomycetes**, see *Basidiomycota*, *Ustomycetes*.
- Blastobotrys** Klopotek (1967), anamorphic *Trichomonascus*, Hso.0eH.6. 13, widespread. See Marvanová (*TBMS* 66: 217, 1976), de Hoog *et al.* (*Antonie van Leeuwenhoek* 51: 79, 1985; keys), de Hoog in Sugiyama (Ed.) (*Pleomorphic Fungi: The Diversity and its Taxonomic Implications*: 221, 1987; developmental cycle), Hoog & Smith in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 443, 1998), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny), Blackwell *et al.* (*British Mycological Society Symposium Series* 25: 357, 2007; ecology), Kurtzman (*Int. J. Syst. Evol. Microbiol.* 57: 1154, 2007), Kurtzman & Robnett (*FEMS Yeast Res.* 7: 141, 2007).
- Blastocapnias** Cif. & Bat. (1963) = *Aithaloderma* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Blastocatena** Subram. & Bhat (1989), anamorphic *Pezizomycotina*, Hsy. = eP.4. 1, India. See Subramanian & Bhat (*Kavaka* 15: 43, 1987).
- blastocatenate** (of blastoconidia), formed in chains with the youngest at the apical or distal end of the chain.
- Blastocladia** Reinsch (1877), Blastocladiaceae. c. 15 (saprobes in water), widespread. See Emerson & Cantino (*Am. J. Bot.* 35: 157, 1948), Das Gupta & John (*Indian Phytopath.* 41: 521, 1988), Steciow (*Darwiniana* 37: 335, 1999; Argentina).
- Blastocladiaceae** H.E. Petersen (1909), Blastocladiiales. 5 gen. (+ 4 syn.), 40 spp.
Lit.: Olson (*Op. bot.* 73: 1, 1984), Remy *et al.* (*Am. J. Bot.* 81: 690, 1994), Bullerwell *et al.* (*Nucl. Acids Res.* 31: 1614, 2003), Tanabe *et al.* (*J. gen. appl. Microbiol.* Tokyo 51: 267, 2005).
- Blastocladiiales** H.E. Peterson (1909). Blastocladiomycetes. 5 fam., 14 gen., 179 spp. Thallus monocentric

or polycentric; zoospores with a prominent nuclear cap of ribosomes, microtubule root consisting of 27 microtubules in groups of 3 extending from proximal end of kinetosome; freshwater or terricolous, saprobic or parasitic (*Coelomomyces* on mosquito larvae); cosmop. Fams:

- (1) **Blastocladiaceae**
- (2) **Catenariaceae**
- (3) **Coelomomycetaceae**
- (4) **Physodermataceae**
- (5) **Sorochytriaceae**

Lit.: Sparrow (1960: 605; 1973), Fitzpatrick (1930: 130), Emerson & Robertson (*Am. J. Bot.* 61: 303, 1974), Karling (1977, 1978), Dewel & Dewel (*CJB* 68: 1968, 1977), Lange & Olson (*TBMS* 74: 449, 1980), Olson (*Opera Bot.* 73: 1, 1984; key fams), Dewel (*CJB* 63: 1525, 1985), James *et al.* (*Mycol.* 98: 860, 2006; molecular phylogeny), Hibbett *et al.* (*MR* 111: 109, 2007), and see under Families.

Blastocladiella V.D. Matthews (1937), Blastocladiaceae. 13, widespread. See Couch & Whiffen (*Am. J. Bot.* 29: 582, 1942), Sparrow (*Aquatic Phycomycetes* Edn 2: 660, 1960; key), Cantino in Meynell & Gooder (Eds) (*Microbial reaction to environment*: 243, 1961; morphogenesis), Karling (*Mycopath. Mycol. appl.* 49: 169, 1973; subgen.).

Blastocladiomycetes Doweld (2001). Blastocladiomycota. 1 ord., 5 fam., 14 gen., 179 spp. Ord.:

Blastocladiiales

Lit.: James *et al.* (*Mycol.* 98: 860, 2006; molecular phylogeny), and see under Fam. and Ord.

Blastocladiomycota T.W. James (2007), Fungi. 1 class., 1 ord., 5 fam., 14 gen., 179 spp. Class:

Blastocladiomycetes

Lit.: James *et al.* (*Mycol.* 98: 860, 2006; molecular phylogeny), and see under Classes and Orders.

Blastocladiopsis Sparrow (1950), Blastocladiaceae. 2, USA; Cuba. See Sparrow (*Journal of the Washington Academy of Science* 40: 52, 1950).

blastoconidium, a blasto (q.v.) conidium.

Blastoconium Cif. (1931), anamorphic *Pezizomycotina*, Hso.#eP.?. 2, widespread (tropical).

Blastodendron (M. Ota) Cif. & Redaelli (1925) = *Candida* fide Zobel (*Arch. Hyg. Berlin* 130: 205, 1943), Bai *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 417, 2000).

Blastoderma B. Fisch. & Brebeck (1894) nom. ambig., anamorphic *Pezizomycotina*.

Blastodesmia A. Massal. (1852), Arthopyreniaceae (L). 1 (on *Fraxinus*), Europe. See Keissler (*Rabenh. Krypt.-Fl.* 9: 384, 1937), Aptroot (*Biblthca Lichenol.* 44, 1991; posn).

Blastodictys M.B. Ellis (1976), anamorphic *Pezizomycotina*, Hso.#eP.10. 1, Uganda. See Ellis (*More Dematiaceous Hyphomycetes*: 149, 1976).

Blastofusarioides Matsush. (1996), anamorphic *Pezizomycotina*, Hso.?.?. 1, Japan. See Matsushima (*Matsush. Mycol. Mem.* 9: 2, 1996).

Blastomyces Costantin & Rolland (1888), Ajellomycetaceae. 1, Africa; America. See *Ajellomyces*, blastomycosis. See van Oorschot (*Stud. Mycol.* 20, 1980), Watts *et al.* (*Am. J. Clin. Path.* 93: 575, 1990; giant forms of *B. dermatitidis*), Geber *et al.* (*J. Gen. Microbiol.* 138: 395, 1992; phylogeny, rRNA sequence and phylogeny in *B. dermatitidis*), Hurst & Kaufman (*J. Clin. Microbiol.* 30: 3043, 1992; serology), Walsh *et al.* (*Manual of Clinical Microbiology* Edn 6: 749, 1995; review), Guého *et al.* (*Mycoses* 40: 69, 1997;

epidemiology), Di Salvo (*Topley & Wilson's Microbiology and Microbial Infections* Edn 9. Vol. 4 Medical Mycology: 337, 1998; review), Larone *et al.* (*Manual of Clinical Microbiology*: 1259, 1999; review), Huerre *et al.* (*J. Mycol. Médic.* 12: 5, 2002; morphology), Untereiner *et al.* (*Mycol.* 96: 812, 2004; phylogeny), Bialek *et al.* (*FEMS Immunol. Med. Microbiol.* 45: 355, 2005; molecular diagnosis), Pounder *et al.* (*J. Clin. Microbiol.* 44: 2977, 2006; molecular diagnosis).

Blastomyces Gilchrist & W.R. Stokes (1898) = *Zymonema* fide Dodge (*Medical Mycology*, 1935).

Blastomycetes. Class often used for anamorphic yeasts (q.v.) and then divided into two Orders, (1) *Cryptococcales* (reproduction by budding, ballistospores absent; ascomycetous affinities, but see under Order), and (2) *Sporobolomycetales* (reproduction by budding and ballistospores; basidiomycetous affinities). This simplistic scheme is no longer tenable (see Kendrick, *The fifth kingdom*, edn 2, 1992). Included as anamorphic fungi in this edition of the *Dictionary*.

blastomycin, an antigen made from *Blastomyces dermatitidis*, esp. for skin testing; - S, an antifungal antibiotic from *Streptomyces griseochromogenes* (Fukunaga *et al.*, *Bull. agric. chem. Soc. Japan* 19: 181, 1955) used against rice blast (*Pyricularia oryzae*).

Blastomycoides Castell. (1928) = *Zymonema*.

blastomycosis (1) a disease in humans caused by *Blastomyces dermatitidis* (teleomorph *Ajellomyces dermatitidis*; see Al-Doory & Di Salvo, *Blastomycosis*, 1992); N. American -; Gilchrist's disease; (2) any mycotic disease in humans having budding cells in the parasitized tissues; **cheloidal** -, see lobomycosis; **European** -, see cryptococcosis; **S. American** -, see *Paracoccidioides*.

Blastomycota. Proposed for *Ascoblastomycetes* and *Basidioblastomycetes*, anamorphic yeasts with ascomycetous and basidiomycetous affinities respectively (Moore, *Bot. Mar.* 23: 361, 1980).

Blastophoma Kleb. (1933) ? = *Sclerophoma* fide Sutton (*Mycol. Pap.* 141, 1977).

Blastophorella Boedijn (1937), anamorphic *Pezizomycotina*, Hsy.1eP.6. 1, Java; Sumatra.

Blastophorum Matsush. (1971), anamorphic *Pezizomycotina*, Hso.≡ eH.10/18. 4, Papua New Guinea. See Matsushima (*Microfungi of the Solomon Islands and Papua-New Guinea*: 8, 1971), Matsushima & Matsushima (*Matsush. Mycol. Mem.* 9: 31, 1996).

Blastophragma Subram. (1995), anamorphic *Pezizomycotina*. 2, S.E. Asia. See Subramanian (*Kavaka* 20/21: 57, 1995).

Blastoschizomyces Salkin, M.A. Gordon, Sams. & Rieder (1982) = *Dipodascus* fide Polachek *et al.* (*J. Clin. Microbiol.* 30: 2318, 1992; taxonomic review), Kurtzman & Fell (*Yeasts, a taxonomic study* 4th edn, 1998), D'Antonio *et al.* (*J. Clin. Microbiol.* 37: 2927, 1999; onychomycosis).

Blastospora Dietel (1908), Mikronegeriaceae. 3 (on *Rosaceae* or *Cupressaceae* (0, I); on *Smilacaceae* or *Betulaceae* (II, III)), Japan; China; Korea; Nepal. See Mains (*Am. J. Bot.* 25: 677, 1938), Kaneko & Hiratsuka (*Mycol.* 73: 577, 1981), Ono *et al.* (*Mycol.* 78: 253, 1986).

blastospore, a spore formed by marked enlargement of a recognizable conidium initial before the initial is delimited by a septum. The conidium differentiates from part of the cell. See Kendrick (Ed.) (*Taxonomy of fungi imperfecti*, 1971).

- Blastosporella** T.J. Baroni & Franco-Mol. (2007), Lyophyllaceae. 1, Colombia. See Baroni *et al.* (*MR* 111: 572, 2007).
- Blastosporidium** M. Hartmann (1912) ? = *Coccidioides* fide Sutton (*in litt.*).
- Blastostroma** C.Z. Wei, Y. Harada & Katum. (1998), anamorphic *Mycodidymella*, Hso.?.?. 1, Japan. See Wei *et al.* (*Mycol.* 90: 337, 1998).
- Blastotrichum** Corda (1838) nom. dub., anamorphic *Pezizomycotina*, Hso.≡ eH.?. 5, widespread (esp. Europe). See Gams & Hoozemans (*Persoonia* 6: 99, 1970).
- blematogen** (blematogen layer), the undifferentiated tissue which becomes the universal veil in agarics (Atkinson, *Am. J. Bot.* 1: 3, 1914).
- Blennorella** Kirschst. (1944) ? = *Colletotrichum* fide Sutton (*Mycol. Pap.* 141, 1977).
- Blennoria** Moug. & Fr. (1825), anamorphic *Pezizomycotina*, St.0eH.15. 1, Europe. See Sutton (*Taxon* 21: 319, 1972).
- Blennoriopsis** Petr. (1920), anamorphic *Pezizomycotina*, Hso.0eH.?. 1, Europe.
- Blennothallia** Trevis. (1853) = *Collema* F.H. Wigg. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Blepharia** (Pers.) Ainsw. & Bisby (1943) nom. inval. = *Dematium* fide Mussat (*Syll. fung.* 15: 62, 1901).
- blepharoplast** (of zoospores), the basal body or granule (**kinetosome**) from which arise the longitudinal fibres constituting the axoneme of a flagellum; joined to the nucleus by a **rhizoplast**.
- Bleptosporium** Steyaert (1961), anamorphic *Amphisphaeriaceae*, Cpd.≡ eP.19. 1, Argentina. See Sutton (*Mycol. Pap.* 88, 1963).
- blewits** (blewitt, blue leg, bluet), basidiomata of the edible *Lepista saeva* (syn. *Tricholoma personatum*); **wood -**, *L. nuda* (syn. *T. nudum*).
- blight**, a common name for a number of different diseases of plants (and for insect attack), esp. when leaf damage is sudden and serious; **potato -**, **late -** (*Phytophthora infestans*); **early -** (*Alternaria solani*).
- blister rust** (of 5-needled pines), *Cronartium ribicola*.
- Blistum** B. Sutton (1973), anamorphic *Clavicipitaceae*. 2 (on myxomycetes), widespread. See Seifert (*in litt.*), Bischoff *et al.* (*Mycotaxon* 86: 433, 2003; phylogeny).
- Blitridium** De Not. (1863) = *Triblidium* fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).
- Blodgettia** E.P. Wright (1881) ≡ *Blodgettia* Harv.
- Blodgettia** Harv. (1858), anamorphic *Pezizomycotina*, Hso.-.-. 2 (mycophycobionts; marine), widespread. See Kohlmeyer & Kohlmeyer (*Marine Mycology*, 1979), Hawksworth (*Notes R. bot. Gdn Edinb.* 44: 549, 1987), Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 34: 1, 1991).
- Blodgettomyces** Feldmann (1939) ≡ *Blodgettia* Harv. fide Hawksworth (*Notes R. bot. Gdn Edinb.* 44: 549, 1987).
- Blogiascospora** Shoemaker, E. Müll. & Morgan-Jones (1966), *Amphisphaeriaceae*. Anamorph *Seiridium*. 1, Europe. See Shoemaker *et al.* (*CJB* 44: 247, 1966), Kang *et al.* (*MR* 103: 53, 1999).
- Bloxamia** Berk. & Broome (1854), anamorphic *Bisporella*, Hsp.0eP.22. 8, widespread. See Nag Raj & Kendrick (*Monogr. Chalara Allied Genera*, 1975), Johnston (*Mycotaxon* 31: 345, 1988; teleomorph), Arambarri *et al.* (*Mycotaxon* 43: 327, 1992; key).
- blue cheeses**, ripened and flavoured by *Penicillium roqueforti* (Mitosp. fungi), e.g. Roquefort, Stilton, Gorgonzola, Danish Blue etc.
- blue stain**, blue-grey colouration of wood caused by the growth of brown fungal hyphae in the surface layers.
- Blumenavia** Möller (1895), *Phallaceae*. 3, S. America; Africa. See Vargas-Rodriguez & Vázquez-García (*Mycotaxon* 94: 7, 2005; Mexico).
- Blumeria** Golovin ex Speer (1975), *Erysiphaceae*. Anamorph *Oidium* subgen. *Oidium*. 1, widespread. *B. graminis* (cereal and grass mildew). See Braun (*Beih. Nova Hedwigia* 89, 1987), Caffier *et al.* (*Pl. Path.* 48: 582, 1999; genetic diversity), Mori *et al.* (*Mycoscience* 41: 437, 2000; phylogeny), Salari *et al.* (*Iran. Jl agric. Res.* 34: 353, 2003; physiological races), Wyand & Brown (*Molecular Plant Pathology* 4: 187, 2003; infraspecific variation), Takamatsu (*Mycoscience* 45: 147, 2004; phylogeny), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Inuma *et al.* (*Mol. Phylogen. Evol.* 44: 741, 2008; phylogeny).
- Blumeriaceae** V.P. Gelyuta (1988) = *Erysiphaceae*.
- Blumeriella** Arx (1961), *Dermateaceae*. Anamorphs *Microgloeum*, *Phloeosporella*. 5 (on *Rosaceae*), N. America; Europe. *B. jaapii* (anamorph *P. padi*), cherry leaf spot. See von Arx (*Phytopath. Z.* 42: 161, 1961), Jakobsen & Jørgensen (*Tidsskr. Plant.* 90: 161, 1986), Williamson & Bernard (*CJB* 66: 2048, 1988; on *Spiraea*), Nauta & Spooner (*Mycologist* 14: 21, 2000; UK).
- blusher**, the, basidioma of the edible *Amanita rubescens*.
- Blytridium**, see *Blitridium*.
- Blyttomyces** A.F. Bartsch (1939), *Chytridiaceae*. c. 10, widespread. See Dogma & Sparrow (*Mycol.* 61: 1149, 1970), Dogma (*Kalikasan* 8: 237, 1979; key), Letcher *et al.* (*Australasian Mycologist* 22: 99, 2004; Australia).
- BM**, The Natural History Museum (London, UK); founded 1753; known by official name The British Museum (Natural History) up to 1989; governed by a Board of Trustees and funded through the Office of Arts and Libraries; most non-lichenized fungi were transferred to K in 1969 (Brenan & Ross, *Lichenologist* 4: 157, 1970); see Anon. (*The history of the collections contained in the Natural History Department of the British Museum*, 1, 1904), Stearn (*The Natural History Museum at South Kensington*, 1981).
- boathook hair**, characteristic terminally bifid hair, produced intracellularly in principal-form zoospore of *Saprolegnia*, and which ornaments the cyst formed by this zoospore; principal-form cyst or secondary cyst (see Beakes, 1983).
- Bodinia** M. Ota & Langeron (1923) = *Trichophyton* fide Sutton (*in litt.*).
- Boedijnopeziza** S. Ito & S. Imai (1937) = *Cookeina* fide Denison (*Mycol.* 59: 306, 1967), Pfister (*Phytologia* 27: 55, 1973), Weinstein *et al.* (*Mycol.* 94: 673, 2002), Iturriaga & Pfister (*Mycotaxon* 95: 137, 2006).
- Boehmia** Raddi (1806) nom. rej. = *Arrhenia* fide Kuyper (*in litt.*) Rejected against *Leptoglossum* but should also be rejected against *Arrhenia*.
- Boeomycomyces**, see *Baeomycomyces*.
- Boerlagella** Penz. & Sacc. (1897) [non *Boerlagella* Cogn. 1891, *Sapotaceae*] ≡ *Boerlagiomyces*.
- Boerlagellopsis** C. Ramesh (1988) nom. nud., ? *Dothideales*. 1, India. See Eriksson & Hawksworth (*SA* 8: 62, 1989).

Boerlagiomyces Butzin (1977), Tubeufiaceae. 6, widespread (tropical). See Crane *et al.* (*CJB* 76: 602, 1998), Kodsueb *et al.* (*Fungal Diversity* 21: 105, 2006; phylogeny).

Bogoriella Zahlbr. (1928), ? Verrucariaceae (L). 1, Java.

Bogoriellomyces Cif. & Tomas. (1954) = *Bogoriella*.

Bohleria Trevis. (1860) = *Placidiosis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Bohuslavia J.I.R. Larsson (1985), Microsporidia. 1.

Boidinia Stalpers & Hjortstam (1982), Russulaceae. 10, widespread. Polyphyletic. See Ginns & Freeman (*Bibliotheca Mycol.* 157, 1994), Wu & Buchanan (*Mycotaxon* 67: 123, 1998).

Bojamyces Longcore (1989), Legeriomycetaceae. 3 (in *Ephemeroptera*), Spain; Mexico; USA. See Longcore (*Mycol.* 81: 482, 1989), Valle & Santamaría (*Mycol.* 96: 1386, 2004; Spain), White (*MR* 110: 1011, 2006; phylogeny), Valle *et al.* (*Mycol.* 100: 149, 2008; Mexico).

Bolacotricha Berk. & Broome (1851) = *Chaetomium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Bolbitiaceae Singer (1948), Agaricales. 17 gen. (+ 16 syn.), 287 spp.

Lit.: Watling & Gregory (*Bibliotheca Mycol.* 82, 1981; nomenclator), Pegler (*Kew Bull. Addit. Ser.* 12: 519 pp., 1986), Singer (*Agaric. mod. Tax.* 4th ed, 1986), Watling & Taylor (*Bibliotheca Mycol.* 117: 61 pp., 1987), Singer & Hausknecht (*Pl. Syst. Evol.* 159: 107, 1988), Watling (*Op. bot.* 100: 259, 1989), Young (*Aust. Syst. Bot.* 2: 75, 1989), Singer & Hausknecht (*Pl. Syst. Evol.* 180: 77, 1992), Fukihara & Hongo (*Mycoscience* 36: 425, 1995), Gerhardt (*Bibliotheca Botanica* 147: 149 pp., 1996), Guidot *et al.* (*Appl. Environm. Microbiol.* 65: 903, 1999), Aanen *et al.* (*Mycol.* 92: 269, 2000), Moncalvo *et al.* (*Syst. Biol.* 49: 278, 2000)

Lit.: Peintner *et al.* (*Am. J. Bot.* 88: 2168, 2001), Hallen *et al.* (*MR* 107: 969, 2003), Walther *et al.* (*MR* 109: 525, 2005), Walther & Weiss (*Mycol.* 98: 792, 2006).

Bolbitius Fr. (1838), Bolbitiaceae. c. 25, widespread. See Singer (*Sydowia* 30: 216, 1977; keys world spp.), Watling & Gregory (*Bibliotheca Mycol.* 82, 1981), Watling (*British fungus flora* 3, 1982; key 6 Br. spp.), Arnolds (*Persoonia* 18: 201, 2003; The Netherlands), Walther & Weiss (*Mycol.* 98: 792, 2006; anam.).

Boletaceae Chevall. (1826), Boletales. 35 gen. (+ 26 syn.), 787 spp.

Lit.: Pegler & Young (*TBMS* 72: 353, 1979), Alesio (*Boletus Dill. ex L.*: 712 pp., 1985), Singer (*Agaric. mod. Tax.* 4th ed, 1986), Thiers (*Mem. N. Y. bot. Gdn* 49: 355, 1989), Watling & Hollands (*Notes R. bot. Gdn Edinb.* 46: 405, 1990), Singer *et al.* (*Beih. Nova Hedwigia* 102: 99 pp., 1991), Lannoy & Estadès (*Monographie des Leccinum d'Europe*: 229 pp., 1995), Lakhnopal (*Stud. Cryptog. Bot.* 1: 170 pp., 1996), Bruns *et al.* (*Mol. Ecol.* 5: 257, 1998), Kretzer & Bruns (*Mol. Phylogen. Evol.* 13: 483, 1999), Binder & Besl (*Micologia* 2000: 75, 2000), Watling (*Aust. Syst. Bot.* 14: 407, 2001), Binder & Bresinsky (*Mycol.* 94: 85, 2002), Binder & Bresinsky (*Feddes Repert.* 113: 36, 2002), Lebel & Castellano (*Mycol.* 94: 327, 2002), Trappe *et al.* (*Mycotaxon* 81: 195, 2002), Peintner *et al.* (*MR* 107: 659, 2003), Bakker & Kuyper (*Mycol.* 96: 102, 2004), Bakker *et al.* (*New Phytol.* 163: 201, 2004), Mello *et al.* (*J. Bio-*

techn. 121: 318, 2006).

Boletales E.-J. Gilbert (1931). Agaricomycetidae. 17 fam., 96 gen., 1316 spp. Terrestrial or lignicolous, saprobic (when lignicolous usually causing brown rot), ectomycorrhizal, sometimes parasitic on ectomycorrhizal members of the Boletales, edible, a few species poisonous, cosmopolitan. Formerly used for the 'boletes', a group of fungi with fleshy fruitbodies and poroid hymenophore, usually growing terrestrially. The poroid hymenophore has arisen at least 5 times in the 8 clades of the Homobasidiomycetes (Hibbett & Thorn, *The Mycota* 7B, 2001).

Classification: Fries (*Syst. mycol.* 1-3, 1821-1832) put the fleshy poroid fungi in the genus *Boletus*. A number of his infrageneric groups have subsequently been raised to generic level, and a number of genera have been added. In general, bolete taxonomy reflected its eurocentric bias but Singer (*Agaricales mod. taxon.*, 4th ed., 1986) pointed out that bolete taxonomy can only be understood on the basis of knowledge of tropical species. The *Boletales* as accepted in this edition of the Dictionary also contain lamellate forms, gastroid forms (both epigeous and hypogeous). Consequently, they cannot be characterised in morphological terms, and diagnoses for the various families are not provided. Chemotaxonomic classifications (Gill & Steglich, *Progr. Chem. Nat. Prod.* 51, 1987) are largely consistent with molecular data; see Binder & Hibbett (*Mycol.* 98: 971, 2006), Hibbett *et al.* (*MR* 111: 109, 2007). Fams:

- (1) **Boletaceae**
- (2) **Boletinellaceae**
- (3) **Calostomataceae**
- (4) **Coniophoraceae**
- (5) **Diplocystidiaceae**
- (6) **Gastrosporiaceae**
- (7) **Gomphidiaceae**
- (8) **Gyroporaceae**
- (9) **Hygrophoropsidaceae**
- (10) **Paxillaceae**
- (11) **Protogastraceae**
- (12) **Rhizopogonaceae**
- (13) **Sclerodermataceae**
- (14) **Serpulaceae**
- (15) **Suillaceae**

Lit.: Singer (*Agaricales mod. taxon.*, 4th ed., 1986), Arpin & Kühner (*Bull. Soc. linn. Lyon* 46: 83-108, 181-208, 1977; classification), Cléménçon (*Anatomie der Hymenomyceten*, 1997), Gill & Steglich (*Progr. Chem. Nat. Prod.* 51, 1987; pigment chemistry, Horak (*Synopsis generum Agaricalium*, 1967), Donk (*Reinwardtia* 3: 275, 1955; nomenclature), Høiland (*Nord. J. Bot.* 7: 705, 1987; chemotaxonomy).

Regional: [see also under Macromycetes]. Africa: Heinemann (*Bull. Jard. bot. Etat Brux.* 21: 223, 1951; 30: 21, 1960; 34: 425, 1964; Katanga, Zaire, Uganda). America, North: Snell & Dick (*The Boleti of Northeastern North America*, 1970), Smith & Thiers (*The Boletes of Michigan*, 1971). Belgium: Heinemann (*Naturalistes belges* 42: 333, 1961). Europe, Central: Singer (*Die Röhrlinge, Teil 2, Die Boletoidae und Strobilomycetaceae*, 1967 [*Die Pilze Mitteleuropas*, 6]). British Isles: Pearson (*Naturalist Hull*, 1946; key), Watling (*British Fungus Flora* 2, 1970). France: Gilbert (*Les bolets*, 1931), Blum (*Les bolets*, 1963; key 66 spp.; suppl. and revisions, *BSMF* 80: 297, 1964; 81: 478, 1965; 84: 309, 577, 1969; *Revue mycol.* 34: 249, 1970), Leclair & Essette (*Les*

- bolets*, 1968; col. pl.). Malaysia: Corner (*Boletus in Malaysia*, 1972). New Zealand: McNabb (*N.Z. J. Bot.* 6: 137, 1968). Nova Scotia: Grund & Harrison (*Nova Scotia boletes*, 1976). Poland: Skirgiello (Grzyby (Fungi), Podstawczaki (Basidiomycetes), Barowikwe (Boletales), 1960 [Engl. transl. see *Mycol.* 68: 1136]). USA: Coker & Beers (*The Boletaceae of North Carolina*, 1943), Singer (*The Boletineae of Florida*, 1945-47 [reprinted 1970 from *Farlowia* 2 and *Am. midl. Nat.* 37]), Thiers (*California mushrooms: a field guide to the boletes*, 1975), Mycogeography in the South Pacific Region (*Austr. J. Bot. Suppl. Ser. No. 10*, 1983), Singer, Araujo & Ivory (*Beih. Nova Hedw.* 77, 1983), and under fams. **bolete**, one of the *Boletales*.
- Boletellaceae** Jülich (1982) = Boletaceae.
- Boletellites** P. Briot, Lar.-Coll. & Locq. (1983), Fossil Fungi. 1, Australia.
- Boletellus** Murrill (1909), Boletaceae. c. 50, widespread (esp. subtropical). Separation of *Boletellus* and *Boletus* is still controversial, as spores with longitudinal ridges also occur in *Boletus*. See Singer (*Sydowia* 30: 221, 1978; key), Singer *et al.* (*Beih. Nova Hedwigia* 105: 3, 1992; key C. Am. spp.), Binder & Fischer (*Boll. Gruppo Micol. 'G. Bresadola'* 40: 79, 1997; phylogeny, relationship with *Boletus*).
- Boletinellaceae** P.M. Kirk, P.F. Cannon & J.C. David (2001), Boletales. 2 gen. (+ 2 syn.), 14 spp.
Lit.: Corner (*Beih. Nova Hedwigia* 33: 1, 1970), Cotter & Miller (*Mycol.* 77: 927, 1985), Watling & Meijer (*Edinb. J. Bot.* 54: 231, 1997), Bruns *et al.* (*Mol. Ecol.* 7: 257, 1998; phylogeny), Deschamps & Moreno (*Mycotaxon* 72: 205, 1999), Kretzer & Bruns (*Mol. Phylogen. Evol.* 13: 483, 1999; phylogeny).
- Boletinellus** Murrill (1909), Boletinellaceae. 2 (on roots of *Fraxinus* but not forming ectomycorrhiza), N. America; Japan. See Brundrett & Kendrick (*Symbiosis* 3: 315, 1987; ecology), Gruhn *et al.* (*Mycol.* 84: 528, 1992; ecology), Nagasawa (*Rep. Tottori Mycol. Inst.* 39: 1, 2001).
- boletinoid** (of hymenophores), having a structure intermediate between pores and gills.
- Boletinus** Kalchbr. (1867) = *Suillus* Gray fide Smith & Thiers (*The Boletes of Michigan*, 1971) See, Singer (*Sydowia* 30: 227, 1977; key).
- Boletium** Clem. (1909) = *Volvoboletus*.
- Boletochaete** Singer (1944), Boletaceae. 3, Africa; S.E. Asia. See Singer (*Mycol.* 36: 359, 1944), Zang & Petersen (*Acta Bot. Yunn.* 26: 619, 2004; Tibet).
- Boletogaster** Lohwag (1926) = *Boletellus* fide Singer (*Farlowia* 2: 223, 1945).
- Boletolichen** Juss. (1789) = *Helvella* fide Mussat (*Syll. fung.* 15, 1901).
- Boletopsidaceae** Bondartsev & Singer ex Jülich (1982) = Bankeraceae.
- Boletopsis** Fayod (1889), Bankeraceae. 5 (mycorrhizal), Europe. See Stalpers (*Stud. Mycol.* 35: 29, 1993; key), Lohmeyer (*Mycologia Bavarica* 6: 41, 2003), Bohlin (*MR* 108: 3, 2004; conservation in Europe).
- Boletopsis** Henn. (1898) = *Suillus* Gray fide Singer (*Lilloa* 22: 654, 1951).
- Boletus** Fr. (1821), Boletaceae. c. 300 (ectomycorrhizal), widespread. Some are edible (see cep). See Corner (*Boletus in Malaysia*, 1972), Singer (*Sydowia* 30: 227, 1978; key), Lannoy & Estadès (*Docums Mycol. Mémoire Hors Série* 44: 253, 2001; Europ.), Redeuilh & Simonini (*BSMF* 118: 139, 2002; nomencl.), Beugelsdijk (*A Taxonomic Review of Boletus, Section Boletus in The Netherlands Using Molecular Tools, Part 1: Report; Part 2: Appendices*: 129 pp., 2004; Netherlands), Šutara (*Czech Mycol.* 57: 1, 2005; anatomical characters), Watling *et al.* (*British Fungus Flora. Agarics and Boleti Rev. & Enl. Edn 1*: 173 pp., 2005; Brit.).
- Boletus** L. (1753) = *Phellinus* fide Donk (*Persoonia* 1: 173, 1960).
- Boletus** Tourn. ex Adans. (1763) = *Morchella* fide Donk (*Reinwardtia* 3: 275, 1955).
- Bolinia** (Nitschke) Sacc. (1882) = *Camarops* fide Nannfeldt (*Svensk bot. Tidskr.* 66: 335, 1972).
- Boliniaceae** Rick (1931), Boliniales. 7 gen. (+ 11 syn.), 40 spp.
Lit.: Nannfeldt (*Svensk bot. Tidskr.* 66: 335, 1972), Samuels & Rogers (*Mycotaxon* 28: 45, 1987), Rogers & Samuels (*Mycol.* 80: 738, 1988), Untereiner (*Mycol. Soc. Amer. Newsl.* 39: 52, 1988), Andersson *et al.* (*SA* 14: 1, 1995; posn), Vasilyeva (*Mikol. Fitopatol.* 31: 5, 1997), Park & Jong (*Mycoscience* 44: 25, 2003), Huhndorf *et al.* (*Mycol.* 96: 368, 2004).
- Boliniales** P.F. Cannon (2001). Sordariomycetidae 2 fam., 8 gen., 41 spp. Stromata immersed to erumpent, crustose or pulvinate, sometimes absent, usually soft-textured, composed of thin-walled hyphal tissue. Ascomata perithecial, long-necked, sometimes vertically elongate, the ostiole periphysate. Interascal tissue of narrow true paraphyses, sometimes thin-walled and evanescent. Asci cylindrical, persistent, thin-walled, not fissitunicate, with a usually small, J-apical ring. Ascospores hyaline or brown, aseptate or transversely septate, sometimes with germ pores. Anamorphs not known. Saprobiic in wood and bark, widespr. Affinities of this order are unclear; *Camarops* was traditionally linked to the *Xylariaceae* but molecular data indicates a closer relationship with the *Sordariales*. However, that assemblage has been unacceptably loosely defined in recent years. Fams:
- (1) **Boliniaceae**
 - (2) **Catabotrydaceae**
- Lit.*: Andersson *et al.* (*SA* 14: 1, 1995; posn).
- Bolosphaera** Syd. & P. Syd. (1917) = *Phaeostigme* fide Hansford (*Mycol. Pap.* 15, 1946).
- Bolton** (James; 1750-1799; England). An amateur mycologist (probably in the weaving trade). Produced the first book in the English language dedicated to fungi. *Publs. An History of Fungusses, Growing about Halifax* [Yorkshire], 4 parts (1788-1791) [in German, by Willdenow, as *Geschichte der Merkwürdigsten Pilze*, 1795-1820]. *Biogs, obits etc.* Grummann (1974: 257); Laplanche, (*Dictionnaire Iconographique des Champignons Supérieurs (Hymenomycetes)*, 1894 [gives Friesian names for figures by Bolton, Bulliard, Paulet, Persoon, Sowerby, and others]); Petersen (*Mycotaxon* 5: 498, 1977, index); Sartory & Maire (*Interpretation des Planches de J. Bolton An history of fungusses, vols. 1 & 2*, Paris); Shear (*TBMS* 17: 302, 1933); Stafleu & Cowan (*TL-2* 1: 264, 1976); Stafleu & Mennega (*TL-2, Suppl. 2*: 296, 1993); Watling & Seaward (*Archives of Natural History* 10: 89, 1981, biographical data, bibliography).
- Bombardia** (Fr.) P. Karst. (1873), Lasiosphaeriaceae. 1 (from wood), Europe; N. America. See Lundqvist (*Symb. bot. upsal.* 20 no. 1, 1972), Jensen (*Mycol.* 77: 688, 1985; anatomy), Miller (*Sydowia* 55: 267, 2003; anatomy), Huhndorf *et al.* (*Mycol.* 96: 368, 2004;

- phylogeny), Miller & Huhndorf (*Mol. Phylogen. Evol.* 35: 60, 2005; anatomy, phylogeny), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Bombardiastrum** Pat. (1893), *Pezizomycotina*. 1, S. America.
- Bombardiella** Höhn. (1909), *Sordariales*. 1, Java. See Eriksson & Hawksworth (*SA* 6: 116, 1987).
- Bombardioidea** C. Moreau ex N. Lundq. (1972), *Lasiosphaeriaceae*. Anamorph *Angulimaya*. 4 (coprophilous), widespread. See Lundqvist (*Symb. bot. upsal.* 20 no. 1, 1972), Krug & Scott (*CJB* 72: 1302, 1994; key), Huhndorf *et al.* (*Mycol.* 96: 368, 2004), Miller & Huhndorf (*Mol. Phylogen. Evol.* 35: 60, 2005; anatomy, phylogeny).
- Bombyliospora** De Not. (1852) = *Megalospora* Meyen fide Hafellner & Bellemère (*Nova Hedwigia* 35: 207, 1982).
- Bombyliosporomyces** Cif. & Tomas. (1953) = *Megalospora* Meyen.
- bombysine**, like silk.
- Bommerella** Marchal (1885), *Chaetomiaceae*. Anamorph *Scopulariopsis*-like. 1 (from soil), widespread. See von Arx *et al.* (*Beih. Nova Hedwigia* 84, 1986; as *Chaetomium*).
- Bomplandiella** Speg. (1886), anamorphic *Pezizomycotina*, *Hsp.0eP.?*. 1, S. America.
- Bonanseja** Sacc. (1906), ? *Rhytismatales*. 1, Mexico.
- Bonaria** Bat. (1959), *Micropeltidaceae*. 3, widespread (tropical). See Batista (*Publicões Inst. Micol. Recife* 56: 438, 1959).
- Bondarcevomyces** Parmasto (1999), *Tapinellaceae*. 1, Asia. See Parmasto & Parmasto (*Mycotaxon* 70: 219, 1999).
- Bondartsev** (Apollinaris Semenovich; 1877-1968; Russia). Head of the Phytopathology Department (1913-1931) then Head of Mycology, Department of Cryptogamic Plants (1931-1950), V.L. Komarov Botanical Institute, Leningrad; survived the siege of Leningrad (1941-1943) and awarded Defence of Leningrad medal and Order of Lenin. One of the founders of Russian mycology and plant pathologist; he collaborated with Singer (q.v.) proposing a new taxonomic system for polypores. *Publs. [Diseases and Protection of Cultivated Plants]* edn 3 (1931) [in Russian]; [*The Polyporaceae of the European USSR and the Caucasus*] (1953) [in Russian; English translation, 1971]; [*Manual for Identification of Domestic Fungi*] (1956) [text in Russian]. *Biogs, obits etc.* Anon. ([*Mikologiya i Fitopatologiya*] 1: 506, 1967, portrait [in Russian]); Anon. ([*Mikologiya i Fitopatologiya*] 3: 550, 1969, bibliography, portrait [in Russian]).
- Bondarzewia** Singer (1940), *Bondarzewiaceae*. 3, widespread. See Corner (*Beih. Nova Hedwigia* 78: 205, 1984; key S. E. Asia spp.), See Stalpers (*Stud. Mycol.* 40: 48, 1996).
- Bondarzewiaceae** Kotl. & Pouzar (1957), *Russulales*. 8 gen. (+ 4 syn.), 48 spp.
Lit.: Donk (*Persoonia* 3: 199, 1964), Korhonen (*Evolutionary Biology of the Fungi* Symposium of the British Mycological Society held at the University of Bristol, April 1986: 301, 1987), Redhead & Norvell (*Mycotaxon* 48: 371, 1993), Stenlid *et al.* (*MR* 98: 57, 1994), Stalpers (*Stud. Mycol.* 40: 185 pp., 1996), Garbelotto *et al.* (*CJB* 76: 397, 1998), Ginns (*Mycol.* 90: 19, 1998), Niemelä & Korhonen (*Heterobasidion annosum*, *Biology, Ecology, Impact and Control*: 27, 1998), Schulze (*J. Phytopath.* 147: 125, 1999), Ryvarden (*Karstenia* 40: 153, 2000), Binder & Hibbett (*Mol. Phylogen. Evol.* 22: 76, 2002), Binder *et al.* (*Systematics and Biodiversity* 3: 113, 2005).
- Bondarzewiales** Jülich (1981) = *Russulales*.
- Bondiella** Piroz. (1972), ? *Mesnieraceae*. 1 (*Palmae*), Tanzania. See Pirozynski (*Mycol. Pap.* 129, 1972), Hyde (*Mycotaxon* 57: 347, 1996).
- Bonia** Pat. (1892) [non *Bonia* Balansa 1890, *Gramineae*] = *Mycobonia*.
- Boninogaster** Kobayasi (1937), *Hysterangiaceae*. 1, Bonin Island.
- Boninohydnum** S. Ito & S. Imai (1940) = *Gyrodontium* fide Maas Geesteranus (*Persoonia* 3: 187, 1964).
- Bonordenia** Schulzer (1866) = *Hypomyces* fide Rogerson (*Mycol.* 62: 865, 1970), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Bonordeniella** Penz. & Sacc. (1901) = *Coniosporium* fide Ellis (*Dematiaceous Hyphomycetes*, 1971).
- booted**, see *peronate*.
- Boothiella** Lodhi & Mirza (1962), *Sordariaceae*. 1 (from soil), Asia. See Udagawa & Furuya (*TMSJ* 18: 302, 1977), von Arx *et al.* (*Beih. Nova Hedwigia* 94, 1988), Cai *et al.* (*MR* 110: 137, 2006).
- Boothiomycetes** Letcher (2006), *Terramycetaceae*. 1 (from soil), New Zealand. See Letcher *et al.* (*MR* 110: 898, 2006).
- boot-lace fungus**, the honey agaric, *Armillaria mellea*.
- Bordea** Maire (1916), *Laboulbeniaceae*. 14 (on beetles), widespread. See Thaxter (*Memoirs of the American Academy of Arts and Sciences* 16: 1, 1931), Benjamin (*Aliso* 19: 99, 2000).
- Bordeaux mixture**, A spray first used by Millardet in 1883-85 against vine (*Vitis*) mildew (*Plasmopara*), and still in general use for controlling numbers of plant diseases. A common mixture is the '4-4-50': copper sulphate 1.8 kg, quick lime 1.8 kg (or hydrated lime 2.7 kg), water 227 l. When making small amounts the copper sulphate is put in some of the water, the lime in the rest, and the two liquids then mixed. See Ainsworth (*Introduction to the history of plant pathology*, 1981).
- Boreoplaca** Timdal (1994), *Ophioparmaceae* (L.). 1, Siberia. See Timdal (*Mycotaxon* 51: 503, 1994), Wedin *et al.* (*MR* 109: 159, 2005), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Boreostereaceae** Jülich (1982) = *Gloeophyllaceae*.
- Boreostereum** Parmasto (1968), *Gloeophyllaceae*. 4, widespread (north temperate). See Parmasto (*Consp. System. Corticiac.*: 186, 1968).
- Borinquenia** F. Stevens (1917) nom. dub., *Tubeufiaceae*. ? = *Malacaria*, but type material is exhausted. See Rossman (*Mycol. Pap.* 157: 71 pp., 1987).
- Bornetina** L. Mangin & Viala (1903), anamorphic *Diacanthodes*. 1. See Donk (*Beih. Nova Hedwigia* 5, 1962).
- Borrera** Ach. (1809) [non *Borreria* G. Mey. 1818] nom. cons., *Rubiaceae*] nom. rej. = *Teloschistes* fide Kurokawa (*Beih. Nova Hedwigia* 6, 1962).
- Bostrichonema** Ces. (1867), anamorphic *Pezizomycotina*, *Hso.1eH.?*. 5, Europe; N. America. See Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 2, 1998), Kendrick (*CJB* 81: 75, 2003; morphogenesis).
- Bostrychia** Fr. (1821) = *Cytospora* fide Fries (*Syst. mycol.* 2: 1, 1823).
- Bostrychonema**, see *Bostrichonema*.

- Botanamphora** Nogrsek & Scheuer (1990) = Trematosphaeria fide Nogrsek & Scheuer (*SA* 12: 31, 1993).
- Bothia** Halling, T.J. Baroni & Binder (2007), Boletaceae. 1, N. America. See Halling *et al.* (*Mycol.* 99: 310, 2007; descr., phylogeny).
- Bothrodiscus** Shear (1907), anamorphic *Ascocalyx*, St.≡ eH.10. 3, N. America; former USSR. See Groves (*CJB* 46: 1273, 1968).
- bothrosome** (sagenogen, sagenogenetosome), an invaginated organelle at the cell surface which connects the plasma membrane to the network membranes in *Labyrinthulomycota* (see Porter, 1990).
- Botryandromyces** I.I. Tav. & T. Majewski (1976), Laboulbeniaceae. 2, widespread. See Tavares & Majewski (*Mycotaxon* 3: 195, 1976), Tavares (*Mycol. Mem.* 9: 627 pp., 1985), Santamaria (*Fl. Mycol. Iberica* 5, 2003).
- Botrydiaceae** Lindl. (1846) = Sclerotiniaceae.
- Botrydiella** Badura (1963) = Staphylotrichum fide Ellis (*Dematiaceous Hyphomycetes*, 1971).
- Botrydina** Bréb. ex Menegh. (1844) nom. utique rej. = Lichenomphalia fide Kuyper (*in litt.*; syn. of *Lichenomphalina* but the name has been used for the anamorph of this genus), Gams (*Öst. bot. Z.* 109: 376, 1962), Poelt & Jülich (*Herzogia* 1: 331, 1969), Oberwinkler (*Deutsch. bot. Ges. N.F.* 4: 139, 1970), Redhead & Kuyper (*Arctic & Alpine Mycology* 2: 319, 1987), Redhead & Kuyper (*Mycotaxon* 31: 221, 1988), Jørgensen & Ryman (*Taxon* 38: 305, 1989).
- Botrydiplis** Clem. & Shear (1931) ≡ Botryodiplodia.
- Botrydium** Wallr. (1815), Algae. Algae.
- Botryella** Syd. & P. Syd. (1916) = Sphaerellopsis Cooke fide Sutton (*Mycol. Pap.* 141, 1977).
- botryo-aleuriospore**, one of an apical cluster of aleuriospores developed basipetally from the conidiogenous cells.
- Botryoascus** Arx (1972) = Saccharomycopsis Schiønning fide Kurtzman & Robnett (*CJB* 73 Suppl. 1: S824, 1995), Matsushima (*Matsush. Mycol. Mem.* 9: 1, 1996).
- Botryobasidiaceae** Jülich (1982), Cantharellales. 5 gen. (+ 5 syn.), 83 spp.
Lit.: Maekawa (*Trans. Mycol. Soc. Japan* 33: 317, 1992), Langer (*Bibliotheca Mycol.* 158: 459 pp., 1994), Ginns (*Mycol.* 90: 19, 1998), Langer *et al.* (*MR* 104: 510, 2000), Langer *et al.* (*Mycoscience* 41: 201, 2000), Binder & Bresinsky (*Mycol.* 94: 85, 2002).
- Botryobasidium** Donk (1931), Botryobasidiaceae. 55, widespread. See Eriksson & Ryvarden (*Cortic. N. Europ.* 2: 145, 1973; key 11 Eur. spp.), Langer (*Bibliotheca Mycol.* 158, 1994; world key).
- Botryobasidium** Rick (1959), Thelephoraceae. 3, Brazil. See Rick (*Iheringia Série Botânica* 4: 98, 1959).
- botryoblastospore**, clusters of conidia borne on the swollen apex (ampulla) of a conidiogenous cell, arising synchronously or asynchronously, either singly or in chains.
- Botryobolus** Arnaud (1952) = Ballocephala fide Huber (*in litt.*).
- Botryochaete** Corda (1854) ≡ Phleogenia fide Donk (*Persoonia* 4: 160, 1966).
- Botryochaete** Rick (1959), Basidiomycota. 3, Brazil. See Rick (*Iheringia Série Botânica* 4: 122, 1959).
- Botryochora** Torrend (1914), ? Dothioraceae (?L). 1, Africa. See von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Botryocladium** Preuss (1851) = Nematogonium fide Saccardo (*Syll. fung.* 4: 170, 1886).
- Botryoconiaceae** Cif. & Vegni (1963) = Cryptobasidiaceae.
- Botryoconis** Syd. & P. Syd. (1906), Cryptobasidiaceae. 3, Brazil; Japan. See Donk (*Reinwardtia* 4: 114, 1956), Begerow *et al.* (*Mycol. Progr.* 1: 187, 2002), Hendrichs *et al.* (*Sydowia* 55: 33, 2003).
- Botryocrea** Petr. (1949) = Fusarium fide Samuels *et al.* (*Mycol. Pap.* 164, 1991).
- Botryodeorsum** T.P. Devi, N. Mathur, Chowdhry, Jasvir Singh & O. Prakash (2006), anamorphic *Pezizomycotina*. 1, India. See Devi *et al.* (*Indian Phytopath.* 59: 215, 2006).
- Botryoderma** Papendorf & H.P. Upadhyay (1969), anamorphic *Pezizomycotina*, Hso.0eH.14. 3, S. Africa; Brazil. See Papendorf & Upadhyay (*TBMS* 52: 257, 1969), Lopez *et al.* (*Mycotaxon* 55: 269, 1995).
- Botryodiplis** Clem. & Shear (1931) ≡ Botryodiplodia.
- Botryodiplodia** (Sacc.) Sacc. (1884) nom. dub., Diaporthales. See *Lasioidiplodia* for *B. theobromae* and relatives. See Stevens (*Mycol.* 33: 69, 1941), Zambetakis (*BSMF* 70: 219, 1954), Crous & Palm (*Sydowia* 51: 167, 1999).
- Botryodiplodina** Dias & Sousa da Câmara (1954), anamorphic *Pezizomycotina*, St.1eP.?. 1, Portugal. See Dias & Sousa da Câmara (*Agron. lusit.* 16: 13, 1954).
- Botryodontia** (Hjortstam & Ryvarden) Hjortstam (1987), ? Hymenochaetaceae. 6, widespread. Polyphyletic. See Hjortstam (*Mycotaxon* 28: 20, 1987).
- Botryogene** Syd. & P. Syd. (1917) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Botryohypochnaceae** Jülich (1982) = Botryobasidiaceae.
- Botryohypochnus** Donk (1931) = Botryobasidium Donk fide Langer (*Bibliotheca Mycol.* 158, 1994).
- Botryohypoxylon** Samuels & J.D. Rogers (1986), Dothideomycetes. Anamorph *Iledon*. 1, Brazil. See Samuels & Rogers (*Mycotaxon* 25: 631, 1986).
- Botryola** Bat. & J.L. Bezerra (1964), ? Nitschkiaceae. 1, Brazil. See Batista & Bezerra (*Publicações Inst. Microl. Recife* 431: 11, 1964).
- Botryolepraria** Canals, Hern.-Mar., Gómez-Bolea & Llimona (1997), Lecanorales. 1, Europe. See Canals *et al.* (*Lichenologist* 29: 339, 1997), Ekman & Tønsberg (*MR* 106: 1262, 2002; phylogeny), Baruffo *et al.* (*Nova Hedwigia* 83: 387, 2006; Italy).
- Botryomonilia** Goos & Piroz. (1975), anamorphic *Pezizomycotina*, Hso.0eH.38. 1, Panama. See Goos & Pirozynski (*CJB* 53: 2927, 1975), Kendrick (*CJB* 81: 75, 2003; morphogenesis).
- Botryomyces** de Hoog & C. Rubio (1982) ≡ Ybotromyces.
- Botryomyces** Greco (1916), anamorphic *Pezizomycotina*, Hso.?.?. 1 (from man, also in rocks), Argentina. See Benoldi *et al.* (*J. Med. Vet. Mycol.* 29: 9, 1991; agent of phaeohyphomycosis), Sterflinger (*The Yeast Handbook* [1]: 501, 2006; ecology).
- Botryonipha** Preuss (1852) nom. rej., anamorphic *Pezizomycotina*.
- Botryophialophora** Linder (1944) = Myrioconium Syd. fide von Arx (*Gen. Fungi Sporul. Cult.*, 1970).
- Botryophoma** (P. Karst.) Höhn. (1916) = Sclerodothiorrella fide Sutton (*Mycol. Pap.* 141, 1977).
- Botryorhiza** Whetzel & Olive (1917), Chaconiaceae. 1 (on *Hippocratea* (*Hippocrateaceae*)), Caribbean; Brazil.

botryose, racemose; grouped like grapes.

Botryosphaeria Ces. & De Not. (1863), Botryosphaeriaceae. Anamorphs *Diplodia*, *Dothiorella*, *Fusicoccum*, *Lasiodiplodia*, *Sphaeropsis*. c. 36, widespread. Many important plant pathogens; molecular species concepts are narrower than traditional morphology-based taxa. See von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954), Barr (*Contr. Univ. Mich. Herb.* 9: 523, 1972), Jacobs & Rehner (*Mycol.* 90: 601, 1998; DNA, anams), Denman *et al.* (*Mycol.* 91: 510, 1999), Silva-Hanlin & Hanlin (*MR* 103: 153, 1999; DNA), Denman *et al.* (*Stud. Mycol.* 45: 129, 2000), Smith & Stanosz (*Mycol.* 93: 505, 2001), Zhou & Stanosz (*Mycol.* 93: 516, 2001; phylogeny), Ma & Michailides (*Phytopathology* 92: 519, 2002; California), Phillips (*Phytopath. Mediterr.* 41: 3, 2002; on grape), Slippers *et al.* (*Mycol.* 96: 83, 2004; *B. dothidea* s.l.), Slippers *et al.* (*Mycol.* 96: 1030, 2004; *B. dothidea*, phylogeny), Phillips *et al.* (*Mycopathologia* 159: 433, 2005; on *Olea*), Crous *et al.* (*Stud. Mycol.* 55: 235, 2006; phylogeny), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).

Botryosphaeriaceae Theiss. & P. Syd. (1918), Botryosphaeriales. 26 gen. (+ 60 syn.), c. 1517 spp.

Lit.: von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954), Sivanesan (*Bitunicate Ascomycetes and their Anamorphs*, 1984), Pennycook & Samuels (*Mycotaxon* 24: 445, 1985), Bissett (*Mycotaxon* 25: 519, 1986), Barr (*Prodr. Cl. Loculoasc.*, 1987), Morgan-Jones & White (*Mycotaxon* 30: 117, 1987), Bissett & Palm (*CJB* 67: 3378, 1989), Hyde (*Sydowia* 47: 180, 1995), Jacobs *et al.* (*Phytopathology* 85: 1206, 1995), Jacobs & Rehner (*Mycol.* 90: 601, 1998), Denman *et al.* (*Stud. Mycol.* 45: 129, 2000), Rodrigues *et al.* (*MR* 108: 45, 2004), Slippers *et al.* (*Mycol.* 96: 83, 2004), Van Niekerk *et al.* (*Mycol.* 96: 781, 2004), Barber *et al.* (*MR* 109: 1347, 2005), Crous *et al.* (*Stud. Mycol.* 55: 235, 2006), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny), Slippers *et al.* (*Pl. Path.* 56: 128, 2007; on *Rosaceae*), de Wet *et al.* (*Mol. Phylogenet. Evol.* 46: 116, 2008; phylogeny, host association).

Botryosphaeriales C.L. Schoch, Crous & Shoemaker (2007). Dothideomycetes. 1 fam., 28 gen., 1628 spp. Fam:

Botryosphaeriaceae

For *Lit.* see under fam.

Botryosphaerostroma Petr. (1921) = Botryodiplodia fide Sutton (*Mycol. Pap.* 141, 1977).

Botryosphaerostroma Petr. & Syd. (1926) = *Sphaeropsis* Sacc. fide Sutton (*Mycol. Pap.* 141, 1977).

Botryosporium Corda (1831), anamorphic *Pezizomycotina*, Hso.0eH.6. 4, widespread. See Mason (*Mycol. Pap.* 2: 27, 1928), Vincent & Blackwell (*Taxon* 36: 158, 1987; nomencl.), Zhang & Kendrick (*Acta Mycol. Sin.* 9: 31, 1990; key 4 spp.).

Botryosporium Schwein. (1832) ? = *Dictyosporium* fide Sutton (*in litt.*).

Botryostroma Höhn. (1911), anamorphic *Venturiaceae*. 2, America (tropical). See Hughes & Seifert (*Sydowia* 50: 192, 1998).

Botryothecium Syd. (1937) = *Rosenscheldiella* fide Hansford (*Mycol. Pap.* 15, 1946).

Botryotinia Whetzel (1945), Sclerotiniaceae. Anamorph *Botrytis*. c. 19, widespread. See Hennebert & Groves (*CJB* 41: 341, 1963), Jarvis (*Can. Dept. Agric. Monogr.* 15, 1977; taxonomy, physiology, patho-

genicity), Giraud *et al.* (*Mol. Biol. Evol.* 14: 1177, 1997; genetics), Holst-Jensen *et al.* (*Mycol.* 89: 885, 1997; phylogeny), Giraud *et al.* (*Phytopathology* 89: 967, 1999; sibling spp.), Holst-Jensen *et al.* (*Nordic Jl Bot.* 18: 705, 1999; phylogeny), Nielsen & Yohalem (*Mycol.* 93: 1064, 2001; polyploidy), Nielsen *et al.* (*Pl. Dis.* 86: 682, 2002; PCR detection), Yohalem *et al.* (*Mycotaxon* 85: 175, 2003; on onions), Beever & Weeds (*Botrytis: Biology, Pathology and Control*: 29, 2004; review), Fukumori *et al.* (*J. Gen. Pl. Path.* 70: 256, 2004; spermatia), Staats *et al.* (*Mol. Biol. Evol.* 22: 333, 2005; phylogeny).

Botryotrichum Sacc. & Marchal (1885), anamorphic *Chaetomium*, Hso.0eP.?. 8, widespread. See Hawksworth (*Persoonia* 8: 167, 1975), Kushwaha & Agrawal (*TMSJ* 17: 18, 1976), Santos *et al.* (*Mycotaxon* 48: 271, 1993; parasitic on nematode eggs), Untereiner *et al.* (*CJB* 79: 321, 2001; phylogeny).

Botryoxylon Cif. (1962) = *Conoplea* fide Hughes (*CJB* 36: 727, 1958).

Botryozyma Shann & M.T. Sm. (1992), anamorphic *Ascobotryozyma*, Hso.0eH.1. 3, widespread. See Smith *et al.* (*Antonie van Leeuwenhoek* 61: 281, 1992), Kerrigan *et al.* (*Antonie van Leeuwenhoek* 79: 7, 2001), Kerrigan *et al.* (*MR* 107: 1110, 2003), Kerrigan *et al.* (*FEMS Yeast Res.* 4: 849, 2004), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).

Botrypes Preuss (1852) nom. dub ? = *Ciliciopodium* fide Saccardo (*Syll. fung.* 4: 577, 1886), Seifert (*TBMS* 88: 123, 1985).

Botrysphaeris Clem. & Shear (1931) = *Sphaeropsis* Sacc. fide Sutton (*in litt.*).

Botrytis P. Micheli ex Pers. (1794), anamorphic *Botryotinia*, Hso.0eH.6. c. 54, widespread. *B. cinerea* (the common grey mould, frequently parasitic); *B. allii* and other spp. (neck rot of onions); *B. paeoniae* (paeony blight); *B. tulipae* (tulip fire). See Hennebert (*Persoonia* 7: 185, 1973; segregates), Jarvis (*Can. Dept. Agric. Monogr.* 15, 1977), Coley-Smith *et al.* (*The biology of Botrytis*, 1981), Harrison (*Pl. Path.* 37: 168, 1987; review of spp. on beans), Shirare *et al.* (*Phytopathology* 79: 728, 1989; nuclei and mitotic chromosomes in *Botrytis* spp.), Lu & Wu (*Acta Mycol. Sin.* 10: 27, 1991; *Botryotinia fabae* teleomorph of *Botrytis fabae*, chocolate spot), Verhoeff *et al.* (*Recent advances in Botrytis research*, 1992), van der Vlugt-Bergmans *et al.* (*MR* 97: 1193, 1993; genetic variation and DNA polymorphisms in *B. cinerea*), van Kan *et al.* (*Neth. Jl Pl. Path.* 99 Suppl. 3: 119, 1993; electrophoretic karyotypes in *B. cinerea*), Giraud *et al.* (*Mol. Biol. Evol.* 14: 1177, 1997), Holst-Jensen *et al.* (*Nordic Jl Bot.* 18: 705, 1998; phylogeny), Förster & Adaskaveg (*Phytopathology* 90: 171, 2000; detection with DNA primers), Nielsen & Yohalem (*Mycol.* 93: 1064, 2001; polyploidy), Albertini *et al.* (*MR* 106: 1171, 2002; speciation), Muñoz *et al.* (*MR* 106: 594, 2002; Chile), Nielsen *et al.* (*Pl. Dis.* 86: 682, 2002; on onion), Fournier *et al.* (*Mycol.* 95: 251, 2003; VCG markers), Moyano *et al.* (*Eur. J. Pl. Path.* 109: 515, 2003; population genetics), Yohalem *et al.* (*Mycotaxon* 85: 175, 2003; nomencl.), Beever & Weeds (*Botrytis: Biology, Pathology and Control*: 29, 2004; review), Chilvers *et al.* (*Australas. Pl. Path.* 33: 29, 2004; on onion in Australia), Fukumori *et al.* (*J. Gen. Pl. Path.* 70: 256, 2004; spermatia), Fournier *et al.* (*Mycol.* 97: 1251, 2006; phylogeny), Ma & Michailides (*Pl. Dis.* 89: 1083, 2005; California), Rehner & Buckley (*My-*

- col. 97: 84, 2005; cryptic speciation), Staats *et al.* (*Mol. Biol. Evol.* 22: 333, 2005; phylogeny).
- Botrytites** Mesch. (1892), Fossil Fungi. 1 (Oligocene), Europe.
- Botrytoides** M. Moore & F.P. Almeida (1937) = *Rhinocladiella* Nannf. fide Schol-Schwarz (*Antonie van Leeuwenhoek* 34: 140, 1968).
- Bottaria** A. Massal. (1856) = *Mycoporum* Flot. ex Nyl. fide Harris (*Evansia* 4: 28, 1987).
- Bottariomyces** Cif. & Tomas. (1953) = *Pyrenula* Ach. (1809) fide Harris (*Mem. N. Y. bot. Gdn* 49, 1989).
- botuliform**, cylindrical with rounded ends; sausage-like in form; see allantoid.
- Boubovia** Svrček (1977), Pezizales. 6, widespread (esp. temperate). See Yao & Spooner (*MR* 100: 193, 1996), van Brummelen & Kristiansen (*Persoonia* 17: 265, 1999; Norway), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Boudier** (Jean Louis Émile; 1828-1920; France). A pharmacist of Montmorency. An expert on discomycetes, producing some of the finest illustrations of these fungi. Boudier's microscopic measurements are usually c. 10% too high (van Brummelen, *Persoonia* 5: 233, 1969). *Publs. Histoire et Classification des Discomycètes d'Europe* (1907) [reprint 1968]; *Icones Mycologicae ou Iconographie des Champignons de France, Principalement Discomycètes* 5 vols (1905-1910) [reprint 1981-1986]. *Biogs, obits etc.* Mangin (*BSMF* 36: 181, 1920); Lamy (*BSMF* 100: CXXXIX, 1984 [correspondence]); Grumann (1974: 268); Stafleu & Cowan (*TL-2* 1: 290, 1976).
- Boudiera** Cooke (1877), Pezizaceae. 10, Europe; N. America. See Hirsch (*Wissen. Z. Fried.-Schiller-Univ.* 32: 1013, 1983), Landvik *et al.* (*Nordic Jl Bot.* 17: 403, 1997; DNA), Norman & Egger (*Mycol.* 91: 820, 1999; phylogeny), Hansen *et al.* (*Mol. Phylogen. Evol.* 36: 1, 2005; phylogeny), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny).
- Boudiera** Lázaro Ibiza (1916) = *Phellinus* fide Donk (*Verh. K. ned. Akad. Wet.* tweede sect. 62: 1, 1974).
- Boudierella** Costantin (1897) = *Delacroixia*.
- Boudierella** Sacc. (1895), ? Pyronemataceae. 1, Europe. See Kimbrough & Korf (*Am. J. Bot.* 54: 9, 1967).
- bouillon**, meat broth used as a culture medium.
- Bourdout** (Hubert; 1861-1937; France). Priest, Saint-Priest-en-Murat, Allier (1898-1937). Noted for his studies on *Hymenomycetes*, esp. *Thelephoraceae* and resupinate fungi. Collections in PC. *Publs.* (with Galzin) *Hymenomycètes de France* (1928) [reprint 1969]. *Biogs, obits etc.* Gilbert (*BSMF* 55: 137, 1939) [bibliography, portrait]; Grumann (1974: 268); Stafleu & Cowan (*TL-2* 1: 294, 1976); Stafleu & Mennega (*TL-2, Suppl.* 2: 391, 1992).
- Bourdoutia** (Bres.) Bres. & Torrend (1913), Auriculariales. 1, widespread. See Weiss & Oberwinkler (*MR* 105: 403, 2001; phylogeny).
- bourrelet**, see ascus.
- Bouvetiella** Øvstedal (1986), ? Hymeneliaceae (L.). 1, Antarctica. See Øvstedal (*Norsk Polarinstitut Skrifter*: 35, 1986), Timdal in Hawksworth (Ed.) (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. 269 269: 381, 1994; posn).
- Bovetia** Onofri & Persiani (1982) = *Sarophorum* fide Samson & Seifert (*Advances in Penicillium and Aspergillus Systematics* 102: 397, 1985).
- Bovicornua** Jørg. Koch & E.B.G. Jones (1993), Halosphaeriaceae. 1 (marine), Europe. See Yusoff *et al.* (*CJB* 71: 346, 1993), Yusoff *et al.* (*CJB* 72: 1550, 1994).
- Bovilla** Sacc. (1883) = *Cercophora* fide Lundqvist (*Symb. bot. upsal.* 20 no. 1, 1972).
- Bovista** Pers. (1794), Agaricaceae. c. 55, widespread. See Kreisel (*Beih. Nova Hedwigia* 25, 1967; monogr.), Calonge (*Mycol.* 96: 1152, 2004; Mexico), Baseia (*Mycotaxon* 91: 81, 2005; Brazil).
- Bovistaria** (Fr.) P. Karst. (1889) = *Langermannia*.
- Bovistella** Morgan (1892) = *Lycoperdon* Pers. fide Larsson & Jeppson (*MR* 112: 4, 2008).
- Bovistina** Long & Stouffer (1941) = *Disciseda* fide Ponce (*Fieldiana, Bot.* 38: 23, 1976).
- Bovistoides** Lloyd (1919) = *Myriostoma* fide Suárez & Wright (*Mycotaxon* 71: 251, 1999).
- Boydia** A.L. Sm. (1919) = *Vialaea* fide Redlin (*Sydowia* 41: 296, 1989).
- BPI**, US National Fungus Collection (Beltsville, Md, USA); founded 1869, part of the United States Department of Agriculture's (USDA) Agricultural Research Service (ARS); see Cross *et al.* (*Systematic collections of the Agricultural Research Service*, 1977).
- BR**, National Botanic Garden of Belgium (Meise, Belgium); founded 1870; supported by the Ministry of Agriculture.
- Brachiola** A. Cali, P.M. Takvorian, S. Lewin, M. Rendel, C.S. Sian, M. Wittner, H.B. Tanowitz, E. Keohane & L. Weiss (1998), Microsporidia. 4. See Cali *et al.* (*Acta Protozool.* 43: 73, 1998).
- Brachiosphaera** Nawawi (1976), anamorphic *Aliquandostipitaceae*, Hso.1bH.19. 2 (aquatic), pantropical. See Nawawi (*TBMS* 67: 213, 1976), Chan *et al.* (*Fungal Diversity* 5: 89, 2000; Hong Kong), Descals (*MR* 109: 545, 2005; propagules), Campbell *et al.* (*CJB* 85: 873, 2007; phylogeny).
- brachy-** (prefix), short.
- Brachyascus** Syd. (1917) = *Microdiscus* Sacc.
- Brachybasidiaceae** Gäum. (1926), Exobasidiales. 4 gen. (+ 1 syn.), 10 spp.
Lit.: Donk (*Taxon*: 243, 1951-63), Gäumann (*Belg. Jl Bot.*: 358, 1964), Cunningham *et al.* (*Mycol.* 68: 642, 1976; key), Ingold (*TBMS* 84: 542, 1985), Oberwinkler (*Stud. Mycol.* 30: 61, 1987), Barreto & Evans (*TBMS* 91: 81, 1988), Gruèzo (*Nat. Hist. Bull. Siam Soc.* 38: 89, 1990), Bauer *et al.* (*CJB* 75: 1273, 1997), Berndt & Sharma (*MR* 102: 1484, 1998), Bergerow *et al.* (*Mycol. Progr.* 1: 187, 2002).
- Brachybasidiales** Donk (1964) = Exobasidiales.
- Brachybasidium** Gäum. (1922), Brachybasidiaceae. 1 (on *Palmae*), Java. See Gäumann (*Annl. Mycol.* 20: 269, 1922).
- Brachycarphium** Berk. (1849), Fossil Fungi, anamorphic *Pezizomycotina*. 1 (Oligocene), Baltic.
- Brachycladites** Mesch. (1892) = *Brachycarphium*.
- Brachycladium** Berk. (1848) = *Brachycarphium*.
- Brachycladium** Corda (1838), anamorphic *Crivellia*. 1, widespread. See Saccardo (*Syll. fung.* 4: 489, 1886).
- Brachyconidiella** R.F. Castañeda & W.B. Kendr. (1990), anamorphic *Dothideomycetes*, Hsy/Hsp.0bP.1. 1, Cuba. See Castañeda Ruiz & Kendrick (*Univ. Waterloo Biol. Ser.* 33: 11, 1990), Decock *et al.* (*Cryptog. Mycol.* 25: 137, 2004).
- Brachyconidiellopsis** Decock, R.F. Castañeda & Adhikari (2004), anamorphic *Microascaceae*. 1 (on dung), Nepal. See Decock *et al.* (*Cryptog. Mycol.* 25: 140, 2004).

brachycyclic, see *Pucciniales* and Table 5.

Brachydesmiella G. Arnaud ex S. Hughes (1961), anamorphic *Pezizomycotina*, Hso.≡ eP.26. 5, widespread. See Nicot (*BSMF* 86: 705, 1971), Sivichai *et al.* (*Mycoscience* 39: 239, 1998), Castañeda Ruiz *et al.* (*Mycotaxon* 85: 211, 2003; Venezuela), Castañeda Ruiz *et al.* (*Mycotaxon* 95: 261, 2006; Brazil).

Brachydesmium (Sacc.) Costantin (1888) = *Clasterosporium* fide Saccardo (*Syll. fung.* 4: 386, 1886).

brachyform, see *Pucciniales* and Table 5.

Brachyhelicoon Arnaud (1952), anamorphic *Pezizomycotina*, Hso.0≡ hH.?. 1, Europe. See Arnaud (*BSMF* 68: 208, 1952), Goos (*Mycol.* 79: 1, 1987).

brachymeiosis (obsol.), a third division, once claimed to occur in the ascus.

Brachymyces G.L. Barron (1980), *Helicocephalidaceae*. 1 (from soil), Canada. See Barron (*CJB* 58: 2450, 1980).

Brachyphoris J. Chen (2007), anamorphic *Hyalorbilia*. 5, widespread. See Chen *et al.* (*Fungal Diversity* 26: 127, 2007).

Brachysporiella Bat. (1952), anamorphic *Ascotaiwania*, Hso.≡ eP.1. 6, widespread. See Ellis (*Mycol. Pap.* 72, 1959; key), Ranghoo & Hyde (*Mycol.* 90: 1055, 1998; key), Fallah *et al.* (*CJB* 77: 87, 1999), Partridge *et al.* (*Mycotaxon* 73: 303, 1999), Yanna & Ho (*Cryptog. Mycol.* 25: 129, 2004).

Brachysporiellina Subram. & Bhat (1989), anamorphic *Pezizomycotina*, Hso.≡ eP.10. 1, India. See Subramanian & Bhat (*Kavaka* 15: 46, 1987).

Brachysporiopsis Yanna, W.H. Ho & K.D. Hyde (2004), anamorphic *Pezizomycotina*. 1 (on palms), Hong Kong. See Yanna & Ho (*Cryptog. Mycol.* 25: 130, 2004).

Brachysporisporites R.T. Lange & P.H. Sm. (1971), Fossil Fungi. 2 (Eocene), Australia; Canada.

Brachysporium Sacc. (1886), anamorphic *Cryptadelphina*, Hso.≡ eP.11. 11, widespread. See Ellis (*Dematiaceous Hyphomycetes*, 1971; key), Scheuer & Chlebicki (*Acta Mycologica Warszawa* 32: 147, 1997), Réblová & Seifert (*Mycol.* 96: 343, 2004).

brand, a leaf disease caused by a microscopic fungus, esp. a rust or smut (sometimes named the - fungus) (obsol.); - **spore**, urediniospore; smut spore.

brandy, see spirits.

Brasiliomyces Viégas (1944), *Erysiphaceae*. Anamorph *Oidium*. 7, widespread. See Hanlin & Tortolero (*Mycol.* 76: 439, 1984; key), Zheng (*Mycotaxon* 19: 281, 1984), Braun (*Beih. Nova Hedwigia* 89, 1987; key), Mori *et al.* (*Mycol.* 92: 74, 2000; phylogeny), Braun *et al.* (*The Powdery Mildews A Comprehensive Treatise*: 13, 2001; review), To-Anun *et al.* (*Mycoscience* 44: 447, 2003), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).

Brassia A. Massal. (1860) [non *Brassia* R. Br. 1813, *Orchidaceae*] = *Thelotrema* fide Hale (*Bull. Br. Mus. nat. hist. Bot.* 8: 227, 1981).

Braunia Rick (1934) [non *Braunia* Bruch & Schimp. 1846, *Musci*] = *Brauniella* fide Stalpers (*in litt.*).

Brauniella Rick ex Singer (1955), ? *Strophariaceae*. 1, S. America. See Singer (*Proc. K. ned. Akad. Wet. Ser. C, Biol. Med. Sci.* 66: 115, 1963).

Brauniellaceae Singer (1962) = *Strophariaceae*.

Brauniellula A.H. Sm. & Singer (1959) = *Chroogomphus* fide Miller (*Mycol.* 95: 176, 2003).

breathing pore, raised aperture in the upper cortex of *Parmelia exasperata* from the medulla to the exterior.

Brefeld (Julius Oscar; 1839-1925; Germany). Son of a pharmacist in Westphalia; Professor at the Forestry Academy, EberswaldeIn (1876), then Professor of Botany at Münster, and later Breslau. Brefeld is noted for his development of pure culture methods in connexion with work on life-histories and growth of fungi. From the first he saw how necessary it was for culture media and apparatus to be sterile and, 10 years before Koch, was using gelatin to make solid media. Working in turn with different groups of fungi, his writings are still a mine of details on spore germination, and growth and development of fungi. For 25 years he had the use of only one eye and from about 1914 was blind. *Publs. Botanische Untersuchungen über Schimmelpilze* (later *Untersuchungen aus dem Gesamtgebiet der Mykologie*) 15 parts (1872-1912) [in these publications, with the help of beautiful figures, he provided detailed accounts of his investigations]; also responsible for more than 40 papers on mycology and plant diseases. *Biogs, obits etc.* Anon. (*Nature* 116: 369, 1925); Grumann (1974: 16); Sopp (*Norske Videnskaps-Akademi i Oslo Årbok* 1925: 83, 1926); Stafleu & Cowan (*TL-2* 1: 314, 1976); Stafleu & Mennega (*TL-2, Suppl.* 3: 47, 1995).

Brefeldiella Speg. (1889), *Brefeldiellaceae*. 2, pantropical. See Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962), Eriksson (*Op. Bot.* 60, 1981), Reynolds & Gilbert (*Aust. Syst. Bot.* 18: 265, 2005; Australia), Reynolds & Gilbert (*Cryptog. Mycol.* 27: 249, 2006; Panamá).

Brefeldiellaceae E. Müll. & Arx (1962), ? *Dothideomycetes* (inc. sed.). 1 gen., 2 spp.

Lit.: Eriksson (*Op. Bot.* 60, 1981), Eriksson (*Op. Bot.* 60: 220 pp., 1981).

Brefeldiellites Dilcher (1965), Fossil Fungi. 2 (Cretaceous, Eocene), Argentina; USA.

Brefeldiopycnis Petr. & Cif. (1932), anamorphic *Pezizomycotina*, ?0eH.?. 1, West Indies.

Brefeldochium Verkley (2005), anamorphic *Polydesmia*, H??.?. 1, widespread. See Verkley (*Nova Hedwigia* 80: 504, 2005).

Brencklea Petr. (1923) = *Scolecosporella* Petr. fide Sutton (*CJB* 46: 183, 1968).

Brenesiella Syd. (1929), *Pezizomycotina*. 1, C. America.

Bresàdola (Giacopo; 1847-1929; Italy). An amateur mycologist of Trento. Main collection in Stockholm (S). *Publs. Fungi Tridentini Novi et Nondum Delineati, Descripti et Iconibus Illustrati* (1881-1892); *Iconographia Mycologica* 28 vols (1927-60) [mostly *Agaricales*; reprint 1981-1982]. *Biogs, obits etc.* Bresadola (*Iconographia Mycologica* 26: v, 1933) [portrait]; Zalin & Lazzari (*Carteggio Bresadola-Saccardo*, 1987 [correspondence]); Grumann (1974: 431); Stafleu & Mannega (*TL-2, Suppl.* 3: 66, 1995).

Bresadolella Höhn. (1903) = *Trichosphaerella* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).

Bresadolia Speg. (1883) = *Polyporus* P. Micheli ex Adans. fide Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974).

Bresadolina Brinkmann (1909) = *Cotylidia* fide Donk (*Taxon* 6: 22, 1957).

Bresadolina Rick (1928), *Pezizomycotina*. 1, Brazil.

Bretonia C.E. Bertrand & Hovel. (1892), Fossil Fungi (mycel.) Fungi. 1 (Permian), Europe.

Brettanomyces N.H. Claussen ex Custers (1940),

- anamorphic *Dekkera*. 10, widespread. See Lee & Jong (*Mycotaxon* 25: 455, 1986), Hoeben *et al.* (*J. Mol. Evol.* 36: 263, 1993; mitochondrial genomes), Boekhout *et al.* (*Int. J. Syst. Bacteriol.* 44: 781, 1994; phylogeny), Cai *et al.* (*Int. J. Syst. Bacteriol.* 46: 542, 1996; phylogeny), Smith in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 450, 1998), Rodrigues *et al.* (*Journal of Applied Microbiology* 90: 588, 2001; diagnostic media), Cocolin *et al.* (*Appl. Environm. Microbiol.* 70: 1347, 2004; molecular detection), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Brevicatenospora** R.F. Castañeda, Minter & Saikawa (2006), anamorphic *Pezizomycotina*. 1 (submerged leaves), Cuba. See Castañeda Ruiz *et al.* (*Mycotaxon* 96: 152, 2006).
- Brevicellicium** K.H. Larss. & Hjortstam (1978), Hydnodontaceae. 13, widespread. See Larsson & Hjortstam (*Mycotaxon* 7: 117, 1978), Hjortstam (*Mycotaxon* 79: 181, 2001; tropical and subtropical species).
- brevicollate**, short-necked.
- Brewing**. The process of beer making. Classical brewing comprises a number of stages: (1) **malting**, when water soaked barley grain is allowed to germinate and endogenous enzymes attack the starch and certain proteins of the grain; (2) grinding the malted grain to form **grist**; (3) **mashing**, mixing the grist with water when there is further enzyme action after which (4) the resulting liquid, **wort**, is boiled with female hop (*Humulus lupulus*) flowers and on cooling (5) fermented by *S. cerevisiae* or another yeast. See beer, Wine making, yeast.
- Briania** D.R. Reynolds (1989), anamorphic *Meliolina*, Hso.0eH.15. 1, Hawaii. See Reynolds (*Pacific Sci.* 43: 161, 1989).
- Briansuttonia** R.F. Castañeda, Minter & Saikawa (2004), anamorphic *Pleosporales*. 1, Australia. See Castañeda Ruiz *et al.* (*Mycotaxon* 89: 304, 2004).
- Briardia** Sacc. (1885) = *Duebenia* fide Nannfeldt (*Svensk bot. Tidskr.* 23: 316, 1929).
- Briarea** Corda (1831) = *Aspergillus* fide Hughes (*CJB* 36: 727, 1958).
- Bricookea** M.E. Barr (1982) = *Lophiostoma* fide Shoemaker & Babcock (*Stud. Mycol.* 31: 165, 1989), Barr (*Mycotaxon* 43: 371, 1992), Suková (*Czech Mycol.* 56: 63, 2004; Czech Republic), Eriksson (*Svensk Mykol. Tidskr.* 28: 38, 2007; synonymy).
- Bridgeoporus** T.J. Volk, Burds. & Ammirati (1996), Agaricomycetes. 1, USA. *Hymenochaetales* or *Agaricales* (*Oxyporus* clade). See Burdsall *et al.* (*Mycotaxon* 60: 390, 1996), Redberg *et al.* (*Mycol.* 95: 836, 2003; phylogeny).
- bridging hypha**, a branch hypha joining two other hyphae (Buller, *Researches* 4: 152, 1931); - **species** or - **host**, a plant by which a specialized parasite went, in Marshall Ward's opinion (*Ann. Bot.* 15: 560, 1902; *Ann. Myc.* 1: 132, 1903; but see Bean *et al.*, *Ann. Bot. N.S.* 18: 129, 1954), from a susceptible to a resistant host.
- Brigantiaeae** Trevis. (1853) nom. rej., Brigantiaeaceae (L). 22, widespread. See Hafellner & Bellemère (*Nova Hedwigia* 35: 237, 1982), Hafellner & Bellemère (*Nova Hedwigia* 38: 169, 1983; conidia from ascospores), Hafellner (*Acta Univ. Ups. Symb. Bot. Upsal.* 32 no. 1: 35, 1997).
- Brigantiaeaceae** Hafellner & Bellem. (1982), Lecanorales (L). 2 gen. (+ 2 syn.), 25 spp.
- Lit.*: Awasthi & Srivastava (*Proc. Indian Acad. Sci. Pl. Sci.* 99: 165, 1989), Hafellner (*Symb. bot. upsal.* 32 no. 1: 35, 1997).
- Brigantiella** (Sacc.) Sacc. (1905) ? = *Lophiostoma* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Briosia** Cava (1888), anamorphic *Pezizomycotina*, Hsy.0eP.38. 2, widespread. See Sutton (*Mycol. Pap.* 132, 1973), Sigler & Carmichael (*Mycotaxon* 4: 349, 1976), Nasu *et al.* (*Ann. phytopath. Soc. Japan* 60: 608, 1994; on grape).
- Broddingnagia** K.D. Hyde & P.F. Cannon (1999), Phyllachoraceae. 2 (on living leaves), Africa; Australia. See Hyde & Cannon (*Mycol. Pap.* 175: 114, 1999), Sivanesan & Shivas (*Fungal Diversity* 11: 145, 2002).
- Brochospora** Kirschst. (1944) = *Sporormia* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Brodoa** Goward (1987), ? *Parmeliaceae* (L). 3, widespread. See Goward (*Bryologist* 89: 222, 1986), Thell *et al.* (*Symb. bot. upsal.* 34 no. 1: 429, 2004; Scandinavia), Blanco *et al.* (*Mol. Phylogen. Evol.* 39: 52, 2006; phylogeny).
- bromatia**, the rounded swellings at the ends of hyphae of ant fungi (see Insects and fungi) which are used by the ants as food.
- Bromicolla** E.V. Eichw. (1843) = *Sclerotium* fide Mussat (*Syll. fung.* 15, 1901) Also considered an alga (*Chlorophyceae* or *Palmellaceae*).
- bronchomycosis**, see mycosis.
- Brooksia** Hansf. (1956), Dothideomycetes. Anamorph *Hiospira*. 1, widespread (tropical). See Deighton & Pirozynski (*Mycol. Pap.* 105, 1966).
- broom cells** (of agarics), cells bearing apical appendages to give a broom-like appearance on pileus or edge of lamella, as in *Marasmius rotula*; *cellules en brosse* (Singer, 1962: 62).
- Broomeia** Berk. (1844), Broomeiaceae. 2, Africa; S. America.
- Broomeiaceae** Zeller (1948), Agaricales. 1 gen., 2 spp.
- Lit.*: Bottomley (*Bothalia* 4: 473, 1948), Ryvarden *et al.* (*An Introduction to the Larger Fungi of South Central Africa*: 200 pp., 1994), Jacobson (*McIlvainea* 12: 21, 1996), Sharp & Pearce (*Kew Bull.* 54: 739, 1999).
- Broomella** Sacc. (1883), Amphisphaeriaceae. Anamorphs *Pestalotia*, *Truncatella*. 7, widespread. See Müller in Yuan & Zhao (Eds) (*Sydowia* 44: 90, 1992; key), Kang *et al.* (*MR* 103: 53, 1999).
- Broomeola** Kuntze (1891), anamorphic *Pezizomycotina*, Hsp.1eH.?. 1, British Isles.
- broth**, a liquid nutrient culture medium, esp. one containing meat extract.
- Brown** (William; 1888-1975; Scotland, later England). Assistant (1912-1928) then Professor of Plant Pathology (1928-1938) then Professor of Botany (1938-1953), Imperial College of Science & Technology, University of London. Noted for his research on the physiology of parasitism and as a teacher. *Biogs, obits etc.* Garrett (*Biographical Memoirs of Fellows of the Royal Society* 21: 155, 1975) [bibliography, portrait]; Hawker (*TBMS* 65: 343, 1975) [portrait].
- brown oak**, oak wood stained by *Fistulina hepatica* (Cartwright, *TBMS* 21: 68, 1937).
- brown rot fungi**, species of *Monilinia* causing fruit rots and other damage to fruit trees. See Wormald (*Tech. Bull. Ministr. Agric.* 3, 1954), Byrde & Willetts (*The brown rot fungi of fruit*, 1977).

- Brucea** Rikkinen (2003), Lecanorales. 1 (on conifer resin), USA. See Rikkinen (*Ann. bot. fenn.* 40: 444, 2003).
- Brunaudia** (Sacc.) Kuntze (1898) ? = *Rhytidhysterium* fide Kutorga & Hawksworth (*SA* 15: 1, 1997).
- Brunchorstia** Erikss. (1891), anamorphic *Gremmeniella*, St.≡ eH.15. 1, widespread. See Punithalingam & Gibson (*IMI Descr. Fungi Bact.*: no. 369, 1973), Santamaría *et al.* (*Pl. Path.* 54: 331, 2005; population genetics).
- Bruneaudia**, see *Brunaudia*.
- Brunneiapiospora** K.D. Hyde, J. Fröhl. & Joanne E. Taylor (1998), Clypeosphaeriaceae. 6 (saprobic on palms), widespread (tropical). See Hyde *et al.* (*Sydowia* 50: 21, 1998), Kang *et al.* (*Mycoscience* 40: 151, 1999), Rogers & Ju (*Sydowia* 55: 359, 2003).
- Brunneocorticium** S.H. Wu (2007), Agaricales. 1, China; Taiwan. See Wu *et al.* (*Mycol.* 99: 302, 2007).
- Brunneospora** Guarro & Punsola (1987), Onygenaceae. Anamorph *Chrysosporium*. 1, Spain. See Sigler *et al.* (*CJB* 76: 1624, 1999), Cano *et al.* (*Stud. Mycol.* 47: 165, 2002).
- Brunneosporella** V.M. Ranghoo & K.D. Hyde (2001), Annulatascaceae. 1 (on submerged wood), Hong Kong. See Ranghoo *et al.* (*MR* 105: 625, 2001).
- Brunnipila** Baral (1985), Hyaloscyphaceae. 1, north temperate. See Raitviir (*Eesti NSV Tead. Akad. Toim. Biol. seer* 36: 313, 1987), Leenurm *et al.* (*Sydowia* 52: 30, 2000; ultrastructure), Suková (*Czech Mycol.* 57: 139, 2005; lignicolous spp.).
- Brycekendrickia** Nag Raj (1973), anamorphic *Pezizomycotina*, St.0eH.15. 1, India. See Nag Raj (*CJB* 51: 1337, 1973).
- Bryocaulon** Kärnefelt (1986), Parmeliaceae (L). 3, widespread (north temperate). See Kärnefelt *et al.* (*Nova Hedwigia* 67: 71, 1998), Thell *et al.* (*Symb. bot. upsal.* 34 no. 1: 429, 2004; Scandinavia), Randle & Saag (*Central European Lichens*: 75, 2006; key).
- Bryocentria** Döbbeler (2004), Bionectriaceae. 3 (on mosses), Europe. See Döbbeler (*Mycol. Progr.* 3: 247, 2004), Döbbeler (*Mycol.* 97: 924, 2005; ascospores).
- Bryochiton** Döbbeler & Poelt (1978), ? Pseudoperisporiaceae. 4 (on *Musci*), Europe. See Döbbeler in Laursen *et al.* (Eds) (*Arctic and Alpine Mycology* 2: 87, 1987), Döbbeler (*Nova Hedwigia* 76: 1, 2003), Döbbeler (*MR* 111: 1406, 2007).
- Bryochysium** Link (1833) nom. dub., Fungi. See Rabenhorst (*Deutsch. Krypt. Fl.* 2 index: 15, 1853; = *Rhizoctonia* s. lat.).
- Bryocladium** Kunze (1830) = *Pisomyxa* fide Saccardo (*Syll. fung.* 9: 374, 1891).
- Bryodina** Hafellner (2001), Lecanoraceae (L). 1, Europe (central). See Hafellner & Türk (*Stapfia* 76: 150, 2001).
- Bryodiscus** B. Hein, E. Müll. & Poelt (1971), Odonotremataceae. 3 (on *Musci*), Europe. See Döbbeler & Poelt (*Svensk bot. Tidskr.* 68: 369, 1974; key), Döbbeler (*Biodiv. Cons.* 6: 721, 1997).
- Bryoglossum** Redhead (1977), Hyaloscyphaceae. 2, Europe; N. America. See also *Mitrula*. See Redhead (*CJB* 55: 307, 1977), Knudsen & Hansen (*Nordic J Bot.* 16: 211, 1996), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006; phylogeny), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Bryogomphus** Lücking, W.R. Buck, Sérus. & L.I. Ferraro (2005), Pilocarpaceae (L). 1, Caribbean. See Lücking *et al.* (*Bryologist* 108: 483, 2005).
- Bryomyces** Döbbeler (1978), ? Pseudoperisporiaceae. 9 (on *Musci*), widespread. See Döbbeler (*Mitt. bot. StSamml. Münch.* 14: 233, 1978), Döbbeler (*Nova Hedwigia* 76: 1, 2003).
- Bryonectria** Döbbeler (1998), Bionectriaceae. 8 (on foliose liverworts and mosses), widespread. See Döbbeler (*Nova Hedwigia* 66: 334, 1998), Döbbeler (*Sendtnera* 6: 93, 1999; n. spp.), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Döbbeler (*Mycol.* 97: 924, 2005; ascospores).
- Bryonora** Poelt (1983), Lecanoraceae (L). 11, widespread. See Holtan-Hartwig (*Mycotaxon* 40: 295, 1991), Poelt & Obermayer (*Nova Hedwigia* 53: 1, 1991; key), Grube *et al.* (*MR* 108: 506, 2004; phylogeny).
- Bryonosema** E.U. Canninga, D. Refardt, C.R. Vossbrinck, B. Okamurad & A. Curry (2002), Microsporidia. 2. See Canninga *et al.* (*Eur. J. Protist.* 38: 247, 2002).
- Bryopelta** Döbbeler & Poelt (1978), Dothideomycetes. 1 (on *Hepaticae*), Norway; Sweden. See Döbbeler & Poelt (*Mitt. bot. StSamml. Münch.* 14: 126, 1978).
- Bryophagus** Nitschke ex Arnold (1862), Ostropales (L). 3, widespread. See Hawksworth *et al.* (*Lichenologist* 12: 18, 1980; nomencl.), Kantvilas (*Muelleria* 16: 65, 2002; Australian taxa), Kauff & Lutzoni (*Mol. Phylogen. Evol.* 25: 138, 2002; phylogeny), Lumbsch *et al.* (*Mol. Phylogen. Evol.* 31: 822, 2004; phylogeny).
- Bryophilous fungi**. Fungi growing on *Bryophyta*: muscicolous species on mosses, hepaticolous species on liverworts. A wide range of fungi are restricted to bryophytes (obligate bryophilous fungi). For example, *Synchytrium pyriforme* (*Chytridiomycetes*), *Eocronartium muscicola* and species of *Galerina* (*Strophariaceae*) grow on the gametophytes of mosses, *Epicoccum plagiochilae* (anamorphic *Ascomycota*) on those of hepatics. However, the most such fungi by far belong to the *Pezizomycotina* (c. 350 species in 90 genera). They represent an array of taxa of quite different systematic positions (e.g. *Dothideales*, *Hypocreales*, *Leotiales*, *Ostropales*, *Pezizales*), mode of nutrition, infection of host organs and host selection. Several genera are unknown elsewhere (e.g. *Bryodiscus*, *Bryonectria*, *Bryoscyphus*, *Hypobryon*, *Octospora*, *Octosporella*). In other cases mainly non-bryophilous genera contain obligate parasites of mosses and hepatics, for example *Acrosporum adeanum*, *Dactylospora heimerlii*, *Muellerella frullaniae*, *Nectria egeus*.
- The bryophilous habit has evoked surprising adaptations, e.g. the formation of tiny, frequently gelatinous ascomata which generally prefer those parts of a plant which prevent too rapid loss of moisture and allow at the same time effective spore discharge (leaf axils, border of the ventral leaf side, or perforation of the leaves or perianths in hepatics, interspaces of the photosynthetic leaf lamellae in *Polytrichales*). Some species are necrotrophic (*Belonioscypha hypnorum*, *Bryostroma necans*, *Lizonia emperigonia*, *Nectria muscivora*) with intracellular hyphae, causing necrotic lesions. Necrotic rings in moss cushions in polar regions can be conspicuous (Longton, *The Biology of Polar Bryophytes and Lichens*, pp. 101-104, 1988). Lesions in liverwort colonies are known, too (Hawksworth, *Fld Stud.* 4: 391, 1976).
- Most species represent biotrophic parasites which

do not cause severe damage to their hosts. Hyphae of these species grow over the cell walls or within or between them. Hyphal appendages like appressoria, haustoria or conidiogenous cells are most useful taxonomic characters. Endophytic VA mycorrhizal-like fungi regularly occur inside hepatics; most are sterile and part of a coevolved mutualism (Boullard, 1988; see mycothalli). *Octospora* infects the underground rhizoids of acrocarpic mosses with large appressoria and intracellular haustoria, sometimes causing conspicuous rhizoid galls. *Lizonia* is specific to antheridial cups of *Polytrichum* and related genera. Systematically different species colonizing the spaces between the leaf lamellae of *Polytrichales*, a phylogenetically ancient and stable microhabitat, offer striking examples of convergent evolution. Even heavy infections with hundreds of fruit-bodies in a single leaf of *Dawsonia superba* do not induce visible symptoms. Many species have a restricted host range and are specific to a certain host species or group of hosts. The presence of bryophilous fungi in colonies of mosses or hepatics seems to be a very frequent, universal phenomenon. Some hosts apparently never occur without their parasites. These fungi are generally totally neglected despite their number and frequency. *Vezdaea aestivalis* is $\pm$ lichenized but intimately associated also with moss leaves. Some lichens can overgrow and kill mosses (Faegri, *Lichenologist* 12: 248, 1980).

Lit.: Barrio *et al.* (*Boln. Soc. micol. Castellana* 9: 73, 1985; macromycetes, Spain), Benkert (*Z. Mykol.* 53: 195, 1987, 64: 17, 1998, parasitic *Pezizales*), Döbbeler (*Mitt. bot. StSamml., Münch.* 14: 1, 1978, pyrenocarps; *Nova Hedw.* 31: 817, 1980, parasitic *Pezizales*; *Mitt. bot. StSamml., Münch.* 17: 393, 1981, monogr., key 21 spp. on *Dawsonia*; *Arctic Alp. Mycol.* 2: 87, 1987, ascomycetes on *Polytrichastrum sexangulare*; *Nova Hedw.* 62: 61, 1996, *Potriphila navicularis* on *Polytrichastrum alpinum*; *Biodiversity and Conservation* 6: 721, 1997, review; *Nova Hedw.* 66: 325, 1998, ascomycetes on *Radula falccida*), Duckett *et al.* (*New Phytol.* 118: 233, 1991; ultrastr.), Felix (*Bot. Helv.* 98: 239, 1988; review), Kost (*Endocytobiosis & Cell Res.* 5: 287, 1988, bryophilous basidiomycetes), Poelt (*Sydowia* 38: 241, 1986; bryophilous lichens), Pocock & Duckett (*Bryol. Times* 31: 2, 1985; review), Racovitza (*Mém. Mus. natn Hist. Nat., Paris*, n.s. B, 10, 1959; monogr. including anamorphic fungi and sporophytes as substrata).

Bryophytomyces Cif. (1953), anamorphic *Hymenoscyphus*. 1, Europe; Russia. See Bauch (*Ber. dt. bot. Ges.* 56: 73, 1938), Redhead & Spicer (*Mycol.* 73: 940, 1981).

Bryopogon Link (1833) $\equiv$ *Alectoria* Ach.

Bryopogon Th. Fr. (1860) = *Bryoria* fide Brodo & Hawksworth (*Op. bot. Soc. bot. Lund* 42, 1977).

Bryorella Döbbeler (1978), Dothideomycetes. 10 (on *Musci*), widespread. See Döbbeler (*Mitt. bot. StSamml. Münch.* 14: 128, 1978), Döbbeler (*MR* 111: 1406, 2007).

Bryoria Brodo & D. Hawksw. (1977), Parmeliaceae (L). 51, widespread (esp. boreal and cool temperate). See Brodo & Hawksworth (*Op. bot. Soc. bot. Lund* 42, 1977; key 27 N. Am. spp.), Mattsson & Wedin (*Lichenologist* 31: 431, 1999; DNA), Wedin *et al.* (*MR* 103: 1152, 1999; phylogeny), Wang & Harada (*Nat. Hist. Res.* 6: 43, 2001; *B. asiatica* group),

Glavich (*Bryologist* 106: 588, 2003; ecology), Thell *et al.* (*Symb. bot. upsal.* 34 no. 1: 429, 2004; biogeography), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Wang *et al.* (*J. Hattori bot. Lab.* 100: 865, 2006; Himalayas).

Bryoscyphus Spooner (1984), Helotiaceae. 7 (on *Bryophyta, Cladonia*), widespread. See Verkley *et al.* (*Persoonia* 16: 383, 1997), Alstrup & Cole (*Bryologist* 10: 222, 1998).

Bryosphaeria Döbbeler (1978), Dothideomycetes. 9 (on *Musci*), Europe. See Döbbeler (*Mitt. bot. StSamml. Münch.* 14: 151, 1978).

Bryostigma Poelt & Döbbeler (1979) = *Arthonia* fide Coppins (*Lichenologist* 21: 195, 1989).

Bryostroma Döbbeler (1978), Dothideomycetes. 7 (on *Musci*), Europe. See Döbbeler (*Mitt. bot. StSamml. Münch.* 14: 170, 1978).

Bryothele Döbbeler (1998), Dothideomycetes. 1, Comoros. See Döbbeler (*Nova Hedwigia* 66: 337, 1998).

B-spore, see beta-spore. Cf. alpha spore.

Bubacia Velen. (1922) nom. nud., Thelephorales. See Donk (*Taxon* 6: 17, 1957).

Bubakia Arthur (1906) = *Phakopsora* fide Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983).

Bucholtzia Lohwag (1924) = *Russula* fide Singer & Smith (*Mem. Torrey bot. Club* 21, 1960; as *Macowanites*).

Buchwaldoboletus Pilát (1969), Boletaceae. 3, Europe; Australia. See Pilát (*Friesia* 9: 217, 1969), Basezzi & Bottaro (*Rivista di Micologia* 42: 155, 1999), Watling (*Edinb. J. Bot.* 61: 41, 2004).

buck-eye rot, a disease of tomato fruits (*Phytophthora nicotianae* var. *parasitica*).

buckle, see clamp-connexion.

budding, a process of multiplication in 1-celled fungi or in spores, in which there is a development of a new cell from a small outgrowth; cf. fission.

Buellia De Not. (1846) nom. cons., Caliciaceae ($\pm$ L). c. 453, widespread. See Sheard (*Lichenologist* 2: 225, 1964; UK), Schauer (*Mitt. bot. StSamml., München* 5: 609, 1965), Lamb (*Br. Antarct. Surv. Sci. Rep.* 61, 1968), Sheard (*Bryologist* 72: 220, 1969), Hafellner (*Beih. Nova Hedwigia* 62, 1979; gen. concept), Scheidegger & Ruef (*Nova Hedwigia* 47: 433, 1988; xanthone spp. Eur.), Scheidegger (*Bot. Chron.* 10: 211, 1991; distrib. Medit. spp.), Scheidegger (*Lichenologist* 25: 315, 1993; key 36 spp. on rock, Eur.), Nordin (*Symb. bot. upsal.* 31: 327, 1996; Nordic spp.), Kalb & Elix (*Mycotaxon* 68: 465, 1998; chemistry), Moberg *et al.* (*Taxon* 48: 143, 1999; nomencl.), Nordin (*Bryologist* 102: 249, 1999; N. Am.), Marbach (*Biblthca Mycol.* 74: 1, 2000; trop.), Grube & Arup (*Lichenologist* 33: 63, 2001; polyphyly), Trinkaus *et al.* (*Lichenologist* 33: 37, 2001; Australia), Molina *et al.* (*Lichenologist* 34: 509, 2002; phylogeny), Wedin *et al.* (*Taxon* 51: 655, 2002; phylogeny), Helms *et al.* (*Mycol.* 95: 1078, 2003; phylogeny), Bungartz & Nash (*Biblthca Lichenol.* 88: 49, 2004; N America), Bungartz *et al.* (*Bryologist* 107: 459, 2004; Mexico), Grube *et al.* (*Biblthca Lichenol.* 88: 163, 2004; Australia), Simon *et al.* (*J. Mol. Evol.* 60: 434, 2005; introns), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).

Buelliaaceae Zahlbr. (1907) = Caliciaceae.

Buelliastrum Zahlbr. (1930), Lecanorales (L). 2, China.

Buelliaella Fink (1935), Dothideomycetes. 8 (on li-

- chens), widespread. See Hafellner (*Beih. Nova Hedwigia* 62, 1979; key), Suija & Alstrup (*Lichenologist* 36: 203, 2004).
- Buellomyces** E.A. Thomas ex Cif. & Tomas. (1953) = *Diploicia*.
- Buellopsis** A. Schneid. (1897) = *Buellia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Buergenerula** Syd. (1936), Magnaporthaceae. Anamorphs *Passalora*-like, *Nakataea*-like. 3, Europe; N. America. See Barr (*Mycol.* 68: 611, 1976), McKenzie (*Mycotaxon* 42: 351, 1991), Kohlmeyer *et al.* (*Bot. Mar.* 40: 291, 1997).
- Buglossoporus** Kotl. & Pouzar (1966), Fomitopsidaceae. 10, widespread. See Corner (*Beih. Nova Hedwigia* 78: 1, 1984).
- Buglossus** Wahlenb. (1826) = *Fistulina* fide Stalpers (*in litt.*).
- bulbil**, a discrete, compact, multicellular, thalloidic propagule initiated in one of several ways but always homogeneous throughout development, with all cells acropetally produced and expanding more or less synchronously to many times (e.g. 4–10×) the diameter of the colourless, thin-walled hyphae from which they arise; pseudoparenchymatous at least at maturity, and lacking internal differentiation (found in certain basidiomycetes such as *Burgoa* and *Minimedusa*, distinguished from sclerotia; see Weresub & LeClair, *CJB* 49: 2203, 1971); lichenized in *Multiclavula vernalis* (Poelt & Obermayer, *Herzogia* 8: 289, 1990).
- bulbillate** (of a stipe), having a small or not clearly marked bulb at the base.
- Bulbillomyces** Jülich (1974), Meruliaceae. Anamorph *Aegerita*. 1, widespread (northern hemisphere). See Jülich (*Persoonia* 8: 69, 1974), Legon (*Mycologist* 20: 81, 2006).
- bulbillois**, the condition, in *Agaricales*, in which basidiome sporulation is suppressed and the basidial function taken on by bulbils, as in *Rhacophyllus* (Singer, 1962: 27).
- Bulbilopycnis** Matsush. (1996), anamorphic *Pezizomycotina*, Hsp.?.?. 1, Transvaal. See Matsushima (*Matsush. Mycol. Mem.* 9: 3, 1996).
- Bulbithecium** Udagawa & T. Muroi (1990), ? Bionectriaceae. Anamorph *Acremonium*-like. 1 (coprophilous), Peru. See Udagawa & Muroi (*Bull. natn. Sci. Mus. Tokyo*, B 16: 13, 1990), Suh & Blackwell (*Mycol.* 91: 836, 1999; phylogeny), Rossman *et al.* (*Mycol.* 93: 100, 2001; phylogeny).
- Bulbocatenospora** R.F. Castañeda & Iturr. (2000), anamorphic *Pezizomycotina*. 1, Venezuela. See Castañeda Ruiz *et al.* (*MR* 104: 107, 2000).
- Bulbomicrosphaera** A.Q. Wang (1987) = *Erysiphe* fide Braun & Takamatsu (*Schlechtendalia* 4: 3, 2000).
- Bulbomollisia** Graddon (1984) = *Mollisia* fide Graddon (*MR* 94: 231, 1990), Nauta & Spooner (*Mycologist* 13: 3, 1999).
- Bulbopodium** Earle (1909) = *Cortinarius* fide Singer (*Agaric. mod. Tax.* edn 3, 1975).
- Bulborrhizina** Kurok. (1994), Parmeliaceae (L). 1, Mozambique. See Kurokawa (*Acta Bot. Fenn.* 150: 105, 1994), Eriksson & Hawksworth (*SA* 13: 188, 1995).
- Bulbothamnidium** J. Klein (1870) = *Helicostylum* fide Upadhyay (*Mycol.* 65: 735, 1973).
- Bulbothricella**, see *Bulbotricella*.
- Bulbothrix** Hale (1974), Parmeliaceae (L). 45, widespread (esp. tropical). See Hale (*Smithson. Contr. bot.* 32, 1976; monogr.), Lumbsch (*Mycotaxon* 64: 225, 1997), Blanco *et al.* (*Mol. Phylogen. Evol.* 39: 52, 2006; phylogeny).
- Bulbotricella** V. Marciano, Mohali & A. Morales (1996) ? = *Bulbothrix*
Lit.: Lumbsch (*Mycotaxon* 64: 225, 1997).
- Bulbouncinula** R.Y. Zheng & G.Q. Chen (1979) = *Erysiphe* fide Braun & Takamatsu (*Schlechtendalia* 4: 3, 2000).
- bulbous** (1) bulb-like; (2) (of a stipe), having a swelling at the base (Fig. 4G).
- Bulgaria** Fr. (1822), Bulgariaceae. Anamorph *Endomelanconium*. 1, widespread (north & south temperate). *B. inquinans*, common saprobe on bark of hardwoods after felling, but sometimes parasitic. See Fenwick (*Mycologist* 6: 177, 1992; culture), Verkley (*The Ascus Apical Apparatus in Leotiales An Evaluation of Ultrastructural Characters as Phylogenetic Markers in the Families Sclerotiniaceae, Leotiaceae and Geoglossaceae*: 209 pp., 1995; ultrastr.), Döring & Triebel (*Cryptog. Bryol.-Lichénol.* 19: 123, 1998; phylogeny), Gernandt *et al.* (*Mycol.* 93: 915, 2001; phylogeny), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006; phylogeny), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Bulgariaceae** Fr. (1849), Leotiales. 4 gen. (+ 10 syn.), 7 spp.
Lit.: Gamundí & Arambarri (*Revta Fac. Agron. Univ. nat. La Plata* 59: 17, 1983), Fenwick (*Mycologist* 6: 177, 1992), Triebel & Rambold (*Arnoldia* 4: 15, 1992), Döring & Triebel (*Cryptog. Bryol.-Lichénol.* 19: 123, 1998), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006).
- Bulgariastrum** Syd. & P. Syd. (1913) ? = *Dermea* fide Korf in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 249, 1973).
- Bulgariella** P. Karst. (1885), Helotiaceae. 4, Europe; S. America. See Gamundí (*Sydowia* 34: 89, 1981), Gamundí & Romero (*Fl. criptog. Tierra del Fuego* 10: 130 pp., 1998; Argentina).
- Bulgariopsis** Henn. (1902), Helotiaceae. 1 or 2, Brazil.
- Bulla** Battarra ex Earle (1909) = *Agrocybe* fide Singer (*Agaric. mod. Tax.* edn 3, 1975).
- Bullardia** Jungh. (1830) [non *Bulliarda* DC. 1801, *Crassulaceae*] nom. rej. = *Melanogaster* fide Stalpers (*in litt.*).
- Bullaria** DC. (1805) = *Puccinia* fide Arthur (*Manual Rusts US & Canada*, 1934).
- Bullaserpens** Bat., J.L. Bezerra & Cavalc. (1965), anamorphic *Pezizomycotina*, Cpt.0fH.?. 1, Brazil. See Batista *et al.* (*Atas Inst. Micol. Univ. Pernambuco* 2: 292, 1965).
- bullate** (1) having bubble-like or blister-like swellings; (2) (of a pileus), having a rounded projection at the centre (Fig. 19K).
- Bullatina** Vězda & Poelt (1987), Gomphillaceae (L). 1, widespread (tropical). See Vězda & Poelt (*Folia geobot. phytotax.* 22: 186, 1987), Brusse (*Bothalia* 22: 44, 1992; Transkei), Lücking *et al.* (*Lichenologist* 37: 123, 2005; phylogeny).
- Buller** (Arthur Henry Reginald; 1874–1944; England, later Canada). Professor of Botany, Manitoba University (1904–1936). A most versatile mycologist, noted for his research on spore discharge and sexuality in basidiomycetes, particularly rusts; also famous for his limerick poems, and an expert billiards player. His library is at the Research Station, Agriculture

- Canada, Winnipeg (Dowding, *Mycol.* **50**: 794, 1958; Oliver, *Catalogue of the Buller Memorial Library*, 1965). *Publs.* see Literature. *Biogs, obits etc.* Ainsworth (*Mycologist* **2**: 83, 1988) [portrait]; Bisby (*Nature* **154**: 173, 1944); Brodie & Lowe (*Science* **100**: 305, 1944); Brooks (*Obituary Notices of Fellows of the Royal Society* **5**: 51, 1945) [portrait]; Stafleu & Cowan (*TL-2* **1**: 401, 1976); Stafleu & Mennega (*TL-2, Suppl.* **3**: 217, 1995).
- Buller phenomenon.** The dikaryotization, in basidiomycetes and ascomycetes, of a homokaryon by a dikaryon (Quintanilha's (1933) term for Buller's discovery; see Buller, 1941); 'di-mon' matings (Papazian, *Bot. Gaz.* **112**: 143, 1950).
- Bullera** Derx (1930), anamorphic *Tremellaceae*. c. 35, widespread. See Ingold & Young (*TBMS* **76**: 165, 1981; spore discharge), Weijman & Rodrigues de Miranda (*Antonie van Leeuwenhoek* **49**: 559, 1983; cell wall composition), Suh *et al.* (*Microbiol. Reading* **141**: 901, 1995), Suh *et al.* (*J. gen. appl. Microbiol. Tokyo* **42**: 501, 1996; mol. phylogeny), Golubev & Nakasa (*FEMS Microbiol. Lett.* **146**: 59, 1997; mycocins), Barnett *et al.* (*Yeasts: Characteristics and Identification* 3rd edn, 2000), Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* **50**: 1351, 2000; mol. phylogeny), Nakase *et al.* (*Journal of General and Applied Microbiology, Tokyo* **48**: 345, 2002; Taiwan n.sp.), Luong *et al.* (*Journal of General and Applied Microbiology, Tokyo* **51**: 335, 2005; Vietnam n.sp.), Fungsin *et al.* (*Journal of General and Applied Microbiology, Tokyo* **52**: 73, 2006; Thailand n.sp.).
- Bulleribasidium** J.P. Samp., M. Weiss & R. Bauer (2002), *Tremellaceae*. Anamorph *Bullera*. 1, Germany. See Sampaio *et al.* (*Mycol.* **94**: 874, 2002), Sampaio (*Frontiers in Basidiomycete Mycology*: 49, 2004).
- Bulleromyces** Boekhout & A. Fonseca (1991), *Tremellaceae*. Anamorph *Bullera*. 1, widespread (north temperate). See Boekhout & Fonseca (*Antonie van Leeuwenhoek* **59**: 91, 1991), Sampaio (*Frontiers in Basidiomycete Mycology*: 49, 2004).
- Buller's drop.** A drop of liquid on the hilar appendix of a ballistospore (q.v.) developed immediately before discharge, studied by Buller (*Researches* **2-6**, 1922-34); the drop contains mannitol and hexoses in concentrations enabling water to be taken in from a saturated atmosphere; prior to discharge the Buller's drop expands until it is large enough to come into contact with spore surface; at this point the drop redistributes itself over the spore surface, causing a sudden change in the centre of gravity of the spore sufficient to break the weak apiculus-sterigma connexion linking the spore to the basidium and resulting in discharge (Webster *et al.*, *MR* **99**: 833, 1995). Acceleration has been estimated at 25,000 g (Money, *Mycol.* **90**: 547, 1998). An educational video-film on this topic is commercially available (Webster, *Ballistospore discharge in basidiomycetes*, IWF Wissen und Medien, Göttingen, 1998).
- Bulliard** (Jean Baptiste François 'Pierre'; 1752-1793; France). Studied at Clairvaux (up to c. 1774); lived in Paris (c. 1775 onwards). An eminent naturalist; his main mycological work contains excellent early coloured illustrations of fungi; at a time when 'spontaneous generation' was the accepted explanation, he suggested that a fungus caused cereal smut through spore dispersal [a view also expressed, curiously almost simultaneously, in 1794, by the English artist, poet and mystic, William Blake, through his remarkable illustration 'Mildew Blighting the Ears of Corn']. *Publs.* *Histoire des champignons de la France* (1791-1792) [index: Petersen, *Mycotaxon* **6**: 127, 1977]. *Biogs, obits etc.* Gilbert (*BSMF* **68**: 1, 1952, bibliography, list of biographies, portrait); Gilbert (*Mycopathologia et Mycologia Applicata* **6**: 237, 1952). Grumann (1974: 269); Stafleu & Cowan (*TL-2* **1**: 402, 1976).
- Bulliardella** (Sacc.) Paoli (1905) = *Actidium* fide Lohman (*Pap. Mich. Acad. Sci.* **23**: 155, 1938).
- Bulliardia**, see *Bullardia*.
- Bulliardia** Lázaro Ibiza (1916) [non *Bulliarda* DC. 1801, *Crassulaceae*] = *Cerrena* fide Donk (*Verh. K. ned. Akad. Wet.* tweede sect. **62**: 1, 1974).
- Bunodea** A. Massal. (1855) = *Pyrenula* Ach. (1809) fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Bunodophoron** A. Massal. (1861), *Sphaerophoraceae* (L). **20**, widespread (esp. south temperate). See Wedin (*Pl. Syst. Evol.* **187**: 213, 1993), Wedin (*Symb. Bot. Upsal.* **31** no. 1, 1995; key, monograph), Wedin (*Mycotaxon* **53**: 33, 1995), Wedin *et al.* (*Pl. Syst. Evol.* **209**: 75, 1998; phylogeny), Döring & Wedin (*Pl. Biol.* **2**: 361, 2000; anatomy), Wedin *et al.* (*Lichenologist* **32**: 171, 2000; phylogeny), Peršoh *et al.* (*Mycol. Progr.* **3**: 103, 2004; asci).
- bunt**, a wheat disease (*Tilletia caries* and *T. laevis*, syn. *T. foetida*); stinking smut; **dwarf**-, *T. controversa*. See also *Ustilaginales*.
- Burcardia** Schmidel (1797) [non *Burchardia* Schreb. 1789, *Liliaceae*] = *Sarcosoma*.
- Burenella** Jouvenaz & E.I. Hazard (1978), *Microsporidia*. 1.
- Buerenia** M.S. Reddy & C.L. Kramer (1975), *Protomycetaceae*. 3 (on *Umbelliferae*), widespread. See Döbbeler (*Nova Hedwigia* **60**: 171, 1995).
- Burgella** Diederich & Lawrey (2007), *Cantharellales*. 1. See Diederich & Lawrey (*Mycol. Progr.* **6**: 61, 2007; phylogeny).
- Burgoa** Goid. (1938), anamorphic *Sistotrema*. 4 (propagules bulbils), widespread. See Weresub & LeClair (*CJB* **49**: 2203, 1971).
- Burgundy mixture**, made as Bordeaux mixture (q.v.) but with sodium carbonate (Na_2CO_3) in place of lime (copper sulphate 1.8 kg, sodium carbonate 2.3 kg, water 227 l).
- Burkea** Sprague (1977), *Microsporidia*. 1.
- Burnett** (John Harrison; 1922-2007; Scotland, later England). Student (1940-1942, 1945-1947) then lecturer (1947-1954), Oxford University; Professor of Botany, St Andrews University (1955-1960); Professor of Botany, University of Newcastle-upon-Tyne (1960-1968); Regius Professor, Glasgow University (1968-1970); Sibthorpe Professor of Rural Economy, Oxford University (1970-1979); Principal and Vice-Chancellor, Edinburgh University (1979-1987). Noted for his work on fungal biology and, in particular, genetics; also a champion of biodiversity conservation, believing strongly that without fungi the rest of the biosphere could not survive; as a commando under Fitzroy Maclean during World War II, his contact with guerilla leader and later president of Yugoslavia, Josep Brod (Tito) was catalytic in establishing postwar national parks in the country; after retirement, he strongly embraced the new digital technology, and well understood its importance for biodiversity conservation; founder and chairman of the Inter-

- national Organization for Plant Information, and secretary of the World Council for the Biosphere (1987-1993); chairman of the UK National Biodiversity Network. Work. *Publs. Fundamentals of Mycology* (1968); *Mycogenetics* (1975); *Fungal Populations and Species* (2003). *Biogs, obits etc.* Anon. (John Harrison Burnett, obituary. *Times* London, 17 August 2007).
- Burrillia** Setch. (1891), Doassansiaceae. 4 (on aquatic plants), N. C. & S. America; Asia. See Thirumalachar (*Mycol.* 34: 602, 1947), Vánky (*Sydowia* 34: 167, 1981).
- bursiculate**, bag-like.
- bursiform**, bag-like.
- Burt** (Edward Angus; 1859-1939; USA). Born into a poor farming family; student, Harvard University (1891-1895); Professor of Natural History, Middlebury College, Vermont (1895-1913); Librarian and Mycologist, Missouri Botanic Garden, and Professor of Botany, Washington University, St Louis (1913-1933). Noted for his work on the *Thelephoraceae*; also, incidentally, a shrewd stock-market investor. *Publs.* The *Thelephoraceae* of North America. I-XV. *Annals of the Missouri Botanical Garden* (1914-1926). *Biogs, obits etc.* Dodge (*Occasional Papers of the Farlow Herbarium of Cryptogamic Botany* 14 1, 1979); Lloyd (*Mycological Notes by G.C. Lloyd* 47: 653, 1917) [portrait].
- Buscalionia** Sambo (1940), ? Trypetheliaceae (L). 1, Brazil.
- Busseëlla** Henn. (1902) = *Cephaleuros* fide Höhnelt (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt. 1* 120: 411, 1911).
- Butler** (Edwin John; 1874-1943, Ireland). Imperial Mycologist, India (1900-1919); founding Director of the Imperial Mycological Institute, Kew (1920-1935). *Publs.* the genus *Pythium*. *Memoirs of the Department of Agriculture in India Botanical Series* 5, 1 (1907); *Fungi and Disease in Plants* (1918); (with H. Sydow & P. Sydow) *Fungi Indiae orientalis Annales Mycologici* 16 (1906); (with Jones) *Plant Pathology* (1950). *Biogs, obits etc.* Güssow (*Phytopathology* 34: 149, 1944) [portrait]; Johnston (*Review of Tropical Plant Pathology* 7: 1, 1993); Kulkarni (*Plant Pathology Newsletter* 1: 5, 1983); Mason (*Obituary Notices of Fellows of the Royal Society* 4: 455, 1943) [bibliography, portrait]; Stafleu & Mennega (*TL-2, Suppl.* 3: 285, 1995).
- Butlerelfia** Weresub & Illman (1980), Atheliaceae. 1, Canada; Europe. See Weresub & Illman (*CJB* 58: 144, 1980).
- Butleria** Sacc. (1914), Elsinoaceae. 1, India. See Petrak & Sydow (*Annls mycol.* 27: 87, 1929).
- button**, a young mushroom (esp. *Agaricus bisporus*) before the pileus has expanded.
- Buxetroidia** K.R.L. Petersen & Jørg. Koch (1997), Halosphaeriaceae. 1 (marine), Denmark. See Petersen & Koch (*MR* 101: 1524, 1997), Pang *et al.* (*Nova Hedwigia* 77: 1, 2003; phylogeny).
- Buxtehudea** J.I.R. Larsson (1980), Microsporidia. 1.
- Byliana** Dippen. (1930) = *Palawaniella* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Byrrha** Bat., F. Monnier & J.S. Silveira (1959) = *Pichia* fide Batra in Subramanian (Ed.) (*Taxonomy of fungi* 1: 187, 1978).
- Byrsalis** Neck. ex Kremp. (1869) = *Peltigera* fide Santesson (*Taxon* 3: 236, 1954).
- Byrsomyces** Cavalc. (1972) = *Microtheliopsis* fide Lücking *et al.* (*Lichenologist* 30: 121, 1998).
- Byssiplacea** A. Massal. (1860) = *Lecanora* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- byssiscede**, see byssoid.
- Byssithecra** Bonord. (1864) = *Rosellinia*.
- Byssosascus** Arx (1971), Myxotrichaceae. Anamorph *Oidiodendron*. 1, Canada. See von Arx (*Persoonia* 6: 377, 1971), Sugiyama *et al.* (*Mycoscience* 40: 251, 1999; phylogeny), Usuki *et al.* (*Mycoscience* 44: 97, 2003; mycorrhizas), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Byssocallis** Syd. (1927), Tubeufiaceae. 2 (on *Meliola*), Costa Rica; S. Africa. See Rossman (*Mycotaxon* 8: 485, 1979), Rossman (*Mycol. Pap.* 157, 1987; key), Kodsueb *et al.* (*Fungal Diversity* 21: 105, 2006; phylogeny).
- Byssocaulon** Mont. (1835), Chrysothricaceae (L). 6, widespread (tropical). See Rogers (*Flora of Australia* 54: 65, 1992; Australia).
- Byssochlamys** Westling (1909), Trichocomaceae. Anamorph *Paecilomyces*-like. 4, widespread. *B. fulva* may damage tinned fruits. See Stolk & Samson (*Persoonia* 6: 341, 1971), Subramanian & Rajendran (*Kavaka* 5: 83, 1978; ontogeny), Domenech *et al.* (*Microbiology Reading* 145: 2789, 1999; chemistry, immunology), Samson *et al.* (*Introduction to Food and Airborne Fungi*: 1, 2002; identification), Luangsa-ard *et al.* (*Mycol.* 96: 773, 2004; phylogeny), Luangsa-ard *et al.* (*Kasetsart Journal Natural Sciences* 38: 94, 2004; Thailand), Houbraken *et al.* (*Advances in Experimental Medicine and Biology* 571: 211, 2006; toxins).
- Byssocladia** Gaillon (1833) = *Byssocladium*.
- Byssocladium** Link (1815) nom. dub., anamorphic *Pezizomycotina*. See Donk (*Taxon* 11: 81, 1962).
- Byssocorticaceae** Jülich (1982) = *Atheliaceae*.
- Byssocorticium** Bondartsev & Singer (1944), Atheliaceae. 9 (mycorrhizal), widespread. See Jülich (*Willdenowia* Beih. 7, 1972), Mervielde (*AMK Mededelingen*: 45, 2003).
- Byssocristella** M.P. Christ. & J.E.B. Larsen (1970) = *Tomentellopsis* fide Hjortstam (*Svensk bot. Tidskr.* 68: 51, 1974).
- Byssocystis** Riess (1853) = *Ampelomyces* fide Rogers (*Mycol.* 51: 96, 1959).
- Byssogene** Syd. (1922), ? Dothideales. 1, Indonesia.
- byssoid**, cotton-like; made up of delicate threads; floccose. - **lichens**, see Egea *et al.* (*Lichenologist* 27: 351, 1995; in *Arthoniales*), Hafellner & Vězda (*Nova Hedw.* 55: 183, 1992; key 17 gen. thalli).
- Byssolecania** Vain. (1921), Pilocarpaceae (L). 9, widespread. See Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952), Santesson (*SA* 10: 137, 1991).
- Byssoloma** Trevis. (1853), Pilocarpaceae (L). Anamorph *Pyriomyces*. 55, widespread. See Vězda (*Folia geobot. phytotax.* 22: 71, 1987; key 10 Afr. spp.), Kalb & Vězda (*Nova Hedwigia* 51: 435, 1990; key 11 spp. neotropics), Elix *et al.* (*Bibliotheca Lichenol.* 58: 81, 1995; chemistry), Sérusiaux (*Cryptog. Bryol.-Lichénol.* 19: 197, 1998; Europe), Holien (*Graphis Scripta* 11: 61, 2000; Scandinavia).
- Byssolomataceae** Zahlbr. (1926) = *Pilocarpaceae*.
- Byssolophis** Clem. (1931), Lophiostomataceae. 1, widespread. See Holm (*Windahlia* 16: 49, 1986), Barr (*Mycotaxon* 45: 191, 1992; posn).
- Byssomerulius** Parmasto (1967), Phanerochaetaceae. 8, widespread. See Parmasto (*Consp. System. Corticiac.*, 1968), Zmitrovich (*Mikol. Fitopatol.* 35: 9,

- 2001).
- Byssonectria** P. Karst. (1881), Pyronemataceae. 10, widespread. See Dennis & Itzerott (*Kew Bull.* 28: 5, 1973), Benkert (*Gleditschia* 15: 173, 1987; status), Caillet & Moyne (*Bull. Soc. Hist. nat. Doubs* 84: 9, 1991; key), Sivertsen (*SA* 9: 23, 1991; nomencl.), Pfister (*Mycol.* 85: 952, 1994; development, key 4 spp. N. Am.), Pfister (*Mycotaxon* 53: 431, 1995), Yao & Spooner (*MR* 100: 881, 1996; Brit. spp.), Landvik *et al.* (*Nordic Jl Bot.* 17: 403, 1997; DNA), Kullman (*Mycotaxon* 69: 199, 1998; sibling spp.), Harrington *et al.* (*Mycol.* 91: 41, 1999; phylogeny), Hansen *et al.* (*Mol. Phylogen. Evol.* 36: 1, 2005), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Byssonygena** Guarro, Punsola & Cano (1987), Onygenaceae. Anamorph *Malbranchea*. 1, Spain. See Guarro *et al.* (*Mycopathologia* 100: 159, 1987).
- Byssopeltis** Bat., J.L. Bezerra & T.T. Barros (1970), Microthyriaceae. 1, Brazil. See Batista *et al.* (*Publções Inst. Micol. Recife* 636: 5, 1969).
- Byssophoropsis** (Vain.) Tehler (1993) = *Sagenidiopsis* fide Egea *et al.* (*Flechten Follmann Contributions to Lichenology in Honour of Gerhard Follmann*: 183, 1995).
- Byssophragma** M. Choisy (1931) = *Megalospora* Meyen fide Sipman (*Biblthca Lichenol.* 18, 1983).
- Byssophytum** Mont. (1848), *Pezizomycotina* (L (sterile)). 2, Java; Tahiti. See Groenhart (*Nederl. Kruid. Arch.* 46: 774, 1936).
- Byssoporia** M.J. Larsen & Zak (1978), Atheliaceae. 1 (mycorrhizal), widespread. See Larsen & Zak (*CJB* 56: 1123, 1978).
- Byssopsora** A. Massal. (1861) = *Bacidia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Byssosphaeria** Cooke (1879), Melanommataceae. Anamorph *Pyrenochaeta*. c. 12, widespread. See Barr (*Mycotaxon* 20: 1, 1984; key), Hyde *et al.* (*MR* 103: 1423, 1999), Chen & Hsieh (*Sydowia* 56: 24, 2004; Taiwan).
- Byssostilbe** Petch (1912) = *Berkelella* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Byssotheciella** Petr. (1923), *Pezizomycotina*. 1 or 2, Europe; S. America.
- Byssothecium** Fuckel (1861), Dacampiaceae. Anamorph *Chaetophoma*-like. 5, widespread (temperate). See Boise (*Mycol.* 75: 666, 1983), Semeniuk (*Mycol.* 75: 744, 1983; on alfalfa), Crane *et al.* (*Mycol.* 84: 235, 1992), Lumbsch & Lindemuth (*MR* 105: 901, 2001; phylogeny), Kruys *et al.* (*MR* 110: 527, 2006; phylogeny), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Byssus** L. (1753) nom. rej. prop. $\equiv$ *Trentepohlia* Formerly used for some filamentous lichenized and other fungus mycelia.
- C** (1) see Metabolic products. (2) Botanical Museum and Herbarium (Copenhagen, Denmark); founded 1759; part of the University of Copenhagen.
- Cabalodontia** Piątek (2004), Meruliaceae. 5. See Piątek (*Polish Botanical Journal* 49: 2, 2004).
- CABI**, the trading name of CAB INTERNATIONAL (formerly Commonwealth Agricultural Bureaux; founded 1929), an intergovernmental organization established by treaty lodged with the UN, and of which IMI (q.v.) was an Institute; see Scrivenor (*CAB – the first 50 years*, 1980).
- Cacahualia** Mercado & R.F. Castañeda (1984) = *Arachnophora* fide Sutton (*in litt.*), Castañeda Ruíz *et al.* (*Nova Hedwigia* 64: 473, 1997).
- Caccobius** Kimbr. (1967), Thelebolaceae. 1 (coprophilous), widespread (north temperate). See Landvik *et al.* (*Mycoscience* 39: 49, 1998; DNA), van Brummelen (*Persoonia* 16: 425, 1998; ultrastr.).
- Cacosphaeria** Speg. (1888) = *Kacosphaeria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Cacumisporium** Preuss (1851), anamorphic *Pezizomycotina*, Hso. $\equiv$ eP.19. 9, Europe; N. America. See Goos (*Mycol.* 61: 52, 1969), Sutton (*Mycol. Pap.* 132, 1973), Kirk (*Mycotaxon* 43: 231, 1992), Hyde & Goh (*MR* 102: 739, 1998), Réblová & Gams (*Czech Mycol.* 51: 1, 1999; teleomorph), Réblová (*Stud. Mycol.* 45: 149, 2000; review), Tsui *et al.* (*Mycol.* 93: 389, 2001; Hong Kong).
- cadavericole**, an organism living on corpses.
- Cadophora** Lagerb. & Melin (1927), anamorphic *Helotiales*. 10, widespread. See Conant (*Mycol.* 29: 597, 1937), Harrington & McNew (*Mycotaxon* 87: 141, 2003; phylogeny), Bills (*Mem. N. Y. bot. Gdn* 89: 113, 2004).
- caducous** (of spores, etc.), falling off readily, deciduous.
- Cadyexinis** Stach (1957), Fossil Fungi. 3 (Miocene, Carboniferous), Taiwan; Germany.
- Caecomycetes** J.J. Gold (1988), Neocallimastigaceae. 2, British Isles; Canada. See Wubah *et al.* (*Mycol.* 83: 303, 1991; morphology), Gleason *et al.* (*Australasian Mycologist* 21: 94, 2002; rhizoid morphology).
- Caenomyces** E.W. Berry (1916), Fossil Fungi (mycel.) ? Fungi. 7 (Tertiary), Brazil; USA.
- Caenothyrium** Theiss. & Syd. (1918) ? = *Actinopeltis* fide Spooner & Kirk (*MR* 94: 223, 1990).
- Caema** Link (1809), anamorphic *Pucciniales*. c. 200, widespread. Anamorph name for aecial anamorphs (I) without bounding structures. See Sato & Sato (*TBMS* 85: 223, 1985; wider circumscription incl. bounded sori), Crane *et al.* (*Mycoscience* 46: 143, 2005; Japan n.sp., rhododendron rust).
- caeoma** (pl. **caeomata**), an aecium as in *Caema*, i.e. without peridial cells and with or without paraphyses.
- caeomatoid** (of aecia), resembling caeomata; sometimes, incorrectly, 'caeomoid'.
- Caemurus**, see *Coeomurus*.
- Caeruleomyces** Stalpers (2000), anamorphic *Hymenochaetales*. 1. See Stalpers (*Karstenia* 40: 177, 2000).
- Caerulicium** Jülich (1982) = *Byssocorticium* fide Stalpers (*in litt.*).
- Caesar's mushroom**, basidioma of the edible *Amanita caesarea*.
- caespitose** (cespitate), in groups or tufts like grass; cf. gregarious.
- Caespitotheca** S. Takam. & U. Braun (2005), Erysiphaceae. 1. See Takamatsu *et al.* (*MR* 109: 907, 2005).
- caespitulus** (pl. **caespituli**), a tuft of spores.
- Caesposus** Nüesch (1937) = *Lyophyllum* fide Kuyper (*in litt.*), Cooke (*Spec. Publ. Div. Myc. Dis. Surv. US Department of Agriculture* 3, 1953; typification).
- Cainea** S. Hughes (1951) nom. nud. = *Apiosordaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Cainia** Arx & E. Müll. (1955), Cainiaceae. 3 (from grasses), widespread (temperate). See Parguey-Leduc (*Revue Mycol. Paris* 28: 200, 1963; asci, affinities), Krug (*Sydowia* 30: 122, 1978), Kang *et al.* (*MR* 103: 1621, 1999), Jeewon *et al.* (*MR* 107: 1392, 2003;

- phylogeny).
- Cainiaceae** J.C. Krug (1978), Xylariales. 2 gen., 4 spp.
Lit.: Müller & Corbaz (*Sydowia* 10: 181, 1956), Krug (*Sydowia* 30: 122, 1978), Kohlmeyer & Volkmann-Kohlmeyer (*SA* 12: 7, 1993), Kang *et al.* (*MR* 103: 1621, 1999), Lumbsch *et al.* (*Mycol. Progr.* 1: 57, 2002).
- Cainiella** E. Müll. (1957), Hyponectriaceae. 2 (saprobic in dead leaves), Canada; Europe. See Müller (*Sydowia* 10: 118, 1957).
- Cainomyces** Thaxt. (1901), ? Laboulbeniales. 1.
- Calathaspis** I.M. Lamb & W.A. Weber (1972), Cladoniaceae (L.). 1, Papua New Guinea. See Stenroos (*Ann. bot. fenn.* 25: 207, 1988; Melanesia), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998; DNA), Stenroos *et al.* (*Mycol. Progr.* 1: 267, 2002; phylogeny).
- Calathella** D.A. Reid (1964), Marasmiaceae. 9, Europe; N. America. A new name to replace the illegitimate homonym has not been introduced. See Reid (*Persoonia* 3: 93, 1964), Singer (*Agar. mod. Tax.* 4th ed.: 387, 1986; syn. on *Flagelloscypha*), Bodensteiner *et al.* (*Mycol.* 93: 1010, 2001; Bali).
- Calathinus** Qué. (1886) [non *Calathinus* Rafin. 1836, *Amaryllidaceae*] = *Crepidotus* fide Kuyper (*in litt.*) Typification is ambiguous, synonymy with *Pleurocybella* has been proposed.
- Calathiscus** Mont. (1841) ? = *Lysurus* fide Dring (*Kew Bull.* 35: 1, 1980).
- Calbovista** Morse (1935) = *Calbovista* Morse ex M.T. Seidl.
- Calbovista** Morse ex M.T. Seidl (1995), Agaricaceae. 1, USA. See Seidl (*Mycotaxon* 54: 389, 1995).
- calcarate**, having a projection or spur.
- calcareous**, containing lime.
- Calcarispora** Marvanová & Marvan (1963), anamorphic *Pezizomycotina*, Hso.0fH.1. 1 (aquatic), Europe; Canada. See Marvanová & Marvan (*Čas. Slez. Mus. Ser. A, Hist. Nat.* 12: 109, 1963), Marvanová & Bärlocher (*Czech Mycol.* 53: 1, 2001; culture).
- Calcarisporiella** de Hoog (1974), anamorphic *Pezizomycotina*, Hso.0eH.10. 1, British Isles. See de Hoog (*Stud. Mycol.* 7: 68, 1974).
- Calcarisporium** Preuss (1851), anamorphic *Hypocreales*, Hso.0eH.10. 2 (on agarics, etc.), Europe. See Barnett (*Mycol.* 50: 497, 1958), Barnett & Lilly (*Bull. W. Va Exp. Stn* 420T, 1958), Nicot (*BSMF* 84: 85, 1968), Rombach & Roberts (*Mycol.* 79: 153, 1987; symbiosis with *Hirsutella*), Kendrick (*CJB* 81: 75, 2003; morphogenesis), Hausner & Reid (*CJB* 82: 752, 2004; phylogeny), Somrithipol & Jones (*Sydowia* 58: 133, 2006; Thailand).
- calceiform**, shoe-like in form.
- Calceispora** Matsush. (1975), anamorphic *Pezizomycotina*, Hso.0eH.15. 2, Japan; Malawi. See Sutton (*Mycol. Pap.* 167: 11, 1993).
- calceolate**, see calceiform.
- Calceomyces** Udagawa & S. Ueda (1988), Xylariaceae. Anamorph *Nodulisporium*. 1, Japan. See Udagawa & Ueda (*Mycotaxon* 32: 448, 1988).
- calcicolous**, an organism (calicicole) growing on substrates rich in calcium; esp. of spp. on limestone or chalky rocks or soils.
- Caldariomyces** Woron. (1926), anamorphic *Pezizomycotina*. See Hughes (*Mycol.* 68: 693, 1976), Reynolds & Faull (*Taxon* 50: 1183, 2001; conservation proposal), Gams (*Taxon* 54: 520, 2005; conservation rejected).
- Caldesia** Rehm (1889) = *Holmiella*.
- Caldesia** Trevis. (1869) [non *Caldesia* Parl. 1860, *Alismataceae*] = *Arthonia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Caldesiella** Sacc. (1877) nom. rej. = *Tomentella* Pat. fide Larsen (*Taxon* 16: 510, 1967) See also, Nikolaeva (*Mikol. Fitopatol.* 2: 198, 1968).
- Calenia** Müll. Arg. (1890), Gomphillaceae (L.). 41, widespread (tropical). See Santesson (*Symb. bot. ups. 12* no. 1: 1, 1952), Vězda & Poelt (*Folia geobot. phytotax.* 22: 179, 1987), Hartmann (*Mycotaxon* 59: 483, 1996), Lücking (*Biblthca Lichenol.* 65: 1, 1997), Lücking *et al.* (*Trop. Bryol.* 19: 55, 2000), Ferraro (*Fungal Diversity* 15: 153, 2004; hypophores), Lücking *et al.* (*Mycol.* 96: 283, 2004; phylogeny), Lücking *et al.* (*Lichenologist* 37: 123, 2005; morphology, cladistics), Papong *et al.* (*Nova Hedwigia* 86: 201, 2008).
- Caleniomyces** Cif. & Tomas. (1953) = *Caleniopsis*.
- Caleniopsis** Vězda & Poelt (1987), Gomphillaceae (L.). 2, widespread (tropical). See Vězda & Poelt (*Folia geobot. phytotax.* 22: 187, 1987), Lücking *et al.* (*Lichenologist* 37: 123, 2005; phylogeny), Papong *et al.* (*Nova Hedwigia* 86: 201, 2008).
- Caleutypa** Petr. (1934), Pezizomycotina. 1, Europe.
- Caliciaceae** Chevall. (1826), Teloschistales ($\pm$ L.). 31 gen. (+ 46 syn.), 731 spp.
Lit.: Tibell (*Nova Hedwigia Beih.* 79: 597, 1984), Tibell (*Symb. bot. ups. 27* no. 1: 279 pp., 1987), McCune & Rosentreter (*Bryologist* 95: 329, 1992), Tibell & Kalb (*Nova Hedwigia* 55: 11, 1992), Tibell (*Symb. bot. ups. 32* no. 1: 291, 1997), Wedin & Tibell (*CJB* 75: 1236, 1997; phylogeny), Tibell (*Biblthca Lichenol.* 71, 1998; S Am. spp. s.l.), Tibell (*Biblthca Lichenol.* 71: 107 pp., 1998), Hladun (*Clementeana* 4: 48, 1999; key to *Caliciales*), Sarrión *et al.* (*Mycotaxon* 71: 169, 1999), Tibell (*Nordic Lichen Flora* 1. Introductory Parts; Calicioid Lichens and Fungi: 20, 1999), Tibell (*Nordic Lichen Flora* 1. Introductory Parts; Calicioid Lichens and Fungi 1, 1999; Nordic spp. s.l.), Wedin *et al.* (*CJB* 78: 246, 2000; rels with *Physciaceae*), Helms *et al.* (*Mycol.* 95: 1078, 2003; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Caliciales** Bessey (1907) = Teloschistales.
- Calicidium**, see *Calycidium*.
- Caliciella** Vain. (1927) = *Calicium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Caliciomyces** E.A. Thomas ex Cif. & Tomas. (1953) = *Calicium*.
- Caliciopsis** Peck (1880), Coryneliaceae. 28 (on conifers), widespread. See Benny *et al.* (*Bot. Gaz.* 146: 437, 1985; key), Marmolejo (*Mycotaxon* 72: 195, 1999), Rikkinen (*Karstenia* 40: 147, 2000; China), Winka & Eriksson (*Phylogenetic Relationships Within the Ascomycota Based on 18S rDNA Sequences* Akademisk Avhandling [Thesis (PhD), Department of Ecology and Environmental Science, Umeå University]: [17] pp., 2000; phylogeny), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny).
- Calicium** Pers. (1794), Caliciaceae ($\pm$ L.). 30, widespread. See Tibell (*Symb. bot. ups. 21* no. 2, 1975), Tibell (*Svensk bot. Tidskr.* 71: 239, 1977), Tibell (*Beih. Nova Hedwigia* 79: 597, 1984; gen. concept), Tibell & Kalb (*Nova Hedwigia* 55: 11, 1992; 9 trop. Am. spp.), Tibell (*Nordic Lichen Flora* 1. Introductory Parts; Calicioid Lichens and Fungi 1, 1999; Nordic spp. s.l.), Wedin *et al.* (*Taxon* 51: 655, 2002; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088,

- 2006; phylogeny), Tibell (*J. Hattori bot. Lab.* 100: 809, 2006; Himalayas).
- Calidia** Stirt. (1876) = *Byssoloma* fide James (*Lichenologist* 5: 175, 1971).
- Calidion** Syd. & P. Syd. (1919), anamorphic *Uncola*. 2 (on *Lindsaea*, *Polypodium*, *Thelypteris* (Pteridophyta)), S. America. Anamorph name for (II).
Lit.: Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003; syn. *Macabuna*, *Physopella* sensu Ono *et al.*, 1992).
- Californiomyces** U. Braun (1981) = *Brasiliomyces* fide Zheng (*Mycotaxon* 19: 281, 1984).
- Calkinsia** Nieuwl. (1916) = *Pterygium*.
- Callebaea** Bat. (1962), ? Capnodiaceae. 1, Uganda. See Batista (*Broteria ser. bot.* 31: 100, 1962).
- Calliderma** (Romagn.) Largent (1994) = *Entoloma* fide Kuyper (*in litt.*).
- Callimastix** Weissenb. (1912), Coelomomycetaceae. 1 (On *Cyclops*), Germany. See Barr *in* Margulis *et al.* (Eds) (*Handbook of Protoctista*: 454, 1990).
- Callimothallus** Dilcher ex Janson. & Hills (1977), Fossil Fungi, Microthyriaceae. 7 (Cretaceous, Tertiary), widespread. See Hansen (*Grana* 19: 67, 1980).
- Calliospora** Arthur (1905) = *Uropyxis* fide Arthur (*Manual Rusts US & Canada*, 1934).
- Callistodermatium** Singer (1981), ? Tricholomataceae. 1, Brazil. See Singer (*Mycol.* 73: 506, 1981).
- Callistospora** Petr. (1955), anamorphic *Pezizomycotina*, Hso. = eP.19. 1, Australia. See Nag Raj (*CJB* 67: 3169, 1989; redescr.).
- Callistosporium** Singer (1944), Tricholomataceae. 13, widespread. See Singer (*Sydowia* 30: 261, 1978; key), Redhead (*Sydowia* 35: 223, 1982; *Callistosporium luteo-olivaceum*), Gándara & Guzmán (*Mycotaxon* 96: 73, 2006).
- Callolechia** Kremp. (1869) = *Collolechia*.
- Callopis** (Müll. Arg.) Gyeln. (1933) = *Phyllopsora* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Callopisma** De Not. (1847) nom. rej. prop. = *Caloplaca*.
- Calloria** Fr. (1836), Helotiales. Anamorph *Cylindrocolla*. 4, Europe; N. America. See Hein (*Willdenowia Beih.* 9, 1976), Spooner (*Biblthca Mycol.* 116: 711 pp., 1987; Australia), Nauta & Spooner (*Mycologist* 13: 65, 1999; UK).
- Calloriella** Höhn. (1918), Helotiales. 1, Europe. See Nannfeldt (*Nova Acta R. Soc. Scient. upsal.* 8: 193, 1932; aff. with *Orbiliaceae*).
- Callorina** Korf (1971) = *Calloria* fide Hein (*Willdenowia Beih.* 9, 1976).
- Calloriopsis** Syd. & P. Syd. (1917), ? Helotiaceae. 1 (on *Meliolaceae*), widespread (tropical). See Pfister (*Mycotaxon* 4: 340, 1976), Lizoň *et al.* (*Mycotaxon* 67: 73, 1998; posn), Baral & Marson (*Micologia* 2000: 23, 2000).
- Callorites** Fiore (1932), Fossil Fungi. 1 (Eocene), Italy.
- callose**, hard or thick and sometimes rough.
- Callosisperma** Preuss (1855) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- callosities** (of fungi), wall thickenings associated with the penetration of fungicolous parasites (Swart, *TBMS* 64: 511, 1975). See papillae.
- Calocera** (Fr.) Fr. (1828), Dacrymycetaceae. c. 15, widespread. See McNabb (*N.Z. Jl Bot.* 3: 31, 1965; key), Kennedy (*CJB* 50: 413, 1972; basidioma devel.), Reid (*TBMS* 62: 437, 1974; key Brit. spp.), Mathiesen (*Svampe* 25: 35, 1992; key Danish spp.).
- Caloceraceae** Rea (1922) = Dacrymycetaceae.
- Caloceras** Fr. ex Wallr. (1833) = *Calocera* fide Kennedy (*Mycol.* 50: 884, 1958).
- Calochaetis** Syd. (1935) = *Wentiomycetes* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Calocladia** Lév. (1851) [non *Calocladia* Grev. 1836, *Rhodophyta*] = *Microsphaera* fide Braun (*in litt.*).
- Calocline** Syd. (1939), anamorphic *Pezizomycotina*, St.0eH.15. 1, Ecuador.
- Calocybe** Kühner ex Donk (1962), Lyophyllaceae. c. 40, widespread. *C. gambosum*, St. George's mushroom. See Singer (*Sydowia* 30: 264, 1978; key).
- Caloderma** Petri (1900) = *Scleroderma* fide Guzmán (*Darwiniana* 16: 233, 1970).
- Calodon** P. Karst. (1881) = *Hydnellum* P. Karst. (1879) fide Donk (*Taxon* 5: 69, 1956).
- Calogloeum** Syd. (1924) = *Fusamen* fide von Arx (*Verh. K. ned. Akad. Wet. Amst.* C 51: 1, 1957).
- Calolepis** Syd. (1925) = *Pycnoderma* fide von Arx (*Persoonia* 2: 421, 1963).
- Calonectria** De Not. (1867), Nectriaceae. Anamorph *Cylindrocladium*. c. 34, widespread. See Rossman (*Mycotaxon* 8: 321, 1979), Rossman (*Mycotaxon* 8: 485, 1979; excl. names), Rossman (*Mycol. Pap.* 150, 1983), Subramanian & Bhat (*Cryptog. Mycol.* 4: 269, 1983), Crous & Wingfield (*Mycotaxon* 51: 341, 1994), Rehner & Samuels (*CJB* 73 Suppl. 1: S816, 1995; phylogeny), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Schoch *et al.* (*Stud. Mycol.* 45: 45, 2000), Schoch *et al.* (*Mycol.* 92: 665, 2000; phylogeny), Crous & Kang (*Mycoscience* 42: 51, 2001; phylogeny), Kang *et al.* (*Syst. Appl. Microbiol.* 24: 206, 2001; species concepts), Kang *et al.* (*CJB* 79: 1241, 2001; connexions), Schoch *et al.* (*MR* 105: 1045, 2001; phylogeny), Schoch *et al.* (*Pl. Dis.* 85: 941, 2001; populations), Crous (*Taxonomy and Pathology of Cylindrocladium (Calonectria) and Allied Genera*: 278 pp., 2002; monogr.), Crous *et al.* (*Stud. Mycol.* 50: 415, 2004; revision), Crous *et al.* (*Stud. Mycol.* 55: 213, 2006; revision).
- Calopactis** Syd. & P. Syd. (1912) = *Endothiella* fide Sutton (*Mycol. Pap.* 141, 1977).
- Calopadia** Vězda (1986), Ectolechiaceae (L). 15 (on leaves), widespread (tropical). See Vězda (*Folia geobot. phytotax.* 21: 208, 215, 1986), Kalb & Vězda (*Folia geobot. phytotax.* 22: 287, 1987; Brazil), Aptroot *et al.* (*Biblthca Lichenol.* 64: 220 pp., 1997; New Guinea), Lücking (*Phyton Horn* 39: 131, 1999; Costa Rica).
- Calopadiopsis** Lücking & R. Sant. (2002), Ectolechiaceae. 1, Argentina. See Lücking & Santesson (*Bryologist* 105: 58, 2002).
- Calopeltis** Syd. (1925) = *Cyclotricha* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Calopeziza** Syd. & P. Syd. (1913) = *Dictyonella* fide von Arx (*Persoonia* 2: 421, 1963).
- Caloplaca** Th. Fr. (1860) nom. cons., Teloschistaceae (L). c. 510, widespread. See Wade (*Lichenologist* 3: 1, 1965; UK), Alon & Galun (*Israel J. Bot.* 20: 273, 1971; Israel), Nordin (*Caloplaca sect. Gasparrinia i Nordeuropa*, 1972), Wunder (*Biblthca Lichenol.* 3, 1974; dark apothecia), Hafellner & Poelt (*J. Hattori bot. Lab.* 46: 1, 1979; key 17 polarilocular spp.), Egea (*Collect. bot.* 15: 173, 1984; key 59 spp., Spain), Poelt & Pelleter (*Pl. Syst. Evol.* 148: 51, 1984; key, 10 fructescent spp.), Hansen *et al.* (*Meddr Grønland Biosc.* 25, 1987; key 43 spp. Greenland), Kärnefelt (*Monogr. Syst. Bot. Miss. Bot. Gdn* 25:

439, 1988; S. Africa), Söchting (*Op. Bot.* 100: 241, 1989; key 13 spp.), Nimis (*Not. Soc. Lich. Ital.* 5: 9, 1992; key 10 spp. Italy), Poelt & Hinteregger (*Biblthca Lichenol.* 50, 1993; Himalaya), Wetmore (*Mycol.* 86: 813, 1994; key 17 spp. dark apothecia N. & C. Am.), Arup (*Bryologist* 98: 129, 1995; key N. Am. maritime spp.), Wetmore (*Bryologist* 99: 292, 1996; *C. sideritis* group), Wetmore & Kärnefelt (*Bryologist* 101: 230, 1998; sub fruticose & lobate N. Am. spp.), Wetmore (*Bryologist* 104: 1, 2001; C. & N. Am.), Gaya *et al.* (*Am. J. Bot.* 90: 1095, 2003; phylogeny), Kärnefelt (*Biblthca Lichenol.* 86: 341, 2003; Australia, reproduction), Söchting & Lutzoni (*MR* 107: 1266, 2003; phylogeny, generic limits), Wetmore (*Bryologist* 106: 147, 2003; N and C America), Kärnefelt & Kondratyuk (*Biblthca Lichenol.* 88: 255, 2004; Australia), Wetmore (*Bryologist* 107: 284, 2004; N and C America), Wetmore (*Bryologist* 107: 505, 2004; N and C America), Arup (*Lichenologist* 38: 1, 2006; Scandinavia), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Kondratyuk *et al.* (*Biblthca Lichenol.* 95: 341, 2007; Australia), Söchting & Figueras (*Lichenologist* 39: 7, 2007; despide-producing spp.), Gaya *et al.* (*MR* 112: 528, 2008; phylogeny), Muggia *et al.* (*MR* 112: 36, 2008; endolithic spp.).

Caloplacaceae Zahlbr. (1907) = Teloschistaceae.

Caloplacomycetes E.A. Thomas (1939) nom. inval. = Caloplaca.

Caloplacopsis (Zahlbr.) B. de Lesd. (1932) = Candelariella fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Caloporaceae Bondartseva (1983) = Meruliaceae.

Caloporia P. Karst. (1893) = Caloporus P. Karst.

Caloporus P. Karst. (1881) = Merulius Fr. fide Donk (*Persoonia* 1: 193, 1960).

Caloporus Qué. (1886) = Albatrellus fide Stalpers (*in litt.*).

Calopposis Lloyd (1925) = Calocera fide McNabb (*N.Z. J. Bot.* 3: 31, 1965).

Caloscypha Boud. (1885), Caloscyphaceae. Anamorph *Geniculodendron*. 1, Europe. See Kimbrough & Curry (*Mycol.* 78: 735, 1986; ultrastr.), Landvik *et al.* (*Nordic J. Bot.* 17: 403, 1997; phylogeny), Harmaja (*Karstenia* 42: 27, 2002; family), Schröder *et al.* (*Forest Pathology* 32: 225, 2002; anam.), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).

Caloscyphaceae Harmaja (2002), Pezizales. 2 gen. (+ 1 syn.), 2 spp. See Harmaja (*Karstenia* 42: 27, 2002; family), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny).

Calosphaeria Tul. & C. Tul. (1863), Calosphaeriaceae. Anamorph *Calosphaeriophora*. 29, widespread. See Barr (*Mycol.* 77: 549, 1985), Samuels & Candoussau (*Nova Hedwigia* 62: 47, 1996), Réblová *et al.* (*Stud. Mycol.* 50: 533, 2004; phylogeny), Damm *et al.* (*Persoonia* 20: 39, 2008; asci, relns).

Calosphaeriaceae Munk (1957), Calosphaeriales. 8 gen. (+ 2 syn.), 44 spp.

Lit.: Barr (*Mycol.* 77: 549, 1985), Romero & Minter (*TBMS* 90: 457, 1988), Samuels & Candoussau (*Nova Hedwigia* 62: 47, 1996), Barr (*Cryptog. Bryol.-Lichénol.* 19: 169, 1998), Mostert *et al.* (*Mycol.* 95: 646, 2003), Réblová *et al.* (*Stud. Mycol.* 50: 533, 2004), Damm *et al.* (*Persoonia* 20: 39, 2008; asci, relns).

Calosphaeriales M.E. Barr (1983). Sordariomycetidae

2 fam., 13 gen., 54 spp. Stromatic tissues almost absent to well-developed, usually pseudostromatic. Ascomata perithecial, immersed, often clustered, with separate or convergent ostioles. Interascal tissue composed of a few elongate paraphyses. Asci formed in fascicles or spicate clusters, croziers sometimes absent, sessile or long-stalked, sometimes polysporous; usually with an inconspicuous J- apical ring. Ascospores hyaline or pale brown, ellipsoidal or allantoid, thin-walled. Saprobes on bark or wood, mainly temp. Fams:

(1) **Calosphaeriaceae**

(2) **Pleurostomataceae**

Lit.: Barr (*Mycol.* 77: 549, 1985; *Mycotaxon* 39: 43, 1990), Barr *et al.* (*Mycotaxon* 48: 529, 1993), Rogers (*in Hawksworth* (Ed.), *Ascomycete systematics*: 321, 1994).

Calosphaeriophora Réblová, L. Mostert, W. Gams & Crous (2004), anamorphic *Calosphaeria*. 1. See Réblová *et al.* (*Stud. Mycol.* 50: 542, 2004).

Calosphaeriopsis Petr. (1941), Pezizomycotina. 1, Europe.

Calospora Nitschke ex Niessl (1875) = Macrodiaporthe fide Barr (*Mycol. Mem.* 7: 232 pp., 1978), Holm (*Taxon* 24: 475, 1978).

Calospora Sacc. (1883) = Prosthecium fide Barr (*Mycol. Mem.* 7: 232 pp., 1978).

Calosporella J. Schröt. (1897) = Prosthecium fide Barr (*Mycol. Mem.* 7: 232 pp., 1978).

Calostilbe Sacc. & P. Syd. (1902), Nectriaceae. Anamorph *Calostilbella*. 1 (on rotten wood etc.), pantropical. See Samuels (*CJB* 51: 1275, 1973), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).

Calostilbella Höhn. (1919), anamorphic *Calostilbe*, Hsy. = eP.1. 1, W. Africa; West Indies. See Mason (*Mycol. Pap.* 2: 29, 1925), Hewings & Crane (*Mycotaxon* 20: 245, 1984).

Calostoma Desv. (1809), Calostomataceae. 15, widespread. See Boedijn (*Bull. Jard. bot. Buitenz. ser. 3* 16: 64, 1938; Indonesia, key), Liu (*J. Shansi Univ., nat. sci. ed.* 1: 109, 1979; world key [Chinese]), Hibbett *et al.* (*Nature* 407: 506, 2000; phylogeny), Hughey *et al.* (*Mycol.* 92: 94, 2000; phylogeny).

Calostomataceae E. Fisch. (1900), Boletales. 1 gen. (+ 3 syn.), 15 spp.

Lit.: Cunningham (*Gast. Austr. N.Z.*: 236 pp., 1942), Hughey *et al.* (*Mycol.* 92: 94, 2000), Binder & Bresinsky (*Mycol.* 94: 85, 2002).

Calotrichopsis, see *Calotrichopsis*.

Calothyriella Höhn. (1917) = Microthyrium fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).

Calothyriolum Speg. (1919) = Asterina fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).

Calothyriopeltis F. Stevens & R.W. Ryan (1925) nom. dub., Fungi. See Petrak (*Sydowia* 5: 169, 1951).

Calothyriopsis Höhn. (1919), Microthyriaceae. 2, America (tropical).

Calothyris Clem. & Shear (1931) = Calothyriopeltis.

Calothyrium Theiss. (1912) = Asterinella fide von Arx & Müller (*Stud. Mycol.* 9, 1975).

Calotrichopsis Vain. (1890), Lichinaceae (L.). 3, S. America. See Henssen (*Symb. bot. upsal.* 18 no. 1, 1963), Moreno & Egea (*Acta Bot. Barcinon.* 41: 1, 1992), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key).

calvacin, a non-diffusible mucoprotein antibiotic from *Langermannia gigantea*; active against mouse, rat,

- and hamster tumours (Beneke, *Mycol.* 55: 257, 1963).
- Calvarula** Zeller (1939), Phallaceae. 1, USA.
- Calvatia** Fr. (1849) nom. cons., Agaricaceae. c. 40, widespread. See Zeller & Smith (*Lloydia* 27: 148, 1964; N. Am. spp., keys), Kreisel (*Nova Hedwigia* 48: 241, 1989; key to segr. *Handkea*, not accepted here), Calonge & Martin (*Boln Soc. Micol. Madrid* 14: 181, 1990; gen. limits), Demoulin (*Mycotaxon* 46: 77, 1993), Lange (*Blyttia* 51: 141, 1993; infr. generic taxa), Coetzee & Van Wyk (*Bothalia* 33: 156, 2003; *Calvatia* sect. *Macrocalvatia*), Coetzee & Van Wyk (*Taxon* 54: 541, 2005; nomencl.).
- Calvatiella** C.H. Chow (1936) = *Lycoperdon* Pers. fide Kreisel & Calonge (*Mycotaxon* 48: 13, 1993).
- Calvatiopsis** Hollós (1929), Agaricaceae. 1, Europe. Perhaps a 'monstrosity'.
- calvescent**, becoming bare or bald.
- Calvitimela** Hafellner (2001), ? Tephromelataceae. 5, widespread. See Hafellner & Türk (*Stappia* 76: 150, 2001), Arup *et al.* (*Mycol.* 99: 42, 2007; sister group relations with *Parmeliaceae*).
- Calvocephalis** Bainier (1882) = *Syncephalis* fide Benjamin (*Aliso* 4: 321, 1959).
- calvous**, naked, bare.
- Calycella** (Fr.) Boud. (1885) = *Calycina*.
- Calycella** (Sacc.) Sacc. (1899), Helotiaceae. 1, Europe. See Korf & Carpenter (*Mycotaxon* 1: 52, 1974).
- Calycella** Quél. (1886) = *Bisporella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Calycellina** Höhn. (1918), Hyaloscyphaceae. Anamorph *Chalara*-like. c. 43, widespread. See Thind & Sharma (*J. Indian bot. Soc.* 59: 350, 1980), Arendholz & Sharma (*Mycotaxon* 20: 633, 1984), Lowen & Dumont (*Mycol.* 76: 1003, 1984; key), Baral (*Beitr. Kenntn. Pilze Mitteleur.* 5: 209, 1989; 4-spored spp.), Huhtinen (*Karstenia* 29: 45, 1990), Svrček (*Česká Mykol.* 46: 149, 1993; 5 spp.), Cantrell & Hanlin (*Mycol.* 89: 745, 1997; DNA), Yu & Zhuang (*Myco-systema* 22: 42, 2003; phylogeny), Raitviir (*Scripta Mycol.* 20, 2004).
- Calycellinopsis** W.Y. Zhuang (1990), Dermateaceae. 1 (on petioles), China. See Zhuang (*Mycotaxon* 38: 121, 1990).
- Calycidiaceae** Elenkin (1929), Lecanorales (L). 1 gen. (+ 2 syn.), 1 spp.
Lit.: Tibell (*Symb. bot. upsal.* 27 no. 1: 279 pp., 1987), Wedin (*Taxonomic Studies in Sphaerophoraceae* (Caliciales, Ascomycotina), Acta Universitatis Upsaliensis (Comprehensive Summaries of Uppsala Dissertations from the Faculty of Science and Technology no. 77): 168 pp., 1994), Tibell (*Symb. bot. upsal.* 32 no. 1: 291, 1997), Wedin (*Lichenologist* 34: 63, 2002).
- Calycidiomyces** Cif. & Tomas. (1953) = *Calycidium*.
- Calycidium** Stirt. (1877), Calycidiaceae (L). 1 (on *Nothofagus*), New Zealand. See Sato (*Miscnea bryol. lichen.*, *Nichinan* 4: 150, 1968), Tibell (*Symb. bot. upsal.* 27 no. 1, 1987), Tibell (*Symb. bot. upsal.* 32: 291, 1997; anamorphs), Wedin (*Lichenologist* 34: 63, 2002; monogr.).
- calyciform**, cup-like.
- Calycina** Nees ex Gray (1821), Hyaloscyphaceae. Anamorph *Acleistia*. c. 45, widespread. See Baral (*SA* 13: 113, 1993), Raitviir (*Scripta Mycol.* 20, 2004), Zhang & Zhuang (*Nova Hedwigia* 78: 475, 2004; phylogeny).
- Calycium** DC. (1805) = *Calicium*.
- calycular**, cup-like.
- Calyculosphaeria** Fitzp. (1923) = *Nitschkia* fide Gaikwad (*Sydowia* 26: 290, 1974), Nannfeldt (*Svensk bot. Tidskr.* 66: 49, 1975), Huhndorf *et al.* (*MR* 108: 1384, 2004).
- calyculus**, a cup-like or calyx-like structure at the base of the sporangium in *Mycetozoa*.
- Calypella** Quél. (1886), Marasmiaceae. 20, widespread. See Singer (*Sydowia* 30: 270, 1978; key), Young (*Mycologist* 10: 152, 1996; *Calypella longipes* in Australia).
- Calypellopsis** Svrček (1986), Hyaloscyphaceae. 1, former Czechoslovakia. See Svrček (*Česká Mykol.* 40: 203, 1986).
- Calyptrasporea** J.G. Kühn (1869), Pucciniastreaceae. 1, north temperate. Separated from *Pucciniastrum* by the demicyclic life cycle (0, I-III). See Faull (*J. Arnold Arbor.* 20: 104, 1939), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983; as *Pucciniastrum*), Hiratsuka (*The Rust Flora of Japan*, 1992).
- Calyptra** Theiss. & Syd. (1918), Dothideomycetes. 2, America.
- calyptra**, a cap or hood.
- Calyptromyces** H. Karst. (1849) = *Mucor* Fresen. fide Sumstine (*Mycol.* 2: 125, 1910), Hesseltine (*Mycol.* 47: 344, 1955) See.
- Calyptronectria** Speg. (1909), Melanommataceae. 1 or 2 (dead branches), S. America. See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Calyptrozyma** Boekhout & Spaay (1995), Eurotiomycetes. 1, USA. See Boekhout *et al.* (*MR* 99: 1244, 1995), Schweigkofler *et al.* (*Organ. Divers. Evol* 2: 1, 2002; phylogeny).
- Camanchaca** Follm. & Peine (1999) = *Pentagenella* fide Follmann & Peine (*J. Hattori bot. Lab.* 87: 259, 1999), Tehler & Irestedt (*Cladistics* 23: 432, 2007).
- Camaroglobulus** Speer (1986), anamorphic *Mytilinidion*, St.0eP.1. 1, Brazil. See Speer (*BSMF* 102: 100, 1986).
- Camarographium** Bubák (1916), anamorphic *Pezizomycotina*, St.#eP.15. 4, Europe. See Verkley *et al.* (*Sydowia* 57: 259, 2005).
- Camaropella** Lar.N. Vassiljeva (1997) = *Camarops* fide Vasilyeva (*Mikol. Fitopatol.* 31: 6, 1997).
- Camarophyllopsis** Herink (1958), ? Hygrophoraceae. 26, widespread (north temperate). See Printz & Læssøe (*Svampe* 14: 83, 1986; key), Boertmann (*Biblhca Mycol.* 192: 168 pp., 2002; monogr.).
- Camarophyllus** (Fr.) P. Kumm. (1871) = *Hygrophorus* fide Kuyper (*in litt.*).
- Camarops** P. Karst. (1873), Boliniaceae. 19, widespread. See Nannfeldt (*Svensk bot. Tidskr.* 66: 335, 1972), Pouzar (*Česká Mykol.* 40: 218, 1987; 4 spp. Czech.), Eriksson & Hawksworth (*SA* 7: 64, 1988; posn), Vasilyeva (*Mikol. Fitopatol.* 22: 388, 1988), Callan & Rogers (*Sydowia* 41: 74, 1989; teleomorph in culture), Vasilyeva (*Mikol. Fitopatol.* 31: 5, 1997; Russian Far East), Huhndorf *et al.* (*Mycol.* 96: 368, 2004; phylogeny), Catania & Romero (*Sydowia* 57: 3, 2005; Argentina), Rogers *et al.* (*Sydowia* 58: 105, 2006; Caribbean), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Camaropycnis** E.K. Cash (1945), anamorphic *Pezizomycotina*, St.0eH.15. 1, USA.
- Camarosporellum** Tassi (1902), anamorphic *Pezizomycotina*, Cpd.#eP.1. 3, Europe; USA. See Sutton & Pollack (*Mycopath. Mycol. appl.* 52: 331, 1974), van Warmelo & Sutton (*Mycol. Pap.* 145, 1981).

- Camarosporiopsis** Abbas, B. Sutton & Ghaffar (2000), anamorphic *Pezizomycotina*. 1, Pakistan. See Abbas *et al.* (*Pakist. J. Bot.* 32: 239, 2000).
- Camarosporium** Schulzer (1870), anamorphic *Botryosphaeriales*, St.#eP.1/19. c. 106, widespread (esp. temperate). A polyphyletic group that is also used for anamorphs of *Cucurbitaria* and related genera. See Butin (*Sydowia* 45: 161, 1993; pleomorphy), Taylor *et al.* (*Mycotaxon* 78: 75, 2001; on *Proteaceae*), Crous *et al.* (*Stud. Mycol.* 55: 235, 2006; phylogeny).
- Camarosporula** Petr. (1954), anamorphic *Anthracostroma*, St.#eP.1. 1, Australia. See Petrak (*Sydowia* 8: 99, 1954), Swart (*TBMS* 84: 733, 1985; conidiogenesis).
- Camarosporulum** Tassi (1902), anamorphic *Pezizomycotina*, Cpd.#eP.?. 1, widespread.
- Camarotella** Theiss. & Syd. (1915) = *Coccodiella* fide Hyde & Cannon (*Mycol. Pap.* 175, 1999).
- Camillea** Fr. (1849), *Xylariaceae*. Anamorph *Xylocadium*. 41, widespread (tropical). See Silveira & Rogers (*Acta Amazon. Supl.* 15: 7, 1987; Brazil), Læssøe *et al.* (*MR* 93: 121, 1989; monogr., SEM, key 27 spp.), Rogers *et al.* (*Mycol.* 83: 274, 1991), González & Rogers (*Mycotaxon* 47: 229, 1993; key 14 spp., Mexico), Whalley (*Mycologist* 10: 149, 1996; SEM), Whalley *et al.* (*Kew Bull.* 54: 715, 1999; SE Asia), Sánchez-Ballesteros *et al.* (*Mycol.* 92: 964, 2000; phylogeny), Rogers *et al.* (*Sydowia* 54: 84, 2002; Costa Rica), Triebel *et al.* (*Nova Hedwigia* 80: 25, 2005; phylogeny).
- Campanella** Henn. (1895), *Marasmiaceae*. c. 40, widespread (esp. tropical). See Singer (*Nova Hedwigia* 26: 847, 1976; key), Bougher (*Mycotaxon* 99: 327, 2007; Australia).
- Campanophyllum** Cifuentes & R.H. Petersen (2003), *Cyphellaceae*. 1, Costa Rica. See Cifuentes *et al.* (*Mycol. Progr.* 2: 287, 2003).
- Campanularius** Roussel (1806) = *Panaeolus* fide Kuyper (*in litt.*) This name has not yet been proposed for rejection against *Panaeolus*, nom. cons.
- campanulate**, bell-like in form (Fig. 23.25).
- Campanulospora** I.V. Issi, Radischcheva & Dolzhenko (1983), *Microsporidia*. 1.
- Campanulospora** Salazar-Yepes, Pardo-Card. & Buriticá (2007), *Phragmidiaceae*. Anamorph *Gerwasia*. 1, S. America. See Salazar Yepes, M.; Pardo Cardona, V.M.; Buriticá Céspedes, P. (*Caldasia* 29: 105, 2007).
- Campbellia** Cooke & Massee (1890) [non *Campbellia* Wight 1849, *Orobanchaceae*] = *Rodwaya*.
- campestroid**, agarics having a pileus with a diam. : stipe ratio of 1 or >1. See Freeman (*Mycotaxon* 8: 1, 1979). Cf. *placomycetoid*.
- Campoa** Speg. (1921), *Parmulariaceae*. 2, S. America; Philippines.
- Camposporidium** Nawawi & Kuthub. (1988), anamorphic *Pezizomycotina*, Hso.≡ eP.19. 3 (aquatic), tropical. See Nawawi & Kuthubutheen (*Mycotaxon* 32: 161, 1988), Castañeda-Ruiz & Guarro (*CJB* 76: 1584, 1998).
- Camposporium** Harkn. (1884), anamorphic *Pezizomycotina*, Hso.≡ eP.10. 17, widespread. See Hughes (*Mycol. Pap.* 36, 1951), Peek & Solheim (*Mycol.* 50: 844, 1959), Watanabe (*TMSJ* 34: 71, 1993; key 14 spp.), Hyde *et al.* (*S. Afr. J. Bot.* 64: 151, 1998), Mercado Sierra *et al.* (*Mycotaxon* 67: 417, 1998), Whitton *et al.* (*Fungal Diversity* 11: 177, 2002; key).
- Campsotrichum** Ehrenb. (1819) = *Myxotrichum* fide Hughes (*CJB* 46: 939, 1968).
- Camptobasidium** Marvanová & Suberkr. (1990), *Microbotryomycetes*. Anamorph *Crucella*. 1, USA. See Marvanová & Suberkropp (*Mycol.* 82: 209, 1990).
- Camptomeris** Syd. (1927), anamorphic *Pezizomycotina*, Hsp.≡ eP.10. 9, widespread (tropical). See Hughes (*Mycol. Pap.* 49, 1952), Bessey (*Mycol.* 45: 364, 1953; key).
- Camptomyces** Thaxt. (1894), *Laboulbeniaceae*. 8, widespread. See Santamaría (*Fl. Mycol. Iberica* 5, 2003; Iberian peninsula).
- Camptosphaeria** Fuckel (1870), *Lasiosphaeriaceae*. 4, widespread. See Krug & Jeng (*Sydowia* 29: 71, 1977; key), Huhndorf *et al.* (*Mycol.* 96: 368, 2004).
- Camptosporium** Link (1818) nom. dub., anamorphic *Pezizomycotina*. See Kirk (*in litt.*), Hughes (*CJB* 36: 744, 1958; possible synonymy with *Menispora*).
- Camptoum** Link (1824) = *Arthrimum* fide Hughes (*CJB* 36: 727, 1958).
- Campylacia** A. Massal. ex Beltr. (1858) = *Leptorhaphis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- campylidium**, helmet-shaped conidiomata occurring in various, mainly foliicolous, tropical lichenized genera (e.g. *Badimia*, *Loflammia*, *Sporopodium*); the name *Pyrenotrichum* (Ascomycetes, inc. sed.) has been applied to many of these conidiomata. See Sérusiaux (*Lichenologist* 18: 1, 1986).
- Campylobasidium** Lagerh. ex F. Ludw. (1892) nom. rej. = *Septobasidium* fide Berndt (*in litt.*).
- Campylocarpon** Halleen, Schroers & Crous (2004), anamorphic *Nectriaceae*. 2 (on *Vitis* roots), S. Africa. See Halleen *et al.* (*Stud. Mycol.* 50: 448, 2004).
- Campylomyces** Nakasone (2004), *Gloeophyllaceae*. 2, Australia; Morocco. See Nakasone (*Sydowia* 56: 258, 2004).
- Campylospora** Ranzoni (1953), anamorphic *Pezizomycotina*, Hso.1bH.1. 3 (aquatic), widespread (north temperate). See Ranzoni (*Farlowia* 4: 373, 1953).
- Campylostylus** Genev. (1873) nom. dub., ? Fungi.
- Campylothecium** Ces. (1846) = *Cordyceps* fide Tulasne & Tulasne (*Select. fung. carpol.* 3: 18, 1865).
- Campylothelium** Müll. Arg. (1883), *Trypetheliaceae* (L.). 6, widespread (tropical). See Tucker & Harris (*Bryologist* 83: 1, 1980), Harris (*Acta Amazon. Supl.* 14: 55, 1984; Brazil), Prado *et al.* (*MR* 110: 511, 2006; phylogeny), Aptroot *et al.* (*Bibliotheca Lichenol.* 97, 2008; Costa Rica).
- Canadian tuckohoe**, see stone-fungus.
- canal**, sometimes applied to the pore connecting the two cells of a polarilocular spore.
- canaliculate**, having longitudinal grooves (Fig. 20.16).
- Canalisporium** Nawawi & Kuthub. (1989), anamorphic *Pezizomycotina*, Hsp.#eP.1. 9, widespread. See Nawawi & Kuthubutheen (*Mycotaxon* 34: 477, 1989), Goh *et al.* (*CJB* 76: 142, 1998; revision), Goh & Hyde (*Mycol.* 92: 589, 2000; Australia), Cai *et al.* (*Cryptog. Mycol.* 24: 3, 2003; China), Ferrer & Shearer (*Mycotaxon* 93: 179, 2005; Panamá).
- Canariomyces** Arx (1984), *Microascaceae*. 1, Canary Islands. See von Arx *et al.* (*Beih. Nova Hedwigia* 94, 1988; posn).
- Canavirgella** W. Merr., N.G. Wenner & Dreisbach (1996), *Rhytismataceae*. 1, USA. See Merrill *et al.* (*CJB* 74: 1476, 1996).
- Cancellaria** Brongn. (1825) = *Roestelia* fide Berndt (*in litt.*) Anamorph name for (I), aecial states of *Gymno-*

- sporangium*.
- cancellate**, reticulate; like a network, as the basidioma of *Clathrus*.
- Cancellidium** Tubaki (1975), anamorphic *Hypocreales*, Hso.#eP.1. 2 (aero-aquatic, conidia hollow), E. Asia. See Tubaki (*TMSJ* 16: 357, 1975), Shaw (*Mycologist* 8: 162, 1994; Australia), Yeung *et al.* (*Cryptog. Mycol.* 27: 295, 2006; phylogeny).
- Canceromyces** Niessen [not traced] nom. dub., Fungi. Based on a mould from a cancer.
- Candelabrella** Rifai & R.C. Cooke (1966) = *Arthrobotrys* fide Cooke (*TBMS* 53: 475, 1969), Schenck *et al.* (*CJB* 55: 977, 1977), Rubner (*Stud. Mycol.* 39, 1996).
- Candelabrochaete** Boidin (1970), *Phanerochaetaceae*. 11, widespread. See Hjortstam (*Mycotaxon* 56: 451, 1995).
- Candelabrum** Beverw. (1951), anamorphic *Pezizomycotina*, Hso.1bH.1. 7 (aero-aquatic), widespread. See Beverwijk (*Antonie van Leeuwenhoek Ned. Tijdschr. Hyg.* 17: 283, 1951), Voglmayr (*MR* 102: 410, 1998; key).
- Candelaria** A. Massal. (1852), *Candelariaceae* (L). 11, widespread. See Hillmann (*Rabenh. Krypt.-Fl.* 9 5.3: 19, 1936), Poelt (*Phyton Horn* 16: 189, 1974), Jørgensen & Galloway (*Lichenologist* 24: 407, 1992), Kärnefelt & Westberg (*Mycotaxon* 80: 456, 2001; southern Africa), LaGreca & Lumbsch (*Biblhca Lichenol.* 78: 211, 2001; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Westberg *et al.* (*MR* 111: 1277, 2007; phylogeny).
- Candelariaceae** Hakul. (1954), *Candelariales* (L). 5 gen. (+ 6 syn.), 66 spp.
Lit.: Jørgensen & Galloway (*Lichenologist* 24: 407, 1992), Castello & Nimis (*Acta Bot. Fenn.* 150: 5, 1994), LaGreca & Lumbsch (*Biblhca Lichenol.* 78: 211, 2001), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny), Westberg *et al.* (*MR* 111: 1277, 2007; phylogeny).
- Candelariales** Miadl., Lutzoni & Lumbsch (2007). *Lecanoromycetes*. 1 fam., 5 gen., 66 spp. Fam.:
Candelariaceae
 For *Lit.* see under fam.
- Candelariella** Müll. Arg. (1894), *Candelariaceae* (L). c. 48, widespread. See Hakulinen (*Ann. bot. Soc. Zool.-Bot. Fenn. Vanamo* 27 no. 3, 1954; monogr.), Poelt & Reddi (*Ergebn. ForschUnternehmens Nepal Himalaya* 6: 1, 1969), Laundon (*Lichenologist* 4: 297, 1970; UK), Harris & Buck (*Mich. Bot.* 17: 155, 1978; N. Am.), Gilbert *et al.* (*Lichenologist* 13: 249, 1981; citrine spp.), Castello & Nimis (*Acta Bot. Fenn.* 150: 5, 1994; Antarctic spp.), LaGreca & Lumbsch (*Biblhca Lichenol.* 78: 211, 2001; phylogeny), Aragón & Martínez (*Lichenologist* 34: 81, 2002; Europe), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny), Westberg (*Bryologist* 110: 365, 2007; N America), Westberg (*Bryologist* 110: 375, 2007; N America), Westberg (*Bryologist* 110: 391, 2007; N America), Westberg *et al.* (*MR* 111: 1277, 2007; phylogeny).
- Candelariellomyces** E.A. Thomas ex Cif. & Tomas. (1953) = *Candelariella*.
- Candelariellopsis** Werner (1936) = *Candelariella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Candelariopsis** (Sambo) Szatala (1959) nom. inval. ? = *Caloplaca* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Candelina** Poelt (1974), *Candelariaceae* (L). 3, widespread. See Poelt (*Phyton Horn* 16: 194, 1974), LaGreca & Lumbsch (*Biblhca Lichenol.* 78: 211, 2001; phylogeny, anatomy), Westberg *et al.* (*MR* 111: 1277, 2007; phylogeny).
- Candelospora** Rea & Hawley (1912) = *Cylindrocadium* fide Boedijn (*in litt.*).
- Candelosynnema** K.D. Hyde & Seifert (1992), anamorphic *Pezizomycotina*, Hsy. = eH.10. 1, Australia. See Hyde & Seifert (*Aust. Syst. Bot.* 5: 401, 1992).
- candididin**, an antibiotic from the actinomycete *Streptomyces griseus*; antibacterial and antifungal (esp. against *Candida albicans*); Lechevalier *et al.* (*Mycol.* 45: 155, 1953), Kligman & Lewis (*Proc. Soc. exper. Biol. Med.* 82: 399, 1953).
- Candida** Berkhout (1923) nom. cons., anamorphic *Saccharomycetales*, Hso.0eH.?. 355, widespread. Pseudomycelium or mycelium present. *C. albicans* (candidiasis, q.v.) and other spp. are pathogenic for humans and animals; *C. utilis*, food yeast. See Shepherd *et al.* (*Ann. Rev. Microbiol.* 39: 579, 1985; biology, genetics, pathogenicity), Srivastava *et al.* (*Microbial Ecology* 11: 71, 1985; differentiation of biotypes), Belov & Kamenev (*Mikrobiologiya* 55: 473, 1986; wall components and morphology), Lehmann *et al.* (*TBMS* 88: 199, 1987; killer fungi characterize species and biotypes), Magee *et al.* (*J. Bact.* 169: 1639, 1987; rDNA RFLP), Montrocher & Claisse (*Cellular and Molecular Biology* 33: 313, 1987; spectrophotometric analysis), Mendling (*Vulvovaginal Candidosis. Theory and Practice*, 1988; review), Viljoen *et al.* (*J. gen. Microbiol.* 134: 1893, 1988; long chain fatty acids), Weijman & Rodrigues de Miranda (*Antonie van Leeuwenhoek* 54: 535, 1988; carbohydrate patterns), Weijman *et al.* (*Antonie van Leeuwenhoek* 54: 545, 1988; redefinition of genus), Hendriks *et al.* (*Syst. Appl. Microbiol.* 12: 223, 1989; nucleotide sequence of *C. albicans*), Kamiyama *et al.* (*Mycopathologia* 107: 3, 1989; DNA homology between strains), Kamiyama *et al.* (*J. Med. Vet. Mycol.* 27: 229, 1989; Adansonian taxonomy of spp.), Merson-Davies & Odds (*J. gen. Microbiol.* 135: 3143, 1989; morphology index), Montrocher *et al.* (*Yeast Special Issue* 5: S385, 1989; biochemical analysis), Su & Meyer (*Yeast Special Issue* 5: S355, 1989; restriction endonuclease analysis of DNA), Boiron (*Bulletin de la Société Française de Mycologie Médicale* 19: 13, 1990; electrophoretic karyotypes), Iwaguchi *et al.* (*J. gen. Microbiol.* 136: 2433, 1990; karyotypes), Jensen *et al.* (*Mycoses* 33: 519, 1990; crossed immunoelectrophoresis to differentiate *C. albicans*), Odds (*Bulletin de la Société Française de Mycologie Médicale* 19: 5, 1990; molecular biology), Pope (*Phytopathology* 80: 966, 1990; cellular fatty acids), Rustchenko-Bulgac *et al.* (*J. Bact.* 172: 1276, 1990; genetic variation in *C. albicans*), Samaranyake & Yaacob (*Oral Candidosis*: 124, 1990; classification of oral candidosis), Scherer & Magee (*Microbiol. Rev.* 54: 226, 1990; genetics of *C. albicans*), Barns *et al.* (*J. Bact.* 173: 2250, 1991; evolutionary relationships among pathogenic spp.), Calderone & Braun (*Microbiol. Rev.* 55: 1, 1991; adherence and receptor relationships in *C. albicans*), Cribb (*Qd Nat.* 31: 21, 1991; history of delimitation), Hendriks *et al.* (*J. gen. Microbiol.* 137: 1223, 1991; phylogeny of medical spp.), Lacher & Lehmann (*An-*

- nals of Clinical and Laboratory Science* 21: 94, 1991; numerical taxonomy), Meyer *et al.* in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 454, 1998; review), Warren & Hazen (*Manual of Clinical Microbiology*: 1184, 1999; review), Hui *et al.* (*Diagn. Microbiol. Infect. Dis.* 38: 95, 2000; PCR, SSCP analysis), Milde *et al.* (*Veter. Pathol.* 76: 395, 2000; spp. from tortoises), Peltroche-Llacsahuanga *et al.* (*J. Clin. Microbiol.* 38: 3696, 2000; FAME analysis), Calderone (*Candida and Candidiasis*, 2001; review), Land (*Trends in Microbiology* 9: 201, 2001; recombination), Mahmoudabadi *et al.* (*Journal of Applied Microbiology* 93: 894, 2002; lipids), Nosek *et al.* (*J. Clin. Microbiol.* 40: 1283, 2002; mt DNA), Suzuki & Nakase (*J. gen. appl. Microbiol.* Tokyo 48: 55, 2002; phylogeny, ubiquinones), Dodgson *et al.* (*J. Clin. Microbiol.* 41: 5709, 2003; phylogeny of *C. glabrata*), Himmelreich *et al.* (*Appl. Environm. Microbiol.* 69: 4566, 2003; NMR spectroscopy), Muñoz *et al.* (*Mycoses* 46: 85, 2003; lectins), Sampaio *et al.* (*J. Clin. Microbiol.* 41: 552, 2003; microsatellites), Sandt *et al.* (*J. Clin. Microbiol.* 41: 954, 2003; FTIR analysis), Starmer *et al.* (*FEMS Yeast Res.* 3: 441, 2003; yeasts from cacti), Bougnoux *et al.* (*Infect. Genet. Evol.* 4: 243, 2004; genotyping), Diezmann *et al.* (*J. Clin. Microbiol.* 42: 5624, 2004; phylogeny), Fundyga *et al.* (*Infect. Genet. Evol.* 4: 37, 2004; recombination), Graf *et al.* (*Diagn. Microbiol. Infect. Dis.* 48: 1491, 2004; diagnostics), Jones *et al.* (*Proc. natn Acad. Sci. U.S.A.* 101: 7329, 2004; genome of *C. albicans*), Pujol *et al.* (*Eukaryotic Cell* 3: 1015, 2004; genetics), Salomon *et al.* (*Applied Mycology and Biotechnology* 4: [99], 2004; genomics of *C. albicans*), Dodgson *et al.* (*Fungal Genetics Biol.* 42: 233, 2005; recombination), Edelmann *et al.* (*J. Clin. Microbiol.* 43: 6164, 2005; human and animal strain comparison), Foulet *et al.* (*J. Clin. Microbiol.* 43: 4574, 2005; microsatellites), Goldenberg *et al.* (*J. Clin. Microbiol.* 43: 5912, 2005; HPLC), Lott *et al.* (*Fungal Genetics Biol.* 42: 444, 2005; evolutionary origins), Prasad *et al.* (*Int. J. Syst. Evol. Microbiol.* 55: 967, 2005; from oil sludge), Sampaio *et al.* (*J. Clin. Microbiol.* 43: 3869, 2005; microsatellite multiplex PCR), Suh & Blackwell (*Mycol.* 97: 167, 2005; fungus-beetle spp.), Suh *et al.* (*MR* 109: 1045, 2005; insect associates), Tavanti *et al.* (*J. Clin. Microbiol.* 43: 284, 2005; taxonomy), White *et al.* (*J. Clin. Microbiol.* 43: 2181, 2005; detection of invasive strains), Lan & Xu (*Microbiology Reading* 152: 1539, 2006; population analysis), Lasker *et al.* (*J. Clin. Microbiol.* 44: 750, 2006; microsatellites), Marot-Leblond *et al.* (*J. Clin. Microbiol.* 44: 138, 2006; monoclonal antibodies), Nantel (*Fungal Genetics Biol.* 43: 311, 2006; review, whole-genome sequence), Page *et al.* (*J. Clin. Microbiol.* 44: 3167, 2006; flow cytometry), Ramos *et al.* (*Antonie van Leeuwenhoek* 89: 39, 2006; heteroduplex PCR), Romeo *et al.* (*J. Clin. Microbiol.* 44: 2590, 2006; hyphal wall protein sequences), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- candidiasis**, a cosmop. disease of humans (including thrush, mouget, etc.) and animals caused by species of *Candida* (syn. *Monilia* auct.), esp. *C. albicans*; moniliasis; candidosis. Like many other fungal diseases, candidiasis has become more important with the rise in numbers of immunocompromised patients. See Winner & Hurley (*Candida albicans*, 1964; (Eds), *Symposium on Candida infections*, 1966), Odds (*Candida and candidosis*, edn. 2, 1988), Turnbay *et al.* (Eds) (*Candida and candidamycosis*, 1991). *Candida* Society Website: www.candida-society.org.
- candidosis**, see candidiasis.
- candle-snuff fungus**, stromata of *Xylaria hypoxylon*.
- canescent**, becoming hoary or grey.
- caninoid venation**, see veins.
- canker**, a plant disease in which there is sharply-limited necrosis of the cortical tissue, e.g. **apple canker** (*Nectria galligena*).
- CANL**, Lichen Herbarium, Canadian Museum of Nature (Ottawa, Canada); founded 1882; a government corporation.
- Cannanorosporonites** Ramanujam & Rao (1979), Fossil Fungi. 1 (Miocene), India.
- Canningia** J. Weiser, Wegensteiner & Z. Žižka (1995), Microsporidia. 1.
- Cannonia** Joanne E. Taylor & K.D. Hyde (1999), Xylariaceae. 1, Argentina; Australia. See Taylor & Hyde (*MR* 103: 1398, 1999).
- Canomaculina** Elix & Hale (1987) = Parmotrema fide Elix (*Mycotaxon* 65: 475, 1997), Blanco *et al.* (*Mycol.* 97: 150, 2005), Blanco *et al.* (*Mol. Phylogen. Evol.* 39: 52, 2006; phylogeny).
- Canoparmelia** Elix & Hale (1986), Parmeliaceae (L). c. 40, widespread. See Elix *et al.* (*Mycotaxon* 27: 271, 1986), Adler (*Mycotaxon* 28: 251, 1987; Argentina), Elix (*Flora of Australia* 55: 21, 1994), Heiman & Elix (*Mycotaxon* 70: 163, 1999; N. America), Blanco *et al.* (*Mycol.* 97: 150, 2005; phylogeny), Blanco *et al.* (*Mol. Phylogen. Evol.* 39: 52, 2006; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Canterina** Karling (1971), ? Endochytriaceae. 1, British Isles. See Karling (*Arch. Mikrobiol.* 76: 129, 1971).
- Cantharellaceae** J. Schröt. (1888), Cantharellales. 5 gen. (+ 10 syn.), 92 spp.
Lit.: Corner (*Beih. Sydowia* 1: 266, 1957), Petersen & Mueller (*Boln Soc. argent. Bot.* 28: 195, 1992), Danell (*Mycorrhiza* 5: 89, 1994), Feibelman *et al.* (*MR* 101: 1423, 1997), Redhead *et al.* (*Mycotaxon* 65: 285, 1997), Watling (*Nature Lond.* 365: 299, 1997), Li *et al.* (*Acta Sci. nat. Univ. Sunyats.* 38: 29, 1999), Pine *et al.* (*Mycol.* 91: 944, 1999), Dahlman *et al.* (*MR* 104: 388, 2000), Dunham *et al.* (*MR* 107: 1163, 2003), Dunham *et al.* (*Mol. Ecol.* 12: 1607, 2003).
- Cantharellales** Gäum. (1926). Agaricomycetes. 7 fam., 38 gen., 544 spp. Basidioma either funnel-shaped or tubular or stalked and pileate, monomitic, the hymenophore smooth, wrinkled, or folded to form thick gill-like structures; spores smooth, hyaline, non-amylloid; terrestrial, humicolous. Fams:
- (1) **Aphelariaceae**
 - (2) **Botryobasidiaceae**
 - (3) **Cantharellaceae**
 - (4) **Ceratobasidiaceae**
 - (5) **Clavulinaceae**
 - (6) **Hydnaceae**
 - (7) **Tulasnellaceae**
- Lit.*: Donk (1964: 247), Corner (*A monograph of the cantharelloid fungi* [Ann. Bot. Mem. 2], 1966; *New Phytol.* 67: 219, 1968; *Nova Hedw.* 27: 325, 1976), Bigelow (*Mycol.* 70: 707, 1978; New England spp.), Moncalvo *et al.* (*Mycol.* 98: 937, 2006), Hibbett *et al.* (*MR* 111: 509, 2007), Weiss *et al.* (*Frontiers in Basidiomycote Mycology*: 7, 2004), Binder *et*

- al.* (*Systematics and Biodiversity* 3: 113, 2005), and under fams.
- Cantharellopsis** Kuyper (1986), Tricholomataceae. 1, Europe. See Kuyper (*La Famiglia delle Tricholomataceae* Atti del Convegno Internazionale del 10-15 Settembre 1984, Borgo Val di Taro, Italy: 99, 1986), Redhead *et al.* (*Mycotaxon* 83: 19, 2002; phylogeny).
- Cantharellula** Singer (1936), Tricholomataceae. 2, widespread (temperate). See Singer (*Revue Mycol.* Paris 1: 281, 1936), Redhead *et al.* (*Mycotaxon* 83: 19, 2002; phylogeny).
- Cantharellus** Adans. ex Fr. (1821), Cantharellaceae. 65, widespread. *C. cibarius*, the edible chanterelle. See Smith & Morse (*Mycol.* 39: 497, 1947), Corner (*Beih. Sydowia* 1, 1957), Heinemann (*Fl. Icon. Champ. Congo* 8: 154, 1959; keys 17 spp. Congo), Eyssartier & Buyck (*Aust. Syst. Bot.* 14: 587, 2001; Australia), Redhead *et al.* (*Taxon* 51: 559, 2002; nomenclature), Gulden (*Sopp og Nyttevekster* 1: 10, 2005; key nordic spp.).
- Cantharocybe** H.E. Bigelow & A.H. Sm. (1973), Pleurotaceae. 1, N. America. See Bigelow & Smith (*Mycol.* 65: 486, 1973).
- Cantharomyces** Thaxt. (1890), Laboulbeniaceae. 27, widespread. See Weir & Hammond (*Biodiv. Cons.* 6: 701, 1997; ecology, biodiversity), Rossi & Santamaria (*Mycol.* 92: 786, 2000; on *Staphylinidae*), Santamaria (*Fl. Mycol. Iberica* 5, 2003; Iberian peninsula), Shen *et al.* (*Mycosystema* 23: 303, 2004; China).
- Cantharosphaeria** Thaxt. (1920) = *Eriosphaeria* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- cap**, see pileus.
- capillaceous**, see capilliform.
- Capillaria** Pers. (1822), anamorphic *Pezizomycotina*, Hso.?.?. 4, widespread (temperate).
- Capillaria** Velen. (1947) [non *Capillaria* Roussel 1806, *Algae*] = *Lycoperdon* Pers. fide Stalpers (*in litt.*).
- Capillatasporea** K.D. Hyde (1989), Dothideomycetes. 1, Brunei. See Hyde (*CJB* 67: 2522, 1989), Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 34: 1, 1991).
- capilliconidium**, a secondary conidium produced on a long capillary tube in *Entomophthorales*.
- capilliform**, hair-like; thread-like; capillaceous.
- Capillipes** R. Sant. (1956), Helotiaceae. 1, Lapland. See Santesson (*Friesia* 5: 390, 1956).
- Capillistichus** Santam. (2004), Laboulbeniaceae. 1, Spain. See Santamaria (*Mycol.* 96: 763, 2004).
- capillitium** (of *Mycetozoa* and gasteroid *Agaricomycotina*), a mass of sterile, thread-like elements, tubes or fibres among the spores.
- capitate**, having a well-formed head (Figs 29.9, 37.18).
- capitate-fastigiate** (of macrolichens), having a thallus cortex of erect, parallel hyphae terminated by swollen and pigmented apical cells.
- capitellum**, a little head.
- Capitoclavaria** Lloyd (1922) ? = *Clavaria* fide Stalpers (*in litt.*).
- Capitorostrum** Bat. (1957), anamorphic *Pezizomycotina*, Cpd.0eH.15. 2, Australia; Papua New Guinea. See Hyde & Philemon (*Mycotaxon* 42: 95, 1991).
- Capitotricha** (Raitv.) Baral (1985), Hyaloscyphaceae. 3, widespread. See Raitviir (*Eesti NSV Tead. Akad. Toim. Biol.* seer 36: 313, 1987), Leenurm *et al.* (*Sydowia* 52: 30, 2000; ultrastr.), Suková (*Czech Mycol.* 57: 139, 2005; Czech Republic).
- Capitularia** Flörke (1807) = *Cladonia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Capitularia** Rabenh. (1851) = *Uromyces* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- capitulum**, a stalked globose apical apothecium, as in the *Caliciales*. Cf. *mazaedium*.
- Capnia** Vent. (1799) = *Dermatocarpon* Eschw. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Capniomyces** S.W. Peterson & Lichtw. (1983), Legeriomycetaceae. 2 (in *Plectoptera*), Spain; USA. See Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986), White (*MR* 110: 1011, 2006; phylogeny), Valle (*Mycol.* 99: 442, 2007; Spain).
- Capnites** Theiss. (1916) [non *Capnites* (DC.) Dumort. 1827, *Papaveraceae*] = *Phaeosaccardinula* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Capnobatista** Cif. & F.B. Leal ex Bat. & Cif. (1963) = *Trichomerium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Capnobotryella** Sugiy. (1987), anamorphic *Capnodiales*, Hso.1eP.1/12. 2, Japan. See Titze & de Hoog (*Antonie van Leeuwenhoek* 58: 265, 1990; *C. renispora* on roof tile), Sterflinger *et al.* (*Stud. Mycol.* 43: 5, 1999; ecology), Hambleton *et al.* (*Mycol.* 95: 959, 2003; morphology), Tsuneda *et al.* (*Rep. Tottori Mycol. Inst.* 41: 1, 2003; conidiogenesis, phylogeny), Crous *et al.* (*Stud. Mycol.* 58: 1, 2007), Sert *et al.* (*MR* 111: 1235, 2007; Turkey).
- Capnobotrys** S. Hughes (1970), anamorphic *Metacapnodium*, Hso.≡ eP.10. 1, Austria. See Hughes (*N.Z. Jl Bot.* 8: 205, 1970), Reynolds (*CJB* 76: 2125, 1998; phylogeny), Tsuneda *et al.* (*Rep. Tottori Mycol. Inst.* 41: 1, 2003; phylogeny).
- Capnocheirides** J.L. Crane & S. Hughes (1982), anamorphic *Capnodiales*, Hso.0≡ eP.38. 1, Europe. See Crane & Hughes (*Mycol.* 74: 752, 1982).
- Capnociferria** Bat. (1963) = *Antennulariella* fide Hughes (*Mycol.* 68: 693, 1976).
- Capnocrinum** Bat. & Cif. (1963) = *Antennulariella* fide Hughes (*Mycol.* 68: 693, 1976).
- Capnocybe** S. Hughes (1966), anamorphic *Metacapnodiaceae*, Hso.≡ eP.10. 3, New Zealand; USA. See Hughes (*N.Z. Jl Bot.* 4: 335, 1966).
- Capnodaria** (Sacc.) Theiss. & Syd. (1918), Capnodiaceae. 1, Europe.
- Capnodendron** S. Hughes (1976), anamorphic *Antennulariella*, Hso.≡ eP.3. 3, widespread. See Hughes (*Mycol.* 68: 750, 1976), Hughes (*CJB* 78: 1215, 2000), Hughes (*N.Z. Jl Bot.* 41: 139, 2003).
- Capnodenia** (Sacc.) Theiss. & Syd. (1917) = *Capnodium* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Capnodiaceae** Höhn. ex Theiss. (1916), Capnodiales. 26 gen. (+ 28 syn.), 117 spp.
- Lit.*: Batista & Ciferri (*Saccardo* 2, 1963), Reynolds (*Taxon* 20: 759, 1971; hyphal morph.), Reynolds (*Nova Hedwigia* 26: 179, 1975; growth forms), Hughes (*Mycol.* 68: 693, 1976; gen. names, anamorphs), Reynolds (*Mycotaxon* 8: 417, 1979; stalked taxa), Rodríguez Hernández (*Revta Jardín bot. Nac Univ. Habana* 6: 53, 1985), Parbery & Brown (*Microbiology of the Phyllosphere*: 101, 1986), Reynolds (*Mycotaxon* 27: 377, 1986; cladistics), Reynolds *in* Sugiyama (Ed.) (*Pleomorphic Fungi: The Diversity and its Taxonomic Implications*: 157, 1987), Mibey

- (*Soft Scale Insects. Their Biology, Natural Enemies and Control World Crop Pests* 7A: 275, 1997), Inácio & Dianese (*MR* 102: 695, 1998), Reynolds (*CJB* 76: 2125, 1998; phylogeny), Olejnik & Ingrouille (*MR* 103: 333, 1999), Reynolds (*CJB* 76: 2125, 1998), Sterflinger *et al.* (*Stud. Mycol.* 43: 5, 1999; phylogeny), Reynolds (*Mycopathologia* 148: 141, 1999), Lindemuth *et al.* (*MR* 105: 1176, 2001), Lumbsch & Lindemuth (*MR* 105: 901, 2001), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Capnodiales** Woron. (1925). Dothideomycetidae. 9 (?+1) fam., 198 gen., 7244 spp. Mycelium superficial, often well-developed, dark, very varied in form, composed of sometimes irregular $\pm$ cylindrical or torulose hyphae, sometimes with erect branches, sometimes with mucous coating. Ascomata small, globose or vertically elongated, thin-walled, sometimes covered in a mucous layer, sometimes setose or with hyphal appendages, opening either with a clearly-defined ostiole or a poorly-defined lysigenous pore. Interascal tissue absent or composed of inconspicuous periphysoids. Asci small, ovoid or saccate, fissitunicate, not blueing in iodine or rarely with a J+ exterior layer. Ascospores hyaline to brown, septate, sometimes muriform, rarely ornamented, sheath lacking. Anamorphs very varied. Plant parasites (including many important pathogen genera), saprobes or sooty moulds. Fams.:
- (1) **Antennulariaceae**
 - (2) **Capnodiaceae**
 - (3) **Davidiellaceae**
 - (4) **Euantennariaceae**
 - (5) **Metacapnodiaceae**
 - (6) **Mycosphaerellaceae**
 - (7) **Piedraiaceae**
 - (8) **Schizothyriaceae**
 - (9) **Teratosphaeriaceae**
- The *Asterinaceae* may also belong here, but molecular data are inadequate.
- Lit.*: Crous *et al.* (*Stud. Mycol* 58: 1, 2007; phylogeny), Reynolds (*CJB* 76: 2125, 1998; phylogeny), Schoch *et al.* (*Mycol* 98: 1041, 2006; phylogeny), Sterflinger *et al.* (*Stud. Mycol.* 43: 5, 1999; phylogeny).
- Capnodiastrum** Speg. (1886), anamorphic *Rhytidenglerula*, Cpd.1eP.1. 5, widespread (esp. S. America). See Hughes in Sugiyama (Ed.) (*Pleomorphic Fungi: The Diversity and its Taxonomic Implications*: 103, 1987).
- Capnodiella** (Sacc.) Sacc. (1905) $\equiv$ *Sorica*.
- Capnodina** (Sacc.) Sacc. (1926) = *Antennulariella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Capnodinula** Bat. & Cif. (1963), Capnodiales. 1, Australia. See Batista & Ciferri (*Saccardo* 2: 81, 1963).
- Capnodinula** Speg. (1918) = *Wentomyces* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Capnodiopsis** Henn. (1902) = *Mollerella* fide von Arx (*Persoonia* 2: 421, 1963).
- Capnodium** Mont. (1848), Capnodiaceae. Anamorphs *Fumagospora*, *Phaeoxyphiella*, *Polychaetella*, *Scolecoxyphium*. c. 15, widespread. See Reynolds (*Bull. Torrey bot. Club* 97: 253, 1970), Reynolds (*Mycotaxon* 34: 197, 1989; California), Reynolds (*CJB* 76: 2125, 1998; phylogeny), Sterflinger *et al.* (*Stud. Mycol.* 43: 5, 1999; phylogeny), Lumbsch & Lindemuth (*MR* 105: 901, 2001; phylogeny), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Capnofrasera** S. Hughes (2003), anamorphic *Antennulariaceae*. 1, New Zealand. See Hughes (*N.Z. J Bot.* 41: 139, 2003).
- Capnogoniella** Bat. & Cif. (1963) nom. conf., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Capnogonium** Bat. & Peres (1961) = *Brooksia* fide Deighton & Pirozynski (*Mycol. Pap.* 105, 1966).
- Capnokyma** S. Hughes (1975), anamorphic *Euantennariaceae*, Hso. $\equiv$ eP.1. 2, New Zealand; Venezuela. See Hughes (*N.Z. J Bot.* 13: 638, 1975), Hughes (*Mycol.* 93: 603, 2001).
- Capnophaeum** Speg. (1918), ? Capnodiaceae. 2, Asia.
- Capnophialophora** S. Hughes (1966), anamorphic *Metacapnodium*, Hso.0eH.15. 3, New Zealand. See Hughes (*N.Z. J Bot.* 4: 352, 1966).
- Capnosporium** S. Hughes (1976), anamorphic *Metacapnodium*, Hso.1 $\equiv$ eP.28. 1, New Zealand. See Hughes (*Mycol.* 68: 752, 1976).
- Capnostysanus** Speg. (1918) = *Stysanus* fide Clements & Shear (*Gen. Fung.*, 1931).
- Cappellettia** Tomas. & Cif. (1952) = *Gyalidea* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Caprettia** Bat. & H. Maia (1965), Monoblastiaceae (L). 6 (foliicolous), pantropical. See Batista & Maia (*Atas Inst. Micol. Univ. Pernambuco* 2: 377, 1965), Lücking *et al.* (*Lichenologist* 30: 121, 1998), Sérusiaux & Lücking (*Biblthca Lichenol.* 86: 161, 2003; revision).
- Capricola** Velen. (1947), ? Helotiales. 1, Europe.
- Capronia** Sacc. (1883), Herpotrichiellaceae. Anamorphs *Exophiala*, *Rhinocladiella*, *Cladophialophora*, *Phialophora*. 27, Europe; N. America. See Müller *et al.* (*TBMS* 88: 63, 1987; key), Barr (*Mycotaxon* 41: 419, 1991; key N. Am. spp.), Untereiner *et al.* (*MR* 99: 897, 1995; molec. taxonomy), Au *et al.* (*Mycol.* 91: 326, 1999; ultrastr.), Haase *et al.* (*Stud. Mycol.* 43: 80, 1999; phylogeny), Untereiner & Malloch (*Mycol.* 91: 417, 1999; biochemistry), Untereiner & Naveau (*Mycol.* 91: 67, 1999; phylogeny), Untereiner (*Stud. Mycol.* 45: 141, 2000), Lindemuth *et al.* (*MR* 105: 1176, 2001; phylogeny), Hoog *et al.* (*J. Clin. Microbiol.* 41: 4767, 2003), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny), Sterflinger (*The Yeast Handbook* [1]: 501, 2006; ecology).
- Caproniella** Berl. (1896), *Pezizomycotina*. 2, Europe. See Holm (*Taxon* 24: 475, 1975).
- Caproniella** Berl. (1899) = *Capronia* fide Müller *et al.* (*TBMS* 88: 63, 1987).
- Caproventuria** U. Braun (1998) = *Venturia* Sacc. fide Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 2: 493, 1998), Braun *et al.* (*Mycol. Progr.* 2: 3, 2003; phylogeny), Beck *et al.* (*Mycol. Progr.* 4: 111, 2005; phylogeny), Crous *et al.* (*Stud. Mycol.* 58: 185, 2007; phylogeny).
- Capsicumyces** Gamundí, Aramb. & Gaiotti (1979), anamorphic *Pezizomycotina*, Hso.0eH.11. 1, Argentina. See Gamundí *et al.* (*Darwiniana* 22: 190, 1979).
- capsidiol**, a phytoalexin (q.v.) from spur pepper (*Cap-sicum frutescens*).
- Capsulasclerotes** Malan (1959), Fossil Fungi. 1 (Permian), former Czechoslovakia.
- capsule**, a hyaline gelatinous sheath surrounding the cell of certain yeasts and bacteria.
- Capsulospora** K.D. Hyde (1996), Xylariales. 8 (sapro-bic on palms), S.E. Asia. See Kang *et al.* (*Fungal Di-*

- versity 1: 147, 1998; DNA), Kang *et al.* (*Mycoscience* 40: 151, 1999), Kang *et al.* (*Mycotaxon* 81: 321, 2002; phylogeny).
- Capsulotheca** Kamyschko (1960), ? Trichocomaceae. 1, former USSR. See Benny & Kimbrough (*Mycotaxon* 12, 1980).
- Carassea** S. Stenroos (2002), Cladoniaceae (L.). 1, Brazil. See Stenroos *et al.* (*Mycol. Progr.* 1: 277, 2002), Zhou *et al.* (*J. Hattori bot. Lab.* 100: 871, 2006; phylogeny).
- Carbacanthographis** Staiger & Kalb (2002), Graphidaceae (L.). 11, widespread. See Staiger (*Bibliotheca Lichenol.* 85: 98, 2002), Nakanishi *et al.* (*Bull. natn. Sci. Mus. Tokyo*, B 29: 83, 2003; Japan), Archer (*Bibliotheca Lichenol.* 94, 2006; Australia), Archer (*Systematics & Biodiversity* 5: 9, 2007; Solomon Is).
- Carbomyces** Gilkey (1954), Carbomycetaceae. 3, USA. See Trappe (*TBMS* 57: 85, 1971), Zak & Whitford (*Mycol.* 78: 840, 1986; ecology), Trappe & Weber (*Harvard Pap. Bot.* 6: 209, 2001), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Carbomycetaceae** Trappe (1971), Pezizales. 1 gen., 3 spp.
Lit.: Trappe (*Mycotaxon* 9: 297, 1979), Zak & Whitford (*Mycol.* 78: 840, 1986), Trappe & Weber (*Harvard Pap. Bot.* 6: 209, 2001), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- carbonaceous**, dark-coloured and readily broken; charcoal-like or cinder-like.
- Carbonea** (Hertel) Hertel (1983), Lecanoraceae ($\pm$ L.). 20 (mainly on lichens), widespread. See Knoph (*Mycotaxon* 72: 97, 1999), Grube *et al.* (*MR* 108: 506, 2004; phylogeny).
- carbonicolous**, living on burnt ground; pyrophilous (q.v.).
- Carbosphaerella** I. Schmidt (1969), Halosphaeriaceae. 2 (marine), widespread. See Johnson *et al.* (*Bot. Mar.* 27: 557, 1984), Sundari *et al.* (*Bot. Mar.* 39: 327, 1996).
- Carcinomyces** Oberw. & Bandoni (1982), Carcinomycetaceae. 2, north temperate. See Oberwinkler & Bandoni (*Nordic Jl Bot.* 2: 507, 1982).
- Carcinomycetaceae** Oberw. & Bandoni (1982), Tremellales. 3 gen. (+ 2 syn.), 25 spp.
Lit.: Hauerslev (*Friesia* 9: 43, 1969), Gottschalk & Blanz (*Z. Mykol.* 51: 205, 1985), Ginns (*Mycol.* 78: 619, 1986), Oberwinkler (*Stud. Mycol.* 30: 61, 1987), Kotiranta & Larsson (*Windahlia* 18: 1, 1988), Rath (*Atti Soc. ital. Sci. nat. Mus. Civico Storia nat. Milano* 132: 13, 1991).
- Carestiella** Bres. (1897), Stictidaceae ($\pm$ L.). 1, Europe. See Sherwood (*Mycotaxon* 5: 1, 1977), Wedin *et al.* (*Lichenologist* 37: 67, 2005; phylogeny), Wedin *et al.* (*MR* 110: 773, 2006; nests within paraphyletic *Stictis*).
- Caribaeomyces** Cif. (1962), Microthyriaceae. 1, Dominican Republic. See Ciferri (*Atti Ist. bot. Univ. Lab. crittog. Pavia sér. 5* 19: 98, 1962).
- carinate**, keeled; boat-like.
- Carinisporea** K.D. Hyde (1992), Phaeosphaeriaceae. 1 (on *Nypa*), Brunei. See Hyde (*J. Linn. Soc. Bot.* 110: 95, 1992).
- cariose**, decayed.
- carioso-cancellate**, becoming latticed by decay.
- Caripia** Kuntze (1898), Marasmiaceae. 1, America (tropical). See Corner (*Ann. Bot. Mem.* [A monograph of *Clavaria* and allied genera] 1, 1950), Singer (*Agaric. mod. Tax.* edn 2: 792, 1962).
- Carlia** Rabenh. (1857) nom. dub., Fungi. See Wakefield (*TBMS* 23: 215, 1939).
- Carlosia** G. Arnaud (1954) = *Isthmospora* fide Kendrick & Carmichael in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 390, 1973).
- Carlosia** Samp. (1923) = *Thelomma* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Paz-Bermúdez *et al.* (*Taxon* 51: 771, 2002; typification).
- Carmichaelia** N.D. Sharma (1980), anamorphic *Pezizomycotina*, Hso.0eP.10. 1, India. See Sharma (*J. Indian bot. Soc.* 59: 278, 1980), Hambleton *et al.* (*Stud. Mycol.* 53: 29, 2005).
- carminophilic** (of basidia), becoming densely granular (= siderophilous (or carminophilous) granulation) after treatment with aceto-carmin stain.
- Carneopezizella** Svrček (1987), Helotiaceae. 1, former Czechoslovakia. See Svrček (*Česká Mykol.* 41: 88, 1987).
- Carnia** Bat. (1960), *Pezizomycotina*. 1, Brazil. Affinities unknown: the original link suggested with *Pezizaceae* is unlikely.
- carnose** (carnous), fleshy.
- Carnostroma** Lloyd (1919) = *Xylaria* Hill ex Schrank fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954), Læssøe (*SA* 13: 43, 1994; ? synonym of *Xylaria*).
- Carnoya** Dewèvre (1893) = *Mortierella* fide Hesseltine (*Mycol.* 47: 344, 1955).
- carnulose**, somewhat fleshy.
- Caromyxa** Mont. (1856) nom. inval. = *Mutinus* fide Stalpers (*in litt.*).
- carotene**, a mixture of pigments, chiefly the carotenoid β -carotene, found in various fungi, e.g. *Phycomyces blakesleeanus* (Lilly *et al.*, *Bull. W. Va. agric. Exp. Stn* 441T, 1960), *Choanephora cucurbitarum* (Chu & Lilly, *Mycol.* 52: 80, 1961); **carotenoids**, a large group of related polyene compounds, mostly with C₄₀, yellow, red or more rarely colourless. Many have been given trivial names, e.g. torularhodin, neurosporene. See Hesseltine (*Tech. Bull. USDA* 1245, 1961; *Mucorales*), Arpin (*Bull. mens. Soc. linn. Lyon* 38, 1968; *BSMF* 84: 427, 1969; *discomycetes*), Shibata *et al.* (*List of fungal products*, 1964; 24 refs.), Valadon (*TBMS* 67: 1, 1976; taxonomic value of carotenoids). See Metabolic products.
- Carothecis** Clem. (1931) ? = *Cephalotheca* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Carouxella** Manier, Rioux & Whisler (1965), Harpellaceae. 2 (in *Diptera*), France; Argentina. See Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986), Lichtwardt *et al.* (*Mycol.* 91: 1060, 1999; Argentina).
- Carpenteles** Langeron (1922) = *Eupenicillium* fide Stolk & Scott (*Persoonia* 4: 391, 1967), Pitt *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 9, 2000).
- Carpenterella** Tehon & H.A. Harris (1941), Synchroniaceae. 2, USA; India.
- Carpobolus** P. Micheli ex Paulet (1808) [non *Carpobolus* Schwein. 1822, *Hepaticae*] $\equiv$ *Sphaerobolus*.
- carpogenous**, living on fruit.
- carpogonium** (generally of algae, sometimes of fungi, e.g. *Erysiphaceae*), the female sex organ.
- carpoid**, see *Biatoropsis*.
- Carpoligna** F.A. Fernández & Huhndorf (1999), Sordariales. Anamorph *Pleurothecium*. 1, widespread. See Fernández *et al.* (*Mycol.* 91: 251, 1999), Réblová & Winka (*Mycol.* 93: 478, 2001).

- Carpolithes** Brongn. (1822), Fossil Fungi, anamorphic *Fungi*, Hso.???. 1.
- Carpomycetes**, fungi having sporocarps; esp. ascomycetes and basidiomycetes.
- carpophore** (1) stalk of the sporocarp; (2) sometimes (esp. in France) = basidioma.
- carpophoroid**, a sterile carpophore-like body, in agarics, of unknown function (Singer, 1962: 22).
- Carpophoromyces** Thaxt. (1931), Laboulbeniaceae. 1, Sri Lanka. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- Carpozyma** L. Engel (1872) = *Hanseniaspora* fide Lodder (*Yeasts, a taxonomic study* 2nd edn, 1970).
- carrier**, an organism harbouring a parasite without itself showing disease (Anon., *TBMS* 33: 154, 1950).
- Carrionia** Bric.-Irag. (1938) = *Rhinocladia* Nannf. fide Schol-Schwarz (*Antonie van Leeuwenhoek* 34: 119, 1968).
- Carrismyces** R.F. Castañ & Heredia (2000), anamorphic *Pezizomycotina*. 1, Mexico. See Castañeda Ruiz & Heredia (*Mycotaxon* 76: 125, 2000).
- cartilaginous**, firm and tough but readily bent.
- cartilaginous layer**, sometimes applied to the sterome in *Cladonia* and the chondroid axis (q.v.) in *Usnea*.
- Cartilosoma** Kotl. & Pouzar (1958) = *Antrodia* fide Pegler (*The polypores [Bull. BMS Suppl.]*, 1973), Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974) Accepted by.
- caryallagic** (of reproduction), having nuclear change; **acaryallagic**, not having nuclear change, as in clone development (Link, *Bot. Gaz.* 88: 1, 1929).
- caryo-**, see karyo.
- Caryospora** De Not. (1855), Zopfiaceae. 6, widespread. See Barr (*Mycotaxon* 9: 17, 1979), Hawksworth (*TBMS* 79: 69, 1982), Hyde (*TMSJ* 30: 333, 1989), Abdel-Wahab & Jones (*Mycoscience* 41: 379, 2000).
- Caryosporella** Kohlm. (1985), ? Melanommataceae. 1 (on *Rhizophora*), widespread (pantropical). See Kihlmeyer (*Proc. Indian Acad. Sci. Pl. Sci.* 94: 355, 1985), Hyde (*TMSJ* 30: 333, 1989).
- Casaresia** Gonz. Frag. (1920), anamorphic *Mollisia*, Hso.0bP.1. 1 (aquatic), widespread (north temperate). See Webster *et al.* (*Nova Hedwigia* 57: 483, 1993; teleomorph connection).
- Cashiella** Petr. (1951), Dermateaceae. 3, N. America; New Zealand. See Petrak (*Sydowia* 5: 371, 1951), Gadgil & Dick (*N.Z. J. For. Sci.* 29: 440, 1999; New Zealand).
- cassideous**, helmet-shaped.
- Castagnella** G. Arnaud (1914) = *Rhagadostoma* fide Müller & von Arx in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 87, 1973).
- Castanedaia** W.A. Baker & Partridge (2001), anamorphic *Pezizomycotina*. 1, Cuba. See Partridge *et al.* (*Mycotaxon* 78: 176, 2001).
- Castanedomyces** Cano, L.B. Pitarch & Guarro (2002), Onygenaceae. 1, Australia. See Cano *et al.* (*Stud. Mycol.* 47: 167, 2002).
- Castanoporus** Ryvarden (1991), Meruliaceae. 1, Japan. See Ryvarden (*Syn. Fung.* 5: 121, 1991).
- Castellania** C.W. Dodge (1935) = *Candida* fide Didens & Lodder (*Die anaskosporogenen Hefen* 2, 1942).
- Castoreum** Cooke & Massee (1887), Mesophelliaceae. 3, Australia. See Cunningham (*Proc. Linn. Soc. N. S. W.* 57: 313, 1932), Beaton & Weste (*TBMS* 82: 665, 1984), Trappe & Bougher (*Australasian Mycologist* 21: 9, 2002; key).
- Catabotrydaceae** Petr. ex M.E. Barr (1990), Boliniales. 1 gen. (+ 1 syn.), 1 spp.
Lit.: Barr (*Mycotaxon* 39: 43, 1990), Hyde & Cannon (*Mycol. Pap.* 175, 1999), Hyde & Cannon (*Mycol. Pap.* 175: 114 pp., 1999), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Huhndorf *et al.* (*Mycol.* 96: 368, 2004).
- Catabotrys** Theiss. & Syd. (1915), Catabotrydaceae. 1 (on *Palmae*), widespread (tropical). See Seaver & Waterston (*Mycol.* 38: 180, 1946), Hyde & Cannon (*Mycol. Pap.* 175, 1999), Huhndorf *et al.* (*Mycol.* 96: 368, 2004; phylogeny).
- Catacauma** Theiss. & Syd. (1914) = *Phyllachora* Nitschke ex Fuckel (1870) fide Petrak (*Annls mycol.* 22: 1, 1924), Cannon (*Mycol. Pap.* 165, 1991).
- Catacaumella** Theiss. & Syd. (1915) = *Vestergrenia* Rehm fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Catachyon** (Ehrenb. ex Fr.) Fr. (1832) = *Podaxis* fide Kuyper (*in litt.*).
- catahymenium**, see hymenium.
- cataphyses**, pseudoparaphyses (Groenhart, *Persoonia* 4: 11, 1965); see hamathecium.
- Catapyrenium** Flot. (1850), Verrucariaceae (L.). 60, widespread (esp. temperate). See Breuss (*Stapfia* 23: 1, 1990; key 27 spp. Europe), Breuss (*Pl. Syst. Evol.* 185: 17, 1993; key 13 spp. S. Am.), Breuss (*Nova Hedwigia* 58: 229, 1994; key 12 N. Afr. spp.), Breuss (*Annln naturh. Mus. Wien Ser. B, Bot. Zool.* 98: 35, 1996), Breuss (*Annln naturh. Mus. Wien Ser. B, Bot. Zool.* 100: 671, 1998), Breuss (*Linzer biol. Beitr.* 32: 1053, 2000; Mexico), Aragón (*An. Jard. bot. Madr.* 60: 216, 2002; Spain), Heiðmarsson (*MR* 107: 459, 2003; phylogeny), Gueidan *et al.* (*MR* 111: 1145, 2007; phylogeny).
- Cataractispora** K.D. Hyde, S.W. Wong & E.B.G. Jones (1999), Annulatascaceae. 5, S.E. Asia. See Hyde *et al.* (*MR* 103: 1019, 1999), Ho *et al.* (*Mycol.* 96: 411, 2004; Hong Kong).
- Catarraphia** A. Massal. (1860), Arthoniales (L.). 1, Malesian-Pacific. See Egea & Torrente (*Cryptog. Bryol.-Lichénol.* 14: 329, 1993), Grube (*Bryologist* 101: 377, 1998; phylogeny).
- Catarrhospira** Brusse (1994), Porpidiaceae (L.). 2, S. Africa. See Brusse (*Mycotaxon* 52: 501, 1994).
- cata-species**, see *Pucciniales*.
- Catastoma** Morgan (1892) = *Disciseda* fide Stalpers (*in litt.*).
- catathecium**, a flattened ascoma, having the wall more or less radial in structure, and with a basal plate, e.g. *Trichothyria*; cf. thyriothecium.
- Catathelasma** Lovejoy (1910), Tricholomataceae. 4, widespread (north temperate). See Singer (*Sydowia* 31: 193, 1979; key).
- Catathelasmataceae** Wasser (1985) = Tricholomataceae.
- Catatrampa** Franco-Mol. (1991), Amanitaceae. 1, Costa Rica; India. See Franco-Molano (*Mycol.* 83: 501, 1991).
- Catenaria** Sorokin (1889), Catenariaceae. 11, widespread (temperate). See Birchfield (*Mycopathologia* 13: 331, 1960), Olson & Reichle (*TBMS* 70: 423, 1978; meiosis), Singh *et al.* (*MR* 97: 957, 1993; development).
- Catenariaceae** Couch (1945), Blastocladales. 3 gen. (+ 1 syn.), 14 spp.
Lit.: Manier (*Annls Parasit. hum. comp.* 52: 363,

- 1977), Tanabe *et al.* (*J. gen. appl. Microbiol.* Tokyo 51: 267, 2005).
- catenate (catenulate)**, in chains or end-to-end series. See arthro-, baso-, blastocatenate.
- Catenella** Bat. & Peres (1963), anamorphic *Pezizomycotina*, St.0eH.?. 1, Italy. See Batista & Peres (*Publções Inst. Micol. Recife* 222: 6, 1963).
- Catenochytridium** Berdan (1939), Endochytriaceae. 6, N. America; Japan.
- Catenocuneiphora** Matsush. (2003), anamorphic *Pezizomycotina*, Hso.?.?. 1, Japan. See Matsushima (*Matsush. Mycol. Mem.* 10: 40, 2001).
- Catenomyces** A.M. Hanson (1944), Catenariaceae. 1, USA.
- Catenomycopsis** Tibell & Constant. (1991), anamorphic *Chaenothecopsis*, Hso.0eH.3. 1, S. America; Australasia. See Tibell & Constantinescu (*MR* 95: 556, 1991).
- Catenophlyctis** Karling (1965), Catenariaceae. 2, widespread. See Golubeva & Stephenson (*N.Z. Jl Bot.* 41: 319, 2003; from subantarctic).
- Catenophora** Luttr. (1940), anamorphic *Pezizomycotina*, Cac.0eH.1. 3, USA. See Nag Raj & Kendrick (*CJB* 66: 898, 1988; key).
- Catenophoropsis** Nag Raj & W.B. Kendr. (1988), anamorphic *Pezizomycotina*, Cac.0eH.10. 1, Australasia. See Nag Raj & Kendrick (*CJB* 66: 898, 1988).
- catenophysis**, a persistent chain of utricular, thin-walled cells formed by the vertical separation of the pseudoparenchyma in the centrum of certain ascomycetes, e.g. some *Halosphaeriaceae* (see Kohlmeyer & Kohlmeyer, *Mycol.* 63: 857, 1971).
- Catenospegazzinia** Subram. (1991), anamorphic *Pezizomycotina*, Hso.#eP.37/5. 2, Australia. See Subramanian (*Curr. Sci.* 60: 657, 1991).
- Catenosubulisporea** Matsush. (1971), anamorphic *Pezizomycotina*, Hso.0fH.3. 1, Guadalcanal. See Matsushima (*Microfungi of the Solomon Islands and Papua-New Guinea*: 10, 1971).
- Catenosynnema** Kodsueb, E.H.C. McKenzie, W.H. Ho, K.D. Hyde, P. Lumyong & S. Lumyong (2007), anamorphic *Pezizomycotina*. 1, Thailand. See Kodsueb *et al.* (*Cryptog. Mycol.* 28: 237, 2007).
- Catenularia** Grove (1886), anamorphic *Chaetosphaeria*, Hso.0eP.17. 10, widespread (temperate). See Hughes (*N.Z. Jl Bot.* 3: 136, 1965), Réblová (*Stud. Mycol.* 45: 149, 2000; review), Réblová & Seifert (*Sydowia* 55: 313, 2003; Thailand).
- Catenulaster** Bat. & C.A.A. Costa (1959), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, Brazil. See Batista & Costa (*Mycopath. Mycol. appl.* 11: 8, 1959).
- catenulate**, see catenate.
- Catenulifera** Hosoya (2002), anamorphic *Hyphodiscus*, H??.?. 1, north temperate. See Hosoya (*Myco-science* 43: 48, 2002), Untereiner *et al.* (*CJB* 84: 243, 2006; phylogeny, connection).
- catenuliform**, chain-like.
- Catenulopsora** Mundk. (1943) = *Cerotelium* fide Laundon (*Mycotaxon* 3: 133, 1975).
- Catenulostroma** Crous & U. Braun (2007), *Terasphaeriaceae*. 7, widespread. See Crous *et al.* (*Stud. Mycol.* 58: 1, 2007; phylogeny, definition).
- Catenuloxypium** Bat., Nascim. & Cif. (1963) nom. dub., anamorphic *Pezizomycotina*. See Hughes (*Mycol.* 68: 693, 1976), Sutton (*Mycol. Pap.* 141, 1977).
- caterpillar fungi**, see vegetable caterpillars.
- Catharinia** (Sacc.) Sacc. (1895) = *Julella* fide Clements & Shear (*Gen. Fung.*, 1931).
- Cathisinia** Stirt. (1888) = *Sarcogyne* Flot. (1851) fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Catilla** Pat. (1915), Cyphellaceae. 1, Europe.
- Catillaria** A. Massal. (1852), Catillariaceae (L.). c. 158, widespread. See Lamb (*Rhodora* 56: 105, 1956), Vězda (*Folia geobot. phytotax.* 15: 75, 1980; key foliicolous spp.), Kiliass (*Herzogia* 5: 209, 1981; monogr. Eur. saxic. spp.), Coppins (*Lichenologist* 21: 217, 1989; UK), Pant & Awasthi (*Proc. Indian Acad. Sci. Pl. Sci.* 99: 369, 1989; key 10 Indian spp.), Coppins (*Graphis Scripta* 6: 65, 1994; Sweden), Fryday & Coppins (*Lichenologist* 28: 507, 1996; Scotland), Tretiach & Hafellner (*Lichenologist* 30: 221, 1998; Mediterranean), Boom & Etayo (*Lichenologist* 33: 103, 2001; Iberian peninsula), Andersen & Ekman (*MR* 109: 21, 2005; phylogeny), Kalb (*Biblhca Lichenol.* 95: 297, 2007; key).
- Catillariaceae** Hafellner (1984), Rhizocarpaceae (±L.). 8 gen. (+ 18 syn.), 261 spp.
Lit.: Coppins (*Lichenologist* 21: 217, 1989), Pant & Awasthi (*Proc. Indian Acad. Sci. Pl. Sci.* 99: 369, 1989), Fryday & Coppins (*Lichenologist* 28: 507, 1996), Lumbsch (*J. Hattori bot. Lab.* 83: 1, 1997), Ekman (*MR* 105: 783, 2001), Reeb *et al.* (*Mol. Phylogen. Evol.* 32: 1036, 2004).
- Catillariomyces** E.A. Thomas ex Cif. & Tomas. (1953) = *Cliostomum*.
- Catillariopsis** (Stein) M. Choisy (1950) = *Rhizocarpon* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Catillochroma** Kalb (2007), Megalariaceae (L.). 1, north temperate. See Kalb (*Biblhca Lichenol.* 95: 297, 2007).
- Catinaria** Vain. (1922) nom. cons., Ramalinaceae (L.). 2, widespread (temperate). See Poelt & Vězda (*Biblhca Lichenol.* 16, 1981), Kalb (*Biblhca Lichenol.* 95: 297, 2007; key).
- Catinariaceae** Hale ex Hafellner (1984) = *Ramalinaceae*.
- Catinella** Boud. (1907), Dothideomycetes. 1 or 2, widespread. See Spooner & Legon (*Mycologist* 5: 86, 1991), Nauta & Spooner (*Mycologist* 14: 21, 2000; UK), Greif *et al.* (*Am. J. Bot.* 94: 1890, 2007; posn, ontogeny).
- Catinella** Kirschst. (1924) = *Unguicularia* fide Raschle (*Sydowia* 29: 170, 1977).
- Catinopeltis** Bat. & C.A.A. Costa (1957), anamorphic *Pezizomycotina*, Cpt.≡ eH.?. 1, Brazil. See Batista & Costa (*An. Soc. Biol. Pernambuco* 15: 405, 1957).
- Catinula** Lév. (1848), anamorphic *Pezizomycotina*, Cpd.?.?. 10, widespread. See Jae & Sang (*Korean Jl Pl. Path.* 2: 174, 1986; Korea).
- Catocarpus**, see *Catocarpus*.
- Catocarpus** (Körb.) Arnold (1871) = *Rhizocarpon* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Catolechia** Flot. (1850), Rhizocarpaceae (L.). 1 (montane), Europe. See Hafellner (*Nova Hedwigia* 30: 673, 1978), Bellemère & Letrouit-Galinou (*Biblhca Lichenol.* 25: 137, 1987; ultrastr.), Grube *et al.* (*MR* 108: 1111, 2004; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Catopyrenium** Flot. ex Körb. (1855) = *Catapyrenium*.
- Catosphaeropsis** Tehon (1939) = *Sphaeropsis* Sacc. fide Sutton (*The Coelomycetes*, 1980).
- catothecium**, see *catathecium*.
- cat's ear**, basidiome of *Clitopilus passeckerianus*, an

- invader of mushroom beds.
- Cattanea** Garov. (1875) = *Dictyosporium* fide Damon (*Lloydia* 15: 118, 1952).
- Catulus** Malloch & Rogerson (1978), Dothideomycetes. 1 (on *Seuratia*), Canada. See Malloch & Rogerson (*CJB* 56: 2344, 1978).
- cauda**, tail; tail-like appendage.
- caudate**, having a tail.
- Caudatispora** J. Fröhl. & K.D. Hyde (1995), Sordariomycetidae. 2 (on *Palmae*), America (tropical). See Fröhlich & Hyde (*Sydowia* 47: 38, 1995), Huhndorf & Fernández (*Sydowia* 50: 200, 1998).
- Caudella** Syd. & P. Syd. (1916), Microthyriaceae. 2, America. See Hansford (*Mycol. Pap.* 15, 1946), Hosagoudar & Goos (*Mycotaxon* 59: 149, 1996), Pereira & Filardi (*Edinb. J. Bot.* 63: 263, 2006).
- Caudellopeltis** Bat. & H. Maia (1960) = *Maublancia* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Caudomyces** Lichtw., Kobayasi & Indoh (1988), Legeriomycetaceae. 2 (in *Antocha*), Canada; China; Japan. See Lichtwardt *et al.* (*TMSJ* 28: 376, 1987), Strongman & Xu (*Mycol.* 98: 479, 2006; China), Strongman (*CJB* 85: 949, 2007; Canada).
- Caudophoma** B.V. Patil & Thirum. (1968) = *Phyllosticta* fide van der Aa (*Stud. Mycol.* 5, 1973).
- Caudospora** J. Weiser (1946), Microsporidia. 1.
- Caudospora** Starbäck (1889), Diaporthales. Anamorph *Phomopsis*-like. 1 (on *Quercus*), Europe; N. America. See Barr (*Mycol. Mem.* 7, 1978; synonymy with *Hercospora*), Rogers (*Mycotaxon* 21: 475, 1984).
- Caudosporella** Höhn. (1914) = *Harknessia* fide Sutton (*Mycol. Pap.* 123, 1971).
- caulescent**, having a stem; becoming stemmed.
- caulicolous**, living on herbaceous stems; **caulicole**, a fungus which does this.
- Caullerya** Chatton (1907), Microsporidia. 1.
- Caulleryetta** Dogiel (1922), Microsporidia. 1.
- Caulocarpa** Gilkey (1947) = *Sarcosphaera* fide Trappe (*Mycotaxon* 2: 109, 1975).
- Caulochora** Petr. (1940) = *Glomerella* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Caulochytriaceae** Subram. (1974), Spizellomycetales. 1 gen., 2 spp.
Lit.: Voos (*Am. J. Bot.* 56: 898, 1969), Olive (*Am. J. Bot.* 67: 568, 1980), Barr in Margulis *et al.* (Eds) (*Handbook of Protoctista*: 454, 1990).
- Caulochytrium** Voos & L.S. Olive (1968), Caulochytriaceae. 2 (on *Cladosporium* and *Gloeosporium* conidia), USA. See Voos (*Am. J. Bot.* 56: 898, 1969).
- caulocystidium**, see cystidium.
- Caulogaster** Corda (1831) nom. dub., Fungi. Based on insect eggs fide Tulasne & Tulasne (*Selecta fungorum carpologia* 1: 125, 1861).
- Cauloglossum** Grev. (1823) = *Podaxis* fide Stalpers (*in litt.*).
- cauloplane**, the stem surface.
- Caulorhiza** Lennox (1979), Tricholomataceae. 3, USA. See Lennox (*Mycotaxon* 9: 154, 1979).
- Caumadothis** Petr. (1971) = *Botryosphaeria* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Causalis** Theiss. (1918) = *Coccodiella* fide Müller & von Arx in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 87, 1973).
- Cautinia** Maas Geest. (1967) = *Grifola* fide Stalpers (*in litt.*).
- Cavaraella** Speg. (1923), Rhytismatales. 1, Cuba.
- Cave fungi**. There are many records of fungi from caves and mines in temperate and tropical regions. Although so far no fungi have been reported as peculiar to caves, at least one new species, *Microascus caviariformis*, the 'chicken-sandwich cave fungus', has been described from a cave (Malloch & Hubart, *Can. J. Bot.* 65: 2384, 1987). Lagarde (*Arch. Zool. exp. gen.* 53: 277, 1913; 56: 279, and *Notes et Revue*: 129, 1917; 60: 593, 1922) recorded c. 50 taxa (including most groups of fungi) from caves in France, Spain and N. Africa. Went (*Science* 166: 385, 1969) and Hasselbring *et al.* (*Mycol.* 67: 171, 1975) describe fungi associated with stalactites. Cunningham *et al.* (*Environmental geology* 25: 2, 1995) reported over 90 species of fungi from a cave network in New Mexico. Various yeasts have been reported from caves in Japan (Sugita *et al.*, *Appl. Environ. Microbiol.* 71: 7626, 2005). Fungi in caves and mines in general reflect the substrata available. Where caves are not too deep, basidiomata of fungi such as *Boletus* spp. or *Hygrocybe* may occasionally be encountered (e.g. Kibby, *Field Mycology* 9: 66, 2008). Polypores and other wood-destroying fungi are common in mines where the basidiomata are frequently abnormal (Fassatiová, *Česká Myk.* 24: 162, 1970; mines of Příbram, former Czechoslovakia). Caves may also be a source of dermatophyte fungi (Lurie & May, *Mycol.* 49: 178, 1957), with many records of miners in South African gold mines with infections of *Sporothrix schenckii* obtained from mine timbers (Doidge, *Bothalia* 5: 1, 1950); infection by *Histoplasma* can be a serious hazard for speleologists in some parts of the new world (Ashford *et al.*, *Am. J. Trop. Med. Hyg.* 60: 899, 1999). *Fusarium* infections are associated 'white nose syndrome' causing very high mortalities of cave bats (Anon., *New Scientist* 2645: 6, 2008). Where caves become tourist attractions, resulting environmental changes may increase levels of fungi. This can result in damage to e.g. prehistoric cave paintings (Connor, *Independent* [UK newspaper], 10 May 2006).
- cavernose**, having hollows or cavities.
- cavernula** (pl. -ae), cavity; esp. the cavities in the lower cortex of *Cavernularia*.
- Cavernularia** Degel. (1937), Parmeliaceae (L). 2, Europe; N. America. See Ahti & Henssen (*Bryologist* 68: 85, 1965), Printzen & Ekman (*Lichenologist* 34: 101, 2002; population biology), Printzen *et al.* (*Mol. Ecol.* 12: 1473, 2003; phylogeography), Thell *et al.* (*Symb. bot. upsal.* 34 no. 1: 429, 2004; biogeography).
- Cavimalum** Yoshim. Doi, Dargan & K.S. Thind (1977), Clavicipitaceae. 2, Asia. See Doi *et al.* (*Bull. natn. Sci. Mus. Tokyo*, B 3: 23, 1977), Bischoff & White (*Mycology Series* 19: 125, 2003).
- Cazia** Trappe (1989), Pezizaceae. 1 (hypogeous), USA. See Trappe (*Mem. N. Y. bot. Gdn* 49: 336, 1989; placement in *Helvellaceae*), Norman & Eggers (*Mycol.* 91: 820, 1999; phylogeny), Percudani *et al.* (*Mol. Phylogen. Evol.* 13: 169, 1999; phylogeny), Hansen *et al.* (*Mycol.* 93: 958, 2001; phylogeny), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- CBS**, Centraalbureau voor Schimmelcultures (Baarn and Delft, Netherlands); founded 1904; an Institute of the Royal Netherlands Academy of Arts and Science; see van Beverwijk (*Ant. v. Leeuwenh.* 25: 1, 1959), de Hoog (Ed.) (*Centraalbureau voor Schimmelcultures: 75 years culture collection*, 1979).

- cecidium**, a gall (q.v.); caused by an animal (**zoo-**), esp. an insect; caused by a fungus (**myco-**).
- Cecidonia** Triebel & Rambold (1988), Lecideaceae. 2 (on lichens), Europe. See Triebel & Rambold (*Nova Hedwigia* 47: 280, 1988), Buschbom & Mueller (*Mol. Phylogen. Evol.* 32: 66, 2004; phylogeny).
- Ceeveesubramaniomyces** Pratibha, K.D. Hyde & Bhat (2005), anamorphic *Basidiomycota*. 1, India. See Pratibha *et al.* (*Kavaka* 32: 21, 2004).
- Cejpia** Velen. (1934), Dermateaceae. 2, Europe. See Baral (*SA* 13: 113, 1994), Nauta & Spooner (*Mycologist* 14: 21, 2000; UK).
- Cejpomyces** Svrček & Pouzar (1970) = *Thanatephorus* fide Langer (*Biblthca Mycol.* 158, 1994).
- Cejpomycetaceae** Jülich (1982) = *Ceratobasidiaceae*.
- Celatogloea** P. Roberts (2005), *Basidiomycota*. 1, USA. See Roberts (*Mycologist* 19: 69, 2005).
- Celidiaceae** J. Schröt. (1893) = *Arthoniaceae*.
- Celidiopsis** A. Massal. (1856) = *Arthonia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Celidium** Tul. (1852) = *Arthonia* fide Santesson (*Symb. bot. upsal.* 12 no. 1: 69, 1952), Wedin & Hafellner (*Lichenologist* 30: 59, 1998), Ertz *et al.* (*Biblthca Lichenol.* 91: 155 pp., 2005).
- cell**, a unit of cytoplasm containing one or more nuclei, limited by a membrane (the **cell membrane**), and, in fungi, usually enclosed by a wall (see cell wall chemistry). Adjacent fungal cells do not necessarily contain individual protoplasts (q.v.) because cytoplasm and nuclei may pass from one cell to another.
- Cell wall chemistry**. See Klis *et al.* (in Howard & Gow (Eds), *Biology of the fungal cell*, edn 2, 2007). See also Wessels (*Int. Rev. Cytol.* 104: 37, 1986; *New Phytologist* 123: 397, 1993), Bartnicki Garcia (in Rayner *et al.* (Eds), *Evolutionary biology of the fungi*: 389, 1987), Gooday (in Gow & Gadd, *The growing fungus*: 41, 1995). Polymers found in fungal walls are given in Table 2. The wall (e.g. zygospore wall of *Mucorales*) may also contain melanin (a dark coloured pigment which protects spores from UV light and microbial lysis) and sporopollenin (the most resistant biopolymer known).
- cellar fungus**, *Coniophora puteana* or *Rhinocladiella ellisii* (sterile mycelium *Zasmidium cellare*; syn. *Racodium cellare*; Hawksworth & Riedl, *Taxon* 26: 208, 1977).
- cellular slime moulds**, *Dictyosteliomycota* (q.v.).
- Cellularia** Bull. (1788) = *Trametes* fide Donk (*Verh. K. ned. Akad. Wet.* tweede sect. 62: 1, 1974).
- Cellulasclerotes** Stach & Pickh. (1957), Fossil Fungi. 3 (Permo-Carboniferous), Europe.
- cellulin**, a chitan-glucan complex which occurs as granules in the cells and plugs (-**plugs**) at hyphal constrictions in *Leptomitales* (see Lee *et al.*, *Mycol.* 68: 87, 1976).
- cellulolysis adequacy index**, an estimate, derived by dividing the rate of cellulolysis by the mycelial growth rate on an agar plate, as to whether the rate of cellulose decomposition by a fungus is adequate to supply its needs for saprobic survival (Garrett, *TBMS* 49: 59, 1966; Deacon, *TBMS* 72: 469, 1979).
- cellulolytic fungi**, fungi able to utilize cellulose-containing materials (incl. plant cellulose, paper, cloth, etc.), e.g. *Chaetomiaceae* (Chahal & Wang, *Mycol.* 70: 160, 1978). Cellophane or filter paper is often used in the culture of these fungi. See Biodeterioration.
- Cellulsporium** Peck (1879) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Cellypha** Donk (1959), ? *Tricholomataceae*. 10, widespread. See Reid (*Persoonia* 3: 131, 1964).
- Celoporthe** Nakab., Gryzenh., Jol. Roux & M.J. Wingf. (2006), *Cryphonectriaceae*. 1, S. Africa; Indonesia. See Nakabonge *et al.* (*Stud. Mycol.* 55: 261, 2006).
- Celotheliaceae** Lücking, Aptroot & Sipman (2008), *Pyrenulales*. 1 gen., 8 spp.
- Celothelium** A. Massal. (1860), *Celotheliaceae* (L.). 8, widespread (subtropical and tropical). See Aguirre-Hudson (*Bull. Br. Mus. nat. hist. Bot.* 21: 85, 1991), Berger & Aptroot (*Herzogia* 13: 151, 1998; Austria), Prado *et al.* (*MR* 110: 511, 2006; phylogeny), Aptroot *et al.* (*Biblthca Lichenol.* 97, 2008; Costa Rica).
- Celtidia** J.D. Janse (1897), *Zopfiaceae*. 1, Java. See Hawksworth (*CJB* 57: 91, 1979).
- Celyphus** Batten (1973), Fossil Fungi ? Fungi. 1 (late Jurassic – early Cretaceous), British Isles; USA.
- CEM**, see Societies and organizations.
- Cenangella** Sacc. (1884) = *Dermea* fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).
- Cenangiaceae** Rehm (1888) = *Helotiaceae*.
- Cenangiella** Lambotte (1887) = *Scleroderris* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Cenangina** Höhn. (1909) = *Cenangium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Cenangiomycetes** Dyko & B. Sutton (1979), anamorphic *Agaricomycetes*, Ccu.0eH.41. 1 (with clamp connexions), British Isles. See Dyko & Sutton (*TBMS* 72: 411, 1979).
- Cenangiopsis** Rehm (1912), *Helotiaceae*. 1, Europe.
- Cenangiopsis** Velen. (1947), ? *Helotiales*. 1, former Czechoslovakia. See Baral (*SA* 13: 113, 1994).
- Cenangites** Mesch. (1892), Fossil Fungi. 1 (Tertiary), Europe.
- Cenangium** Fr. (1818), *Helotiaceae*. 25, widespread. *C. ferruginosum* (syn. *C. abietis*) (die-back of pines). See Verkley (*MR* 99: 187, 1995; asci), Jung *et al.* (*Pl. Path. J.* 17: 216, 2001; sp. definition).
- Cenangiummella** J. Fröhl. & K.D. Hyde (2000), *Helotiaceae*. 1, Brunei. See Fröhlich & Hyde (*Fungal Diversity Res. Ser.* 3: 240, 2000).
- ceno-**, see coeno-.
- Cenococcum** Moug. & Fr. (1829), anamorphic *Dothideomycetes*, Sc.-.-. 1, Europe; N. America. *C. geophilum* is mycorrhizal. See LoBuglio *et al.* (*CJB* 69: 2331, 1992; variation in rDNA), Massicotte *et al.* (*CJB* 70: 125, 1992; morphology), Stülten *et al.* (*Mycorrhiza* 5: 259, 1995; protoplast regeneration), Timonen *et al.* (*New Phytol.* 135: 313, 1997; ecology), Farmer & Sylvia (*MR* 102: 859, 1998; ITS variation), LoBuglio (*Ectomycorrhizal Fungi*: 287, 1999; review), Shinohara *et al.* (*Curr. Genet.* 35: 527, 1999; phylogeography), Portugal *et al.* (*S. Afr. J. Sci.* 97: 617, 2001; population structure), Brundrett (*New Phytol.* 154: 275, 2002; coevolution), Jany *et al.* (*New Phytol.* 154: 651, 2002; genetic diversity), Sakakibara *et al.* (*MR* 106: 868, 2002; identification techniques), Douhan & Rizzo (*New Phytol.* 166: 263, 2005; population structure), Douhan *et al.* (*Mycol.* 99: 812, 2007; population structure).
- Cenomyce** Ach. (1809) = *Cenomyces*.
- Cenomyces** Ach. (1809) = *Cladonia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Cenomycetaceae** Chevall. (1826) = *Cladoniaceae*.
- Cenozosia** A. Massal. (1854) = *Ramalina* fide Hawk-

- sworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Centonites** Peppers (1964), Fossil Fungi. 1 (Carboniferous), USA.
- central body** (of ascomycetes), the cell structure (central apparatus) from which astral rays emanate and initiate a cleavage of the cytoplasm (Harper, 1905). See Lindegren *et al.* (*Can. J. Genet. Cytol.* 7: 37, 1965).
- centric (central)** (of a stipe), at the centre of the pileus; (of oogonium of *Saprolegniaceae*), having one or two layers of fat droplets surrounding the central cytoplasm in contrast to **sub-**, having the cytoplasm surrounded by one layer of droplets on one side, and by two or three layers on the other and **ex-**, having one large drop or a lunate row of droplets on one side (Coker, 1923).
- Centridium** Chevall. (1826) = *Roestelia* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- centrifugal**, from the centre outwards.
- centriole**, short-cylindrical or barrel-shaped cell organelle 300-500 nm long × 150 nm diam. (kinetosome lacking an axoneme).
- centripetal**, towards the centre.
- Centrolepidosporium** R.G. Shivas & Vánky (2007), ? Ustilaginaceae. 1 (on *Centrolepidaceae*), Australia. See Shivas & Vánky (*Mycol. Balcan.* 4: 1, 2007).
- Centrospora** Neerg. (1942) [non *Centrospora* Trevis. 1845, *Algae*] ≡ *Mycocentrospora*.
- centrum**, the structures within an ascoma, i.e. the asci and interascal tissue (the hamathecium); for types of centrum organization see Reynolds (Ed.) (*Ascomycete systematics*, 1981), and under *Ascomycota*.
- cep**, basidioma of the edible *Boletus edulis*; **fungi suilli** of Pliny and other classical writers.
- cepaceous**, see alliaceous.
- Cephalacladium**, see *Cephalocladium*.
- Cephaleuros** Kunze (1832), Trentepohliaceae. parasitic on vascular plants. *C. virescens* (syn. *Mycoidea parasitica*) is common on tea (**red-rust**) and other trop. plants; photobiont of *Strigula* (q.v.) and other foliicolous lichens. See Printz (*Nytt Mag. Naturvid.* 80: 137, 1940; keys), Santesson (*Symb. bot. upsal.* 12(1), 1952).
- Cephalophora** Thaxt. (1903), anamorphic *Pezizales*, Hso. ≡ eH.6. 6, widespread (tropical). See Barron *et al.* (*CJB* 68: 685, 1990; 2 n.spp.), Tanabe *et al.* (*Mycol.* 91: 830, 1999), Barron (*Biodiversity of Fungi Inventory and Monitoring Methods*: 435, 2004; review).
- Cephaloascaceae** L.R. Batra (1973), Saccharomycetales. 1 gen. (+ 2 syn.), 1 spp.
Lit.: Batra (*Stud. Mycol.* 30: 415, 1987), von Arx & van der Walt (*Stud. Mycol.* 30: 167, 1987), Hausner *et al.* (*Mycol.* 84: 870, 1992; mol. phylogeny), Spatafora & Blackwell (*Mycol.* 85: 912, 1993), Kurtzman & Robnett (*CJB* 73 Suppl. 1: S824, 1995; molecular rels), Read & Beckett (*MR* 100: 1281, 1996), Hoog & Kurtzman in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 143, 1998), Malloch & de Hoog in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 197, 1998), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Cephaloascales** = Saccharomycetales.
- Cephaloascus** Hanawa (1920), Cephaloascaceae. 1, Japan; Canada. See Schippers-Lammertse & Heyting (*Antonie van Leeuwenhoek* 28: 5, 1962), Udagawa *et al.* (*TMSJ* 18: 399, 1977), Cannon & Minter (*TMSJ* 33: 51, 1992), de Hoog & Kurtzman in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 143, 1998), Spatafora (*Cellular Origin and Life in Extreme Habitats* 4: 591, 2002; evolution), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Cephalocladiaceae** Corda (1838) = Sclerotiniaceae.
- Cephalocladium** Rchb. (1828) = *Botrytis* fide Mussat (*Syll. fung.* 15: 82, 1901).
- Cephalodiplosporium** Kamyschko (1961) = *Fusarium* fide Gams (*in litt.*).
- cephalodium** (pl. -ia), a delimited region within (**internal** -), or a warty, squamulose, or fruticose structure on the surface of, a lichen thallus containing a photobiont different from that characteristic of the rest of the thallus. Generally cephalodia contain cyanobacteria (e.g. *Nostoc*) whilst the rest of the thallus contains a green alga (e.g. *Trebouxia*). *Nostoc* cephalodia fix atmospheric nitrogen (see Millbank & Kershaw, *New Phytol.* 68: 721, 1969). Known in about 400 lichenized spp. in diverse orders; see cyanotrophy, gall, Lichens, paracephalodium, photomorph, phycotype.
- Cephalodocheium** Bonord. (1851), anamorphic *Pezizomycotina*, Hsp.0eH.?. 1, Europe.
- Cephaloedium** Kunze (1828) nom. nud. = *Exosporium* fide Hughes (*CJB* 36: 744, 1958; nomencl.).
- Cephalomyces** Bainier (1907) = *Cephalophora* fide Ellis (*Dematiaceous Hyphomycetes*, 1971).
- Cephalophorum** Nees [not traced] nom. dub., anamorphic *Pezizomycotina*. See Benjamin (*Taxon* 17: 524, 1968).
- Cephalophysis** (Hertel) H. Kiliass (1985), Teloschistaceae (L). 1, Europe. See Kiliass (*Herzogia* 7: 182, 1985), Kärnefelt (*Cryptog. bot.* 1: 147, 1989; phylogeny).
- Cephaloscypha** Agerer (1975), Marasmiaceae. 2, widespread. See Agerer (*Sydowia* 27: 193, 1973-1974).
- cephalosporin**, one of a series of antibacterial antibiotics from *Acremonium* spp., esp. *A. chrysogenum* (cephalosporin C) and *A. salmosynnematum*; see Roberts (*Mycol.* 44: 292, 1952), Grosklags & Swift (*Mycol.* 49: 305, 1957), Kavanagh *et al.* (*Mycol.* 50: 370, 1958), Sassiver & Lewis (*Adv. appl. Microbiol.* 13: 163, 1970; structure), Abraham & Newton (*Adv. Chemotherapy* 2: 23, 1969); cephalosporin N = penicillin N.
- Cephalosporiopsis** Peyronel (1915), anamorphic *Hyphocreales*, Hso.1eH.15. 4, Europe; Africa. fide Carmichael *et al.* (*Genera of Hyphomycetes*, 1980; synonymy with *Acremonium* or *Fusarium*).
- Cephalosporium** Corda (1839) = *Acremonium* fide Gams (*Cephalosporium-artige Schimmelpilze*, 1971).
- Cephalotelium** Syd. (1921) = *Ravenelia* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- Cephalotheca** Fuckel (1871), Cephalothecaceae. 6, widespread. See Booth (*Mycol. Pap.* 83, 1961; key), Suh & Blackwell (*Mycol.* 91: 836, 1999; phylogeny), Yaguchi *et al.* (*Mycotaxon* 96: 309, 2006; from human).
- Cephalothecaceae** Höhn. (1917), Sordariales. 5 gen. (+ 4 syn.), 13 spp.
Lit.: Chesters (*TBMS* 19: 261, 1935; life history), Lundqvist (*Svensk bot. Tidskr.* 86: 261, 1992), Fortey *et al.* (*Mycologist* 11: 132, 1997), Suh & Blackwell (*Mycol.* 91: 836, 1999; phylogeny), Lumley *et al.* (*Mycotaxon* 74: 395, 2000), Paulin & Harrington (*Stud. Mycol.* 45: 209, 2000), Huhndorf *et al.* (*Mycol.* 96: 368, 2004), Yaguchi *et al.* (*Mycotaxon* 96: 309,

- 2006), Stchigel & Guarro (*MR* 111: 1100, 2007).
- Cephalothecium** Corda (1838) = *Trichothecium* fide Hughes (*CJB* 36: 727, 1958).
- cephalothecoid**, fragmenting along a series of predefined suture lines, as in ascomata of *Cephalotheca* (q.v.).
- Cephalothricum**, see *Cephalotrichum* Link.
- Cephalotrichum** Berk. ex Sacc. (1886) = *Trichocephalum*.
- Cephalotrichum** Link (1809), anamorphic *Microascaeae*, Hsy.0eP.19. 8, widespread. See Hughes (*CJB* 36: 727, 1958), Morton & Smith (*Mycol. Pap.* 86, 1963).
- Cepsiclava** J. Walker (2004), *Clavicipitaceae*. 1 (on living florets of *Phalaris*), Australia. Perhaps synonymous with *Aciculosporium*. See Walker (*Australas. Pl. Path.* 33: 228, 2004).
- Ceracea** Cragin (1885), anamorphic *Pezizomycotina*, Hsp.0eH.?. 1, USA. See Martin (*Mycol.* 41: 77, 1949), Donk (*Persoonia* 4: 334, 1966).
- Ceraceohydnum** Jülich (1978) = *Mycoaciella* fide Hjortstam *et al.* (*Kew Bull.* 45: 303, 1990; key).
- Ceraceomerulius** (Parmasto) J. Erikss. & Ryvarde (1973) = *Byssomerulius* fide Hjortstam & Larsson (*Windahlia* 21, 1994).
- Ceraceomyces** Jülich (1972), *Amylocorticiaceae*. 16, widespread. See Jülich (*Willdenowia* Beih. 7: 146, 1972), Legon (*Mycologist* 19: 167, 2005).
- Ceraceopsora** Kakish., T. Sato & S. Sato (1984), *Chaoniaceae*. 1 (on *Anemone* (0, I) (*Ranunculaceae*); *Elaeagnus* (II, III) (*Elaeagnaceae*)), Japan. See Kakishima *et al.* (*Mycol.* 76: 969, 1984).
- Ceraceosorales** Begerow, Stoll & R. Bauer (2007). *Exobasidiomycetes*. 1 gen., 1 spp. No families recognized.
- Lit.* Begerow *et al.* (*Mycol.* 98: 906, 2006; phylogeny).
- Ceraceosorus** B.K. Bakshi (1976), *Ceraceosorales*. 1, India. See Bakshi (*Mycol.* 68: 649, 1976), Begerow *et al.* (*Mycol.* 98: 906, 2006; phylogeny).
- ceraceous** (cereous), wax-like.
- Ceraimyces** Thaxt. (1901) = *Laboulbenia* fide Thaxter (*Proc. Amer. Acad. Arts & Sci.* 51: 1, 1915).
- Ceramoclasteropsis** Bat. & Cavalc. (1962), ? *Capnodiaceae*. 1, Brazil. See Batista & Cavalcanti (*Broteria Sér. Ci. Nat.* 31: 101, 1962).
- Ceramothyrium** Bat. & H. Maia (1956), *Chaetothyriaceae*. Anamorph *Stanhughesia*. 20, widespread (tropical). See Constantinescu *et al.* (*Stud. Mycol.* 31: 69, 1989; anamorph), Winka *et al.* (*Mycol.* 90: 822, 1998; rDNA phylogeny), Haase *et al.* (*Stud. Mycol.* 43: 80, 1999; phylogeny).
- Cerania** Gray (1821) nom. rej. = *Thamnia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- ceranoid**, having horn-like branches.
- Cerapora**, see *Ceriporia*.
- Ceraporia**, see *Ceriporia*.
- Ceraporus** Bondartsev & Singer (1941) nom. nud. = *Ceriporia*.
- Cerasterias** Reinsch (1867) nom. dub., ? *Algae*.
- Cerastoma** Qué. (1875), (orthographic variant), see *Ceratostoma* Fr.
- Cerastomis** Clem. (1931) = *Ceratostomella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Ceratelium** Arthur (1906) = *Cerotelium*.
- Ceratella** (Qué.) Bigeard & H. Guill. (1913) [non *Ceratella* Hook. f. 1844, *Compositae*] = *Multiclavula*.
- Ceratella** Pat. (1887) [non *Ceratella* Hook. f. 1844, *Compositae*] = *Ceratelopsis*.
- Ceratelopsis** Konrad & Maubl. (1937), *Gomphaceae*. 9, Europe. See Berthier (*Bull. mens. Soc. linn. Lyon Num. Spéc.* 46: 187, 1976), Shiryayev (*Mikol. Fitopatol.* 38: 59, 2004; Urals).
- Ceratitium** Rabenh. (1851) = *Gymnosporangium* fide Laundon (*Mycol. Pap.* 102, 1965).
- Ceratobasidiaceae** G.W. Martin (1948), *Cantharellales*. 8 gen. (+ 14 syn.), 43 spp. Molecular data suggest most species group together within the *Cantharellales*, except the type, which probably belongs in the *Auriculariales*.
- Lit.*: Jin & Korpradiskul (*Mycosystema* 17: 331, 1998), Roberts (*MR* 102: 1074, 1998), Roberts (*Mycotaxon* 69: 35, 1998), Roberts (*Sydowia* 50: 252, 1998), Saunders & Owens (*Mycorrhiza Manual Springer Lab Manual*: 413, 1998), Roberts (*Rhizoctonia-forming fungi*, 1999), Salazar *et al.* (*Mycol.* 91: 459, 1999), Gonzalez *et al.* (*Mycol.* 93: 1138, 2001), Pope & Carter (*Mycol.* 93: 712, 2001), Larsson *et al.* (*MR* 108: 983, 2004), Otero *et al.* (*Mol. Ecol.* 13: 2393, 2004), Binder *et al.* (*Systematics and Biodiversity* 3: 113, 2005), González *et al.* (*Mol. Phylogen. Evol.* 40: 459, 2006), Sharon *et al.* (*Mycoscience* 47: 299, 2006).
- Ceratobasidiales** Jülich (1981) = *Cantharellales*.
- Ceratobasidium** D.P. Rogers (1935), *Ceratobasidiaceae*. Anamorph *Ceratorhiza*. c. 18, widespread. See Currah & Zelmer (*Rep. Tottori mycol. Inst.* 30: 43, 1992), Roberts (*Rhizoctonia-forming fungi*, 1999), Gonzalez *et al.* (*Mycol.* 93: 1138, 2001; Ribosomal DNA), Shan *et al.* (*Mycol.* 94: 230, 2002; orchid endophytes), Ma *et al.* (*MR* 107: 1041, 2003; anamorph phylogeny), Kotiranta & Saarenoksa (*Ann. bot. fenn.* 42: 237, 2005; Finland).
- Ceratocarpia** Rolland (1896), *Dothideomycetes*. 2, Europe; Africa. See Benny & Kimbrough (*Mycotaxon* 12: 1, 1980).
- Ceratochaete** Syd. & P. Syd. (1917) = *Dysrhynchis* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Ceratochaetopsis** F. Stevens & Weedon (1927) = *Chaetothyria* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Ceratocladia** Schwend. (1860) = *Alectoria* Ach. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Ceratocladium** Corda (1839), anamorphic *Pezizomycotina*, Hso.0eH.?.6. 1, Europe. See Hughes (*Mycol. Pap.* 47, 1951), Kendrick (*CJB* 81: 75, 2003; morphogenesis).
- Ceratocladium** Pat. (1898) = *Xylocladium*.
- Ceratocoma** Buriticá & J.F. Hennen (1991), *Pucciniosiraceae*. 2 (on *Gompholobium* (*Leguminosae*) or *Xylopia* (*Annonaceae*)), Australia; Africa. See Buriticá & Hennen (*Revista de la Academia Colombiana de Ciencias Exactas, Físicas y Naturales* 18: 146, 1991).
- Ceratocystidaceae** Locq. (1972), *Microascales*. 6 gen. (+ 6 syn.), 79 spp.
- Lit.*: Malloch & Blackwell (*CJB* 68: 1712, 1990), Brasier (*Recent Advances in Studies on Oak Decline Proceedings of an International Congress, Selva di Fasano (Brindisi), Italy, September 13-18, 1992*: 241, 1993), Grylls & Seifert in Wingfield *et al.* (Eds) (*Ceratocystis* and *Ophiostoma* Taxonomy, Ecology

- and Pathogenicity: 261, 1993), Hausner *et al.* (*CJB* 71: 52, 1993), Samuels (*Ceratocystis* and *Ophiostoma* Taxonomy, Ecology and Pathogenicity: 15, 1993), Seifert *et al.* (*Ceratocystis* and *Ophiostoma* Taxonomy, Ecology and Pathogenicity: 269, 1993), Wingfield *et al.* (*Ceratocystis* and *Ophiostoma* Taxonomy, Ecology and Pathogenicity, 1993), Wyk *et al.* (*Ceratocystis* and *Ophiostoma* Taxonomy, Ecology and Pathogenicity: 133, 1993), Beer *et al.* (*Antonie van Leeuwenhoek* 67: 325, 1995), Harrington & Wingfield (*CJB* 76: 1446, 1998), Witthuhn *et al.* (*MR* 103: 743, 1999), Hausner *et al.* (*CJB* 78: 903, 2000), Okada *et al.* (*Stud. Mycol.* 45: 169, 2000), Paulin & Harrington (*Stud. Mycol.* 45: 209, 2000), Baker Engelbrecht & Harrington (*Mycol.* 97: 57, 2005), Marín *et al.* (*MR* 109: 1137, 2005), Johnson *et al.* (*Mycol.* 97: 1067, 2005).
- Ceratocystiopsis** H.P. Upadhyay & W.B. Kendr. (1975), Ophiostomataceae. Anamorph *Hyalorhino-cladiella*. c. 11. See Wolfaardt *et al.* (*S. Afr. J. Bot.* 58: 277, 1992; synoptic key, database), Hausner *et al.* (*MR* 97: 625, 1993), van Wijk & Wingfield (*CJB* 71: 1212, 1993; ultrastr.), Benade *et al.* (*CJB* 74: 891, 1996; anamorph devel.), Hsiau & Harrington (*Mycol.* 89: 661, 1997; associated with *Coleoptera*), Benade *et al.* (*Mycotaxon* 68: 251, 1998; conidial devel.), Viljoen *et al.* (*MR* 104: 365, 2000; taxonomy), Zhou *et al.* (*Fungal Diversity* 15: 261, 2004; Chile), Zipfel *et al.* (*Stud. Mycol.* 55: 75, 2006; phylogeny).
- Ceratocystis** Ellis & Halst. (1890), Ceratocystidaceae. Anamorph *Chalara*. 44, widespread (esp. temperate). See also *Ophiostoma*. See Hunt (*Lloydia* 19: 1, 1956; monogr., keys), Upadhyay (*monograph of Ceratocystis and Ceratocystiopsis*, 1981; monogr., keys), Kowalski & Butin (*J. Phytopath.* 124: 236, 1989; 6 spp. on *Quercus*), Wolfaardt *et al.* (*S. Afr. J. Bot.* 58: 277, 1992; synoptic key, database), Grylls & Seifert in Wingfield *et al.* (Eds) (*Ceratocystis* and *Ophiostoma* Taxonomy, Ecology and Pathogenicity: 261, 1993; key), Hausner *et al.* (*CJB* 71: 52, 1993; posn), Seifert *et al.* in Wingfield *et al.* (Eds) (*Ceratocystis* and *Ophiostoma* Taxonomy, Ecology and Pathogenicity, 1993), Wingfield *et al.* (*Mol. Biol. Evol.* 11: 376, 1994), Witthuhn *et al.* (*Mycol.* 90: 96, 1998), Harrington & Wingfield (*CJB* 76: 1446, 1999; spp. on conifers), Witthuhn *et al.* (*MR* 103: 743, 1999; phylogeny), Hausner *et al.* (*CJB* 78: 903, 2000; phylogeny), Paulin & Harrington (*Stud. Mycol.* 45: 209, 2000), Witthuhn *et al.* (*Mycol.* 92: 447, 2000; molecular analysis), Barnes *et al.* (*Molecular Plant Pathology* 2: 319, 2001; microsatellites), Harrington *et al.* (*Pl. Dis.* 86: 418, 2002; conifer-associated spp.), Paulin-Mahady *et al.* (*Mycol.* 94: 62, 2002; phylogeny), Baker *et al.* (*Phytopathology* 93: 1274, 2003; population structure, host specificity), Morin *et al.* (*Phytopathology* 94: 1323, 2004; Canada), Wyk *et al.* (*Stud. Mycol.* 50: 365, 2004; Bhutan), Baker Engelbrecht & Harrington (*Mycol.* 97: 57, 2005; infraspecific taxonomy), Marín *et al.* (*MR* 109: 1137, 2005; *C. polonica* agg.), Thorpe *et al.* (*Phytopathology* 95: 316, 2005; on *Araceae*), Wyk *et al.* (*Australas. Pl. Path.* 34: 587, 2005; Oman), Johnson *et al.* (*Mycol.* 97: 1067, 2005; N America), Wyk *et al.* (*Fungal Diversity* 21: 181, 2006; *C. moniliformis* agg.), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny), Engelbrecht *et al.* (*Phytopathology* 97: 1648, 2007; on *Theobroma*).
- Ceratogaster** Corda (1841) = *Elaphomyces* fide Mus-sat (*Syll. fung.* 15: 83, 1901).
- Ceratomyces** Thaxt. (1892), Ceratomycetaceae. 20, widespread. See Weir & Rossi (*Mycol.* 93: 171, 2001; Bolivia), Santamaría (*Fl. Mycol. Iberica* 5, 2003; Iberian peninsula).
- Ceratomycetaceae** S. Colla (1934), Laboulbeniales. 12 gen., 85 spp.
Lit.: Tavares (*Mycol. Mem.* 9: 627 pp., 1985), Bameul (*Nouv. Rev. Entomol. Nouv. sér.* 10: 19, 1993), Majewski (*Acta Mycologica Warszawa* 34: 7, 1999), Santamaría (*Nova Hedwigia* 68: 351, 1999; European spp.), Weir & Hughes (*Mycol.* 94: 483, 2002).
- Ceratonema** Pers. (1822) nom. dub., Fungi. Based on mycelium, etc. fide Mussat (*Syll. Fung.* 15: 83, 1901).
- Ceratophacidium** J. Reid & Piroz. (1966), Rhytismataceae. 1, USA. See Reid & Pirozynski (*CJB* 44: 645, 1966).
- Ceratophoma** Höhn. (1917), anamorphic *Massarina*, St.0eH.?. 1, Europe.
- Ceratophora** Humb. (1793) nom. rej. = *Gloeophyllum* fide Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974).
- Ceratophorum** Sacc. (1880), anamorphic *Pezizomycotina*, Hso.≡ eP.1. 5, widespread. *C. setosum* (lupin leaf spot). See Hughes (*Mycol. Pap.* 36, 1951), Ellis (*Mycol. Pap.* 70, 1958), Huseyinov *et al.* (*Mikol. Fitopatol.* 36: 11, 2002; Turkey).
- Ceratophyllum** M. Choisy (1951) [non *Ceratophyllum* L. 1753, *Ceratophyllaceae*] = *Hypogymnia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Ceratopodium** Corda (1837) = *Graphium* fide Saccardo (*Syll. fung.* 4: 609, 1886).
- Ceratoporia** Ryvar den & de Meijer (2002), Ceratobasidiaceae. 1 (saprobic), Brazil. See Ryvar den & Meijer (*Syn. Fung.* 15: 44, 2002).
- Ceratoportha** Petr. (1925), Diaporthales. 1 (on *Sarothamnus*), Europe.
- Ceratopycnidium** Maubl. (1907) = *Byssoloma*. Apparently used in two separate senses. fide Bertoni & Cabral (*MR* 95: 1014, 1991), Bertoni (*Mycotaxon* 52: 193, 1994; Brazil), Lücking *et al.* (*Lichenologist* 34: 270, 2002; synonymy).
- Ceratopycnis** Höhn. (1915), anamorphic *Pezizomycotina*, Cpd.≡ eP.15. 1, Europe. See Morgan-Jones (*Mycotaxon* 2: 167, 1975), Farr *et al.* (*Mycol.* 90: 290, 1998).
- Ceratopycnium** Clem. & Shear (1931) ≡ *Ceratopycnidium*.
- Ceratorhiza** R.T. Moore (1987), anamorphic *Ceratobasidium*. c. 7, widespread. See Moore (*Antonie van Leeuwenhoek* 55: 393, 1989), Currah & Zelmer (*Rep. Tottori mycol. Inst.* 30: 43, 1992), Roberts (*Rhizoctonia-forming fungi*, 1999).
- Ceratosebacina** P. Roberts (1993), ? Auriculariales. 3, Europe. See Roberts (*MR* 97: 470, 1993), Weiss & Oberwinkler (*MR* 105: 403, 2001; phylogeny).
- Ceratosperma** Speg. (1918) = *Nematostoma* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Ceratospermopsis** Bat. (1951), Meliolaceae. 2 (from leaves), Brazil. See Batista (*Mycopath. Mycol. appl.* 5: 165, 1951).
- Ceratospermum** P. Micheli (1729) nom. dub., ? *Pezizomycotina*.
- Ceratosphaeria** Niessl (1876), Sordariomycetes. Anamorph *Harpophora*-like. 11, widespread. See Tsuda

- & Ueyama (*TMSJ* 18: 413, 1977), Hyde *et al.* (*Nova Hedwigia* 64: 185, 1997), Réblová (*Sydowia* 50: 229, 1998; Czech Republic), Réblová (*Mycol.* 98: 68, 2006; phylogeny).
- Ceratosporella** Höhn. (1923), anamorphic *Pezizomycotina*, Hso.2bP.1. 13, widespread. See Hughes (*TBMS* 35: 243, 1952), Kuthubutheen & Nawawi (*MR* 95: 159, 1991; key), Castañeda Ruiz *et al.* (*Mycotaxon* 60: 275, 1996).
- Ceratosporiaceae** Nann. (1934) = Helminthosphaeriaceae.
- Ceratospodium** Schwein. (1832), anamorphic *Iodosphaeria*, Hso.0bP.1. 6, widespread. See Hughes (*Mycol. Pap.* 39, 1951), Hughes (*N.Z. J. Bot.* 2: 305, 1965), Kirschner & Chen (*Mycol.* 96: 917, 2004; Taiwan).
- Ceratostoma** Fr. (1818) nom. rej. = *Melanospora* Corda fide Cannon & Hawksworth (*Taxon* 32: 476, 1983).
- Ceratostoma** Sacc. (1876) ? = *Arxiomyces* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Ceratostomataceae** G. Winter (1885), *Melanosporales*. 12 gen. (+ 23 syn.), 63 spp.
Lit.: Doguet (*Botaniste* 39: 1, 1955; monogr.), Cannon & Hawksworth (*J. Linn. Soc. Bot.* 84: 115, 1982; key gen.), Horie *et al.* (*Mycotaxon* 25: 229, 1986), Vakili (*MR* 93: 67, 1989), Rehner & Samuels (*CJB* 73: S816, 1995), Goh & Hanlin (*Mycol.* 90: 655, 1998), Goh *et al.* (*Fungal Science Taipei* 13: 1, 1998), Jones & Blackwell (*MR* 102: 661, 1998; DNA), Stchigel *et al.* (*MR* 103: 1305, 1999), Zhang & Blackwell (*MR* 106: 148, 2002), Huhndorf *et al.* (*Mycol.* 96: 368, 2004).
- Ceratostomella** Sacc. (1878), ? *Annulatascaceae*. c. 18 (on rotten wood etc.), widespread (esp. temperate). See Barr (*Mycotaxon* 46: 45, 1993), Untereiner (*Mycol.* 85: 294, 1993), Kang *et al.* (*Mycoscience* 40: 151, 1999), Inderbitzin (*Mycoscience* 41: 167, 2000; China), Réblová (*Mycol.* 98: 68, 2006; phylogeny).
- Ceratostomina** Hansf. (1946) = *Rhynchomeliola* fide Müller & von Arx in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 87, 1973).
- Ceraunium** Wallr. (1833) = *Elaphomyces*.
- Cercidospora** Körb. (1865), ? *Dothideomycetes*. 22 (on lichens), north temperate; Arctic. See Hafellner (*Herzogia* 7: 353, 1987; key), Eriksson & Yue (*SA* 11: 166, 1993), Hafellner & Obermayer (*Cryptog. Bryol.-Lichénol.* 16: 177, 1995; on *Arthrorhaphis*), Zhurbenko (*Mikol. Fitopatol.* 36: 3, 2002; Russia), Zhurbenko & Triebel (*Biblithca Lichenol.* 86: 205, 2003; on *Lecidoma*), Ihlen & Wedin (*Lichenologist* 39: 1, 2007; Fennoscandia, key).
- Cercocladospora** G.P. Agarwal & S.M. Singh (1974) = *Pseudocercospora* fide Deighton (*Mycol. Pap.* 140, 1976), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003).
- Cercodeuterospora** Curzi (1932) = *Passalora* fide Deighton (*Mycol. Pap.* 137, 1974), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003).
- Cercophora** Fuckel (1870), *Lasiosphaeriaceae*. Anamorph *Cladorrhinum*. 42, widespread. See Lundqvist (*Symb. bot. upsal.* 20 no. 1, 1972; coprophilous spp.), Hilber & Hilber (*Z. Mykol.* 45: 209, 1979; on wood), Ueda (*Mycoscience* 35: 287, 1994; anamorph), Réblová & Svrcek (*Czech Mycol.* 49: 207, 1997), Hanlin (*Am. J. Bot.* 86: 780, 1999; morphology), Miller & Huhndorf (*Sydowia* 53: 211, 2001; neotropical spp.), Miller (*Sydowia* 55: 267, 2003; perithecial anatomy), Huhndorf *et al.* (*Mycol.* 96: 368, 2004; phylogeny), Miller & Huhndorf (*MR* 108: 26, 2004; phylogeny), Miller & Huhndorf (*Mol. Phylogen. Evol.* 35: 60, 2005; phylogeny, anatomy), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Cercoseptoria** Petr. (1925) = *Pseudocercospora* fide Deighton (*TBMS* 88: 365, 1987), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003).
- Cercosperma** G. Arnaud ex B. Sutton & Hodges (1983), anamorphic *Pezizomycotina*, Hso.≡ eP.10. 2, pantropical. See Sutton & Hodges (*Nova Hedwigia* 35: 798, 1981), Dorai & Vittal (*TBMS* 91: 521, 1988; India).
- Cercosphaerella** Kleb. (1918) = *Mycosphaerella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Cercospora** Fresen. (1863) [Aug.] nom. cons. prop., anamorphic *Mycosphaerella*, Hso.0fH.31. c. 1416, widespread. Leaf spot of banana (*C. musae*, see *Mycosphaerella*), beet (*C. beticola*), celery (*C. apii*), groundnut (*Arachis*) (*C. arachidicola*, teleomorph *Mycosphaerella arachidis*), tobacco (*C. nicotianae*). See Chupp (*Monograph of the fungus genus Cercospora*, 1954; arranged by host fam.), Sigler *et al.* (*Mycotaxon* 10: 133, 1979), Oorschot (*Stud. Mycol.* 20, 1980; key 22 spp.), Pons *et al.* (*TBMS* 85: 405, 1985; ultrastructure of *C. beticola*), Assante *et al.* (*Riv. Patol. veg., Pavia Sér.* 4 22: 41, 1986; secondary metabolites), Pollack (*Mycol. Mem.* 12, 1987; annotated compilation of species names), Chabasse (*Bull. Soc. Fr. mycol. Med.* 17: 373, 1988; key French spp.), Pons & Sutton (*Mycol. Pap.* 160, 1988; spp. on *Dioscorea*), Stewart & Pflieger (*Journal of the Minnesota Academy of Science* 53: 34, 1989; synoptic key gen.), Hsieh & Goh (*Cercospora and Similar Fungi from Taiwan*, 1990; Taiwan), Sutton (*Taxon* 40: 643, 1991; conservation), Skou (*Mycotaxon* 43: 237, 1992; xerophilic spp., ? related to *Ascosphaeraceae*), Braun (*Cryptog. bot.* 3: 235, 1993; subgen. *Hyalocercospora*), Braun (*Monogr. Cercosporella, Ramularia Allied Genera (Phytopath. Hyphom.)* 1: 117 pp., 1995; subg. *Hyalocercospora*), Takizawa *et al.* (*Mycoscience* 35: 327, 1995; ubiquinone system), Braun (*Sydowia* 48: 205, 1996), Braun & Mel'nik (*Mikol. Fitopatol.* 30: 1, 1996; Russian types), Pons & Sutton (*MR* 100: 815, 1996; on *Heliotropium*), Crous *et al.* (*Mycotaxon* 64: 405, 1997; Brazil), Crous & Câmara (*Mycotaxon* 68: 299, 1998; Brazil), Guo (*Mycosystema* 17: 97, 1998; China), Kobayashi *et al.* (*Mycoscience* 39: 185, 1998; Japan), Braun (*Schlechtendalia* 2: 1, 1999), Braun & Sivapalan (*Fungal Diversity* 3: 1, 1999; Brunei), Crous & Corlett (*CJB* 76: 1523, 1998; on *Platanus*), Crous *et al.* (*Mycotaxon* 72: 171, 1999; Brazil), Kim & Shin (*Korean J. Mycol.* 27: 220, 1999; Korea), Nakashima *et al.* (*Mycoscience* 40: 269, 1999; Japan), Stewart *et al.* (*MR* 103: 1491, 1999; phylogeny), Crous *et al.* (*Stud. Mycol.* 45: 107, 2000; review), Guo & Jiang (*Mycotaxon* 74: 257, 2000; China), Siboe *et al.* (*J. gen. appl. Microbiol.* Tokyo 46: 69, 2000; *C. apii* complex), Crous & Braun (*Mycotaxon* 78: 327, 2001; spp. described by Chupp), Crous *et al.* (*Mycol.* 93: 1081, 2001; phylogeny), Goodwin *et al.* (*Phytopathology* 91: 648, 2001; phylogeny), Braun *et al.* (*Feddes Repert.* 113: 112, 2002; spp. described by Chupp), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003; annotated checklist), Guo *et al.* (*Flora Fungorum Sinicorum* 20, 2003; China), Braun & Crous (*Mycotaxon* 92: 395, 2005;

- nomencl.), Groenewald *et al.* (*Phytopathology* **95**: 951, 2005; phylogeny, sp. concepts), Crous *et al.* (*Stud. Mycol.* **55**: 189, 2006; on maize), Groenewald *et al.* (*Fungal Genetics Biol.* **43**: 813, 2006; mating type genes), Groenewald *et al.* (*Mycol.* **98**: 275, 2006; host range), Schoch *et al.* (*Mycol.* **98**: 1041, 2006; phylogeny).
- Cercospora** Fuckel (1863) [Apr.] nom. rej. prop. = *Pseudocercospora* fide Sutton & Pons (*Taxon* **112**: 643, 1991).
- Cercosporaceae** Nann. (1934) = *Mycosphaerellaceae*.
- Cercospora** Sacc. (1880), anamorphic *Mycosphaerella*, Hsy.0fH.10. 99, widespread. *C. pastinacae* (parsnip (*Pastinaca*) leaf spot). See Deighton (*Mycol. Pap.* **133**, 1973), Braun (*Monogr. Cercospora*, *Ramularia Allied Genera* (*Phytopath. Hyphom.*) **1**: 61, 1995; monogr., keys), Braun (*Monogr. Cercospora*, *Ramularia Allied Genera* (*Phytopath. Hyphom.*) **2**: 401, 1998), Pons & Sutton (*MR* **104**: 1501, 2000; conidiogenesis), Berner *et al.* (*Mycol.* **97**: 1122, 2006; spp. with biocontrol potential).
- Cercosporaceae** Nann. (1934) = *Mycosphaerellaceae*.
- Cercosporidium** Earle (1901) = *Passalora* fide Deighton (*Mycol. Pap.* **112**, 1967; key), von Arx (*Proc. K. ned. Akad. Wet. Ser. C, Biol. Med. Sci.* **86**: 15, 1983), Castañeda Ruiz & Braun (*Cryptog. Bot.* **1**: 42, 1989), Liu *et al.* (*Acta phytopath. sin.* **28**: 43, 1998; RAPD), Crous *et al.* (*Mycol.* **93**: 1081, 2001; phylogeny), Crous & Braun (*CBS Diversity Ser.* **1**: 571 pp., 2003; annotated checklist).
- Cercosporina** Speg. (1911) = *Cercospora* Fresen. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Cercosporiopsis** Miura (1928) nom. illegit. = *Pseudocercospora* fide Carmichael *et al.* (*Genera of Hyphomycetes*, 1980).
- Cercosporites** E.S. Salmon (1903), *Fossil Fungi*. **1** (Miocene), Italy.
- Cercosporites** Stopes (1913), *Fossil Fungi*. **1** (Cretaceous), former Czechoslovakia.
- Cercosporula** Arnaud (1954) nom. inval., anamorphic *Chaetosphaeriales*, Hso.0fH.15. **3**, France; neotropics. See Castañeda Ruiz & Arnold (*Revta Jardín bot. Nac. Univ. Habana* **6**: 47, 1985).
- Cercostigmina** U. Braun (1993) = *Pseudocercospora* fide Braun (*Cryptog. bot.* **4**: 107, 1993), Crous & Braun (*CBS Diversity Ser.* **1**: 571 pp., 2003; annotated checklist), Taylor *et al.* (*MR* **107**: 653, 2003; phylogeny of spp. on *Proteaceae*).
- Cerebella** Ces. (1851) = *Epicoccum* fide Schol-Schwarz (*TBMS* **42**: 149, 1959), Ellis (*Dematiaceous Hyphomycetes*, 1971), Pažoutová & Kolínská (*Czech Mycol.* **54**: 155, 2003).
- cerebriform**, brain-like; convoluted.
- Cerecium** Locq. (1979) = *Cortinarius* fide Kuyper (*in litt.*).
- Cereolus** (Körb.) Boistel (1903) = *Stereocaulon* Hoffm. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Cericium** Hjortstam (1995), *Cystostereaceae*. **1**, S. America. See Hjortstam (*Mycotaxon* **54**: 184, 1995).
- Cerillum** Clem. (1931) = *Colletomanginia*.
- Cerinomyces** G.W. Martin (1949), *Dacrymycetaceae*. **12**, widespread (temperate). See McNabb (*N.Z. J. Bot.* **2**: 403, 1964; key), Donk (*Persoonia* **4**: 267, 1966), Huckfeldt & Hechler (*Zeitschrift für Mykologie* **70**: 97, 2004; Germany).
- Cerinomycetaceae** Jülich (1982) = *Dacrymycetaceae*.
Lit.: Maekawa (*CJB* **65**: 583, 1987), Maekawa & Zang (*Mycotaxon* **61**: 343, 1997), Duhem (*Bull. trimest. Soc. mycol. Fr.* **114**: 1, 1998), Larsson *et al.* (*MR* **108**: 983, 2004).
- Cerinosterus** R.T. Moore (1987), anamorphic *Femsjonia*. **1**, widespread. See Moore (*Stud. Mycol.* **30**: 216, 1987).
- Cerionomyces** Corda (1837) nom. dub. = *Ptychogaster* fide Patouillard (*Essai taxonomique sur les familles et les genres des Hyménomycètes*, 1900).
- Cerionomyces** Murrill (1909) = *Boletus* Fr. fide Singer (*Farlowia* **2**: 223, 1945).
- Cerion** Masee (1901), *Rhytismataceae*. **2**, Australia; America (tropical). See Sherwood (*Occ. Pap. Farlow Herb. Crypt. Bot.* **15**, 1980), Johnston (*Aust. Syst. Bot.* **14**: 377, 2001; Australia).
- Ceriophora** Höhn. (1919), *Xylariales*. **1** (from *Carex* leaves), Europe. Links with the *Cainiaceae* are tentative. See Kang *et al.* (*MR* **103**: 1621, 1999).
- Ceriporus** Quél. (1886) = *Polyporus* P. Micheli ex Adans. fide Saccardo (*Syll. fung.* **5**: 1, 1887).
- Ceriospora** Niessl (1876), *Annulatascaceae*. Anamorph *Chaetoconis*. **3**, widespread (temperate). See Hyde (*Sydowia* **45**: 204, 1993), Campbell *et al.* (*Mycol.* **95**: 41, 2003).
- Ceriospora** A.R. Caval. (1966) = *Marinospora*.
- Ceriospora** Berl. (1894) = *Lophiostoma* fide von Arx & Müller (*Stud. Mycol.* **9**, 1975), Hyde (*Sydowia* **45**: 204, 1993).
- Ceriosporopsis** Linder (1944), *Halosphaeriaceae*. **7** (marine), widespread. See Jones & Zainal (*Mycotaxon* **32**: 237, 1988; key), Yusoff *et al.* (*CJB* **72**: 1550, 1994; ultrastr.), Spatafora *et al.* (*Am. J. Bot.* **85**: 1569, 1998; DNA), Chen *et al.* (*Mycol.* **91**: 84, 1999; DNA), Zhang *et al.* (*Mycol.* **98**: 1076, 2006; phylogeny).
- Ceriporia** Donk (1933), *Phanerochaetaceae*. **22**, widespread. See Pieri & Rivoire (*BSMF* **113**: 193, 1984), Ryvarden & Iturriaga (*Mycol.* **95**: 1066, 2003; Venezuela), Gilbertson & Hemmes (*Mem. N. Y. bot. Gdn* **89**: 81, 2004; Hawai'i).
- Ceriporiopsis** Domański (1963), *Phanerochaetaceae*. *c.* **25**, widespread. See Domański (*Acta Soc. Bot. Pol.* **32**: 731, 1963), Ryvarden & Iturriaga (*Mycol.* **95**: 1066, 2003; Venezuela).
- cernuous**, hanging down; drooping; nodding.
- Cerocorticium** Henn. (1900), *Meruliaceae*. **2**, widespread. See Wassink (*Coolia* **50**: 21, 2007) See also *Radulomyces*.
- Cerodopsis** Muthappa (1969), *Dothideomycetes*. **1**, India. See Muthappa (*Mycol.* **61**: 737, 1969).
- Cerophora** Raf. (1808) = *Lycoperdon* Pers. fide Donk (*Taxon* **5**: 73, 1956).
- Ceropsora** B.K. Bakshi & Suj. Singh (1960), ? *Coleosporiaceae*. **1** (on *Picea* (*Pinaceae*)), India. See Bakshi & Singh (*CJB* **38**: 260, 1960) May belong to *Chrysomyxa*; similar to *Stilbechrysomyxa*.
- Cerotelium** Arthur (1906), *Phakopsoraceae*. *c.* **25**, widespread (tropical; subtropical). *C. fici* (fig rust), *C. desmum* (cotton rust). See Ono *et al.* (*MR* **96**: 844, 1992; key), Hüseyin & Selçuk (*Pakist. J. Bot.* **36**: 203, 2004; Turkey), Hernández *et al.* (*Sydowia* **57**: 189, 2005; Guyana), Thaung (*Australasian Mycologist* **24**: 29, 2005; Burma).
- Cerradoa** J.F. Hennen & Y. Ono (1978) = *Edythea* fide Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003).

- Cerrena** Gray (1821), Polyporaceae. 4, widespread. See Westhuizen (CJB 41: 1487, 1963; structure), Pegler (*The polypores [Bull. BMS Suppl.]*, 1973).
- Cerrenella** Murrill (1905) = *Inonotus* fide Pegler (TBMS 47: 175, 1964).
- Cesatia** Rabenh. (1850) [non *Cesatia* Endl. 1838, *Umbelliferae*] = *Trullula* fide Saccardo (Syll. fung. 3: 1, 1884).
- Cesatiella** Sacc. (1878), Sordariomycetidae. 1 (from dead wood), Europe. See Kohlmeyer *et al.* (Bot. Mar. 40: 291, 1997), Rossman (Stud. Mycol. 42, 1999).
- cespitose**, see caespitose.
- Ceteraria** Ach. (1809) = *Cetraria*.
- Cetradonia** J.C. Wei & Ahti (2002), Cladoniaceae (L). 1, USA. See Wei & Ahti (Lichenologist 34: 23, 2002), Miadlikowska *et al.* (Mycol. 98: 1088, 2006; phylogeny), Zhou *et al.* (J. Hattori bot. Lab. 100: 871, 2006; phylogeny).
- Cetradoniaceae** J.C. Wei & Ahti (2002) = Cladoniaceae.
- Lit.*: Miadlikowska *et al.* (Mycol. 98: 1088, 2006; phylogeny), Zhou *et al.* (J. Hattori bot. Lab. 100: 871, 2006; phylogeny).
- Cetraria** Ach. (1803) nom. cons., Parmeliaceae (L). 21, widespread (temperate to Arctic). See Kärnefelt (Op. Bot. 46, 1979; monogr. brown fruticose spp.), Jahns & Schuster (Beitr. Biol. Pfl. 55: 427, 1981; morphogenesis), Awasthi (Bull. bot. Surv. India 24: 1, 1983; key, India), Kärnefelt (Op. Bot. 86: 1, 1986; key, as *Coelocaulon*), Kärnefelt *et al.* (Pl. Syst. Evol. 183: 113, 1992; evol. & phylog.), Kärnefelt *et al.* (Bryologist 96: 394, 1993), Thell (Cryptog. Bryol.-Lichénol. 16: 247, 1995; anamorphs), Thell (Folia Cryptog. Estonica 32: 113, 1998), Thell & Miao (Ann. bot. fenn. 35: 275, 1998; phylogeny), Randlane *et al.* (Bryologist 100: 109, 1999; world list cetrarioid lichens), Thell (Lichenologist 31: 441, 1999; introns), Wedin *et al.* (MR 103: 1152, 1999; phylogeny), Thell *et al.* (Folia cryptog. Estonica 36: 95, 2000; phylogeny), Thell *et al.* (Mycol. Progr. 1: 335, 2002; phylogeny), Thell *et al.* (Mitteilungen aus dem Institut für Allgemeine Botanik Hamburg 30-32: 283, 2002; phylogeny, ecology), Miadlikowska *et al.* (Mycol. 98: 1088, 2006; phylogeny), Randlane & Saag (Central European Lichens: 75, 2006; key).
- Cetrariaceae** Schaer. (1850) = Parmeliaceae.
- Cetrariastrum** Sipman (1980), Parmeliaceae (L). 5, tropical. See Sipman (Mycotaxon 26: 235, 1986), Kurokawa (J. Jap. Bot. 74: 251, 1999; sorediate spp.), Divakar *et al.* (Mol. Phylogen. Evol. 40: 448, 2006; phylogeny, morphology).
- Cetrariella** Kärnefelt & A. Thell (1993), Parmeliaceae (L). 2, widespread (northern hemisphere). See Kärnefelt *et al.* (Bryologist 96: 394, 1993), Kärnefelt & Thell (Biblthca Lichenol. 75: 27, 2000; posn), Thell *et al.* (Mycol. Progr. 1: 335, 2002; phylogeny), Thell *et al.* (Symb. bot. upsal. 34 no. 1: 429, 2004; biogeography), Randlane & Saag (Central European Lichens: 75, 2006; key).
- Cetrariomyces** E.A. Thomas (1939) nom. inval. = *Cetraria*.
- Cetrariopsis** Kurok. (1980), Parmeliaceae (L). 2, widespread. See Kärnefelt *et al.* (Pl. Syst. Evol. 183: 113, 1992), Randlane *et al.* (Cryptog. Bryol.-Lichénol. 16: 35, 1995; status).
- Cetrelia** W.L. Culb. & C.F. Culb. (1968), Parmeliaceae (L). 17, widespread (esp. Asia). See Culberson & Culberson (Contr. US natn Herb. 34: 449, 1968), Chen (*Acta Mycol. Sin. Suppl.* 1: 386, 1986; China), Randlane & Saag (*Khemotaksonomicheskoe Izuchenie Sporovykh Rastenii i Gribov, Dostizheniya i Perspektivy Razvitiya*: 193, 1990; chemotaxonomy), Randlane *et al.* (Ukr. bot. Zh. 48: 41, 1991; Ukraine), Randlane & Saag (Nov. sist. Niz. Rast. 28: 118, 1992; Russia), Elix (*Flora of Australia* 55: 33, 1994; Australia), Barbero *et al.* (Cryptog. bot. 5: 28, 1995; Iberian peninsula), Thell & Miao (Ann. bot. fenn. 35: 275, 1998; phylogeny), Thell *et al.* (Mycol. Progr. 1: 335, 2002; phylogeny), Randlane & Saag (Central European Lichens: 75, 2006; key).
- Cetrellopsis** M.J. Lai (1980), Parmeliaceae (L). 5, Australasia. See Lumbsch (SA 7: 105, 1988), Randlane *et al.* (Cryptog. Bryol.-Lichénol. 16: 35, 1995), Lai & Elix (Mycotaxon 84: 355, 2002; Thailand), Thell *et al.* (Mycol. Progr. 1: 335, 2002; phylogeny).
- Ceuthocarpon** P. Karst. (1873) = *Linospora* fide Hawksworth *et al.* (Dictionary of the Fungi edn 8, 1995).
- Ceuthodiplospora** Died. (1912), anamorphic *Splanchnonema*, Cpd.1eH.15. 1, former Czechoslovakia. See Sutton (Mycol. 72: 208, 1980).
- Ceuthosira** Petr. (1924), anamorphic *Pezizomycotina*, Cpd.0eH.?. 1, Europe.
- Ceuthospora** Fr. (1825) nom. rej. = *Pyrenophora* fide Hawksworth *et al.* (Dictionary of the Fungi edn 8, 1995).
- Ceuthospora** Grev. (1826) nom. cons., anamorphic *Phacidium*, St.0eH.15. 106, widespread. See Sutton (*The Coelomycetes*, 1980), DiCosmo *et al.* (Mycotaxon 21: 1, 1984), Ando *et al.* (Ann. phytopath. Soc. Japan 55: 391, 1989; brown zonate leaf blight of tea by *C. lauri*).
- Ceuthosporella** Höhn. (1929) = *Helhonia*.
- Ceuthosporella** Petr. & Syd. (1923), anamorphic *Pezizomycotina*, St.0eH.?. 1, Japan.
- CF** (CFL), see Nomenclature, Societies and organizations.
- Chaconia** Juel (1897), Chaconiaceae. 7 (on dicots, esp. Leguminosae), widespread (tropical). See Ono & Hennen (TMSJ 24: 369, 1983), Hennen *et al.* (Catalogue of the Species of Plant Rust Fungi (Uredinales) of Brazil: 2005, 2005; Brazil spp.).
- Chaconiaceae** Cummins & Y. Hirats. (1983), Pucciniales. 8 gen. (+ 8 syn.), 75 spp.
- Lit.*: Dai & Shen (Mycotaxon 48: 193, 1993), Evans (Mycopathologia 124: 163, 1993), Ono & Harada (Mycoscience 35: 179, 1994), Ono *et al.* (Cryptogams of the Himalayas 3. Nepal and Pakistan: 69, 1995), Payak (Indian Phytopath. 49: 307, 1996), Berndt (Mycol. 91: 1045, 1999), Cummins & Hiratsuka (Illustr. Gen. Rust Fungi edn 3: 225 pp., 2003), Maier *et al.* (CJB 81: 12, 2003), Wingfield *et al.* (Australas. Pl. Path. 33: 327, 2004), Ritschel (Biblthca Mycol. 200: 132 pp., 2005), Aime (Mycoscience 47: 112, 2006).
- Chadefaudia** Feldm.-Maz. (1957), Halosphaeriaceae (?L). 6 (marine algae), widespread. See Kohlmeyer & Kohlmeyer (Marine Mycology, 1979), Stegena & Kemperman (Bot. Mar. 27: 443, 1984; S. Afr.), Nakagiri & Ito (Mycol. 89: 484, 1997; contrast with *Retrostium*).
- Chadefaudiella** Faurel & Schotter (1959), Chadefaudiellaceae. 2 (coprophilous), N. Africa. See Faurel & Schotter (Revue Mycol. Paris 30: 330, 1966).
- Chadefaudiellaceae** Faurel & Schotter ex Benny & Kimbr. (1980), Microascales. 2 gen., 3 spp.

- Lit.*: Valldosera *et al.* (*Mycotaxon* 30: 5, 1987), von Arx *et al.* (*Beih. Nova Hedwigia* 94: 104 pp., 1988), von Arx *et al.* (*Beih. Nova Hedwigia* 94: 104, 1988).
- Chadefaudiomyces** Kamat, V.G. Rao, A.S. Patil & Ullasa (1974), Diaporthales. Anamorph *Lasmenia*. 1, India. See Kamat *et al.* (*Revue Mycol. Paris* 38: 19, 1973).
- Chaenocarpus** Lév. (1843) nom. dub. = *Chaenocarpus* Rebert. fide Læssøe (*SA* 13: 43, 1994).
- Chaenocarpus** Rebert. (1804) nom. dub., Xylariaceae. 1, Europe. See Dennis (*Revta Biol. Lisb.* 1: 175, 1958), Læssøe (*SA* 13: 43, 1994).
- Chaenocarpus** Spreng. (1831) = *Chaenocarpus* Rebert. fide Læssøe (*SA* 13: 43, 1994).
- Chaenotheca** (Th. Fr.) Th. Fr. (1860), Coniocybaceae (L). 25, widespread (esp. temperate). See Tibell (*Symb. bot. upsal.* 23 no. 1, 1980; key 14 N. Hemisph. spp.), Tibell (*Nova Hedwigia* 79: 597, 1984; gen. concept), Honegger (*Sydowia* 38: 146, 1986; asci), Middelborg & Mattsson (*Sommerfeltia* 5, 1987; Norway), Tibell (*Nordic J Bot.* 13: 441, 1993; anamorphs), Tibell (*Fl. Neotrop. Monogr.* 69: 78 pp., 1996; neotropical spp.), Tibell (*Symb. bot. upsal.* 32 no. 1: 291, 1997; anamorphs), Tibell (*Biblthca Lichenol.* 71: 107 pp., 1998; S America), Tibell (*Lichenologist* 33: 519, 2001; phylogeny, synonymy), Tibell (*Bryologist* 104: 191, 2001; phylogeny, photobionts), Tibell (*Ann. bot. fenn.* 39: 73, 2002; morphology, phylogeny), Tibell & Koffman (*Bryologist* 105: 353, 2002; N America), Aptroot & Tibell (*Australasian Lichenology* 52: 12, 2003; Papua New Guinea), Rikkinen (*Acta Bot. Fenn.* 175: 1, 2003; Oregon), Titov *et al.* (*Symb. bot. upsal.* 34 no. 1: 455, 2004; Russia).
- Chaenotheciella** Räsänen (1943) ? = *Chaenothecopsis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Chaenothecomycetes** Cif. & Tomas. (1953) = *Chaenotheca*.
- Chaenothecopsis** Vain. (1927), Mycocaliciaceae. Anamorphs *Asterophoma*, *Catenomycopsis*, *Phialophora*-like. 62 (on lichens, other fungi or wood), Europe. See Schmidt (*Mitt. Inst. Allg. Botanik Hamburg* 13: 111, 1970), Hawksworth (*TBMS* 74: 650, 1980), Tibell (*Beih. Nova Hedwigia* 79: 597, 1984), Tibell (*Symb. bot. upsal.* 27 no. 1, 1987; status, Austral. spp.), Tibell (*CJB* 69: 2427, 1991; anamorphs), Tibell & Constantinescu (*MR* 95: 556, 1991; anamorph), Tibell & Ryman (*Nova Hedwigia* 60: 199, 1995; key 8 spp.), Rikkinen (*Bryologist* 102: 366, 1999; resinicolous spp.), Rikkinen & Poinar (*MR* 104: 7, 2000; fossil sp.), Rikkinen (*Mycol.* 95: 1032, 2003; in amber), Rikkinen (*Mycol.* 95: 98, 2003; on resin), Tibell & Vinuesa (*Taxon* 54: 427, 2005; phylogeny), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny), Groner (*Lichenologist* 38: 395, 2006; Switzerland).
- Chaetalysis** Peyronel (1922) = *Acarosporium* fide Sutton (*Mycol. Pap.* 141, 1977).
- Chaetantromycopsis** H.P. Upadhyay, Cavalc. & A.A. Silva (1986), anamorphic *Pezizomycotina*, Hsy.0eP.15. 1, Brazil. See Upadhyay *et al.* (*Mycol.* 78: 493, 1986).
- Chaetapiospora** Petr. (1947) = *Pseudomassaria* fide Barr (*Mycol.* 68, 1976).
- Chaetarthriomyces** Thaxt. (1931), Laboulbeniaceae. 3, widespread. See Scheloske (*Parasitol. Schr. Reihe* 19: 97, 1969), Majewski (*Acta Mycologica Warszawa* 34: 7, 1999; Poland), Shen *et al.* (*Mycosystema* 22: 157, 2003; China).
- Chaetasbolisia** Speg. (1918), anamorphic *Pezizomycotina*, Cpd.0eH.15. 7, widespread. See Patel *et al.* (*MR* 101: 335, 1997; India).
- Chaetaspis** Syd. & P. Syd. (1917) = *Rhagadolobium* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Chaetasterina** Bubák (1909) = *Chaetothyrium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Chaetendophragmia** Matsush. (1971), anamorphic *Pezizomycotina*, Hso.≡ eP.19. 5, widespread. See Matsushima (*Microfungi of the Solomon Islands and Papua-New Guinea*: 12, 1971), Carris (*MR* 99: 667, 1995; synanamorph), Wu & Zhuang (*Fungal Diversity Res. Ser.* 15, 2005).
- Chaetendophragmiopsis** B. Sutton & Hodges (1978), anamorphic *Pezizomycotina*, Hso.≡ eP.19. 2, pantropical. See Sutton & Hodges (*Nova Hedwigia* 29: 596, 1978).
- Chaethomites**, see *Chaetomites*.
- Chaetoamphisphaeria** Hara (1918), *Pezizomycotina*. 1, Japan.
- Chaetobasidiella** Höhn. (1918) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Chaetobasis** Clem. & Shear (1931) ≡ *Chaetobasidiella*.
- Chaetoblastophorum** Morgan-Jones (1977), anamorphic *Pezizomycotina*, Hso.0eH.1. 1, USA. See Morgan-Jones (*Mycotaxon* 5: 484, 1977).
- Chaetobotrys** Clem. (1931) ≡ *Kusanobotrys*.
- Chaetocalathus** Singer (1943), Marasmiaceae. c. 20, widespread (predominantly subtropical). See Singer (*Lilloa* 8: 441, 1942; monogr.), Singer (*Fl. Neotrop.* 17: 53, 1976; key 6 neotrop. spp.).
- Chaetocarpus** P. Karst. (1889) [non *Chaetocarpus* Thwaites 1849) nom. cons., *Euphorbiaceae*] = *Veluticeps* fide Donk (*Persoonia* 3: 199, 1964).
- Chaetoceratostoma** Turconi & Maffei (1912) = *Scopinella* fide Hawksworth (*TBMS* 64: 447, 1975).
- Chaetoceris** Clem. & Shear (1931) ≡ *Chaetoceratostoma*.
- Chaetochalara** B. Sutton & Piroz. (1965) = *Chalara* fide Kirk in Kirk & Spooner (*Kew Bull.* 38: 579, 1984).
- Chaetocladiaceae** A. Fisch. (1892) = *Mucoraceae*.
Lit.: Kirk (*in litt.*).
- Chaetocladium** Fresen. (1863), *Mucoraceae*. 2 (facultative parasites of *Mucorales*), widespread. See Benny & Benjamin (*Aliso* 8: 391, 1976), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny), Wöstemeyer & Schimek in Heitman *et al.* (Eds.) (*Sex in Fungi*: 431, 2007; trisporic acid & mating).
- Chaetoconidium** Zukal (1887), anamorphic *Pezizomycotina*, Hso.?.?. 1, Europe.
- Chaetoconis** Clem. (1909), anamorphic *Ceriospora*, Cpd.≡ eH.15. 2, widespread (north temperate). See Sutton (*CJB* 46: 183, 1968), Punithalingam (*Nova Hedwigia* 40: 99, 1984; appendages), Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*: 188, 1993).
- Chaetocrea** Syd. (1927), Tubeufiaceae. 1 (fungicolous), widespread (neotropics). See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Chaetocypha** Corda (1829) nom. dub., *Fungi*. See Donk (*Reinwardtia* 1: 208, 1951).
- Chaetocystostroma** Petr. (1920), anamorphic *Pezizomycotina*, St.0eH.?. 1, Europe.

- Chaetoderma** Parmasto (1968), Stereaceae. 2, Europe. See Parmasto (*Consp. System. Corticiac.*: 86, 1968).
- Chaetodermataceae** Jülich (1982) = Stereaceae.
- Chaetodermella** Rauschert (1988), Gloeophyllaceae. 1, Europe. See Rauschert (*Haussknechtia* 4: 52, 1988).
- Chaetodimerina** Hansf. (1946) = Rizalia fide Pirozynski (*Kew Bull.* 31: 595, 1977).
- Chaetodiplis** Clem. (1931), anamorphic *Pezizomycotina*, Cpd.0eP.?. 1, Europe.
- Chaetodiplodia** P. Karst. (1884), anamorphic *Pezizomycotina*, Cpd.1eP.15. 9, widespread (esp. tropical). See Zambettakis (*BSMF* 70: 219, 1954).
- Chaetodiplodina** Speg. (1910), anamorphic *Pezizomycotina*, Cpd.0eP.1. 2, S. America. See Petrak & Sydow (*Annls mycol.* 33: 181, 1935).
- Chaetodiscula** Bubák & Kabát (1910) = Hymenopsis fide Sutton (*Mycol. Pap.* 141, 1977).
- Chaetodocheis** Clem. (1909) ? = Chaetostroma fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Chaetodocheium** Höhn. (1932) = Volutella fide Tulloch (*Mycol. Pap.* 130, 1972).
- Chaetolentomita** Maubl. (1915) = Chaetosphaeria fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Chaetomastia** (Sacc.) Berl. (1891), ? Dacampiaceae. 10, widespread. See Barr (*Mycotaxon* 34: 507, 1989; key N. Am. spp.), Eriksson & Hawksworth (*SA* 8: 64, 1989; posn), Barr (*Mycotaxon* 82: 373, 2002; definition).
- Chaetomelanops** Petr. (1948) = Pyrenostigma fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Chaetomelasmia** Danilova (1951) = Diachorella fide Sutton (*Mycol. Pap.* 141, 1977).
- Chaetomeliola** (Cif.) Bat., H. Maia & M.L. Farr (1962) = Meliola fide Hughes (*in litt.*).
- Chaetomella** Fuckel (1870), anamorphic *Leotiomyces*, Cpd.0eH.15. 5 (esp. in soil), widespread. See Sutton & Sarbhoy (*TBMS* 66: 297, 1976), Vobis *et al.* (*Boln Soc. argent. Bot.* 28: 205, 1992; Argentina), Rossman *et al.* (*Mycol. Progr.* 3: 275, 2004; phylogeny).
- Chaetomeris** Clem. (1931) = Treubiomyces.
- Chaetomiaceae** G. Winter (1885), Sordariales. 16 gen. (+ 8 syn.), 205 spp. The family appears to be paraphyletic.
- Lit.*: Udagawa in Kurato & Ueno (Eds) (*Toxigenic Fungi: their toxins and health hazard*: 139, 1984), Cannon (*TBMS* 87: 45, 1986), von Arx *et al.* (*Beih. Nova Hedwigia* 84: 162 pp., 1986), von Arx *et al.* (*Beih. Nova Hedwigia* 94: 104 pp., 1988), von Arx *et al.* (*Beih. Nova Hedwigia* 94, 1988), Domsch *et al.* (*Compendium of Soil Fungi and Supplement*: 406 pp., 1993), Mouchacca (*Cryptog. Mycol.* 18: 19, 1997), Silva & Hanlin (*Mycoscience* 37: 261, 1996), Lee & Hanlin (*Mycol.* 91: 434, 1999; DNA), Stchigel *et al.* (*MR* 104: 879, 2000), Untereiner *et al.* (*CJB* 79: 321, 2001), Stchigel *et al.* (*MR* 106: 975, 2002), Huhndorf *et al.* (*Mycol.* 96: 368, 2004), Lumbsch & Huhndorf (*MR* 111: 1064, 2007).
- Chaetomiales** = Sordariales.
- Chaetomidium** (Zopf) Sacc. (1882), Chaetomiaceae. Anamorph *Phialophora*-like. 16 (mainly from soil or coprophilous), widespread. See von Arx (*Stud. Mycol.* 8, 1975), von Arx (*Beih. Nova Hedwigia* 94, 1988; keys), Silva & Hanlin (*Mycoscience* 37: 261, 1997; key), Stchigel *et al.* (*Stud. Mycol.* 50: 215, 2004).
- Chaetomiopsis** Mustafa & Abdul-Wahid (1990), Chaetomiaceae. 1 (from soil), Egypt. See Moustafa & Abdul-Wahid (*Mycol.* 82: 129, 1990).
- Chaetomiotricha** Peyronel (1914) = Chaetomium fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Chaetomites** Pampal. (1902), Fossil Fungi. 1 (Tertiary), Italy.
- Chaetomium** Kunze (1817), Chaetomiaceae. Anamorph *Botryotrichum*. 95 (coprophilous, on straw, wet paper, cloth, cotton fibres (esp. *C. globosum*) many cellulolytic, some thermophilic, some mycotoxic), widespread. See Hawksworth & Wells (*Mycol. Pap.* 134, 1973; ornamentation terminal hairs), Millner *et al.* (*Mycol.* 69: 720, 1977; ascospores SEM), Wicklow (*TBMS* 72: 107, 1979; ecology and hair types), Udagawa in Kurato & Ueno (Eds) (*Toxigenic Fungi: their toxins and health hazard*: 139, 1984; toxins), Cannon (*TBMS* 87: 50, 1986; key spp. with inconspicuous hairs), von Arx *et al.* (*Beih. Nova Hedwigia* 84, 1986; keys), Guarro & Figueras (*Cryptog. Bot.* 1: 97, 1989; ontogeny), Koyama (*Proc. Jap. Assoc. Mycotoxic.* 35: 7, 1992; mycotoxins), Lee & Hanlin (*Mycol.* 91: 434, 1999; DNA), Untereiner *et al.* (*CJB* 79: 321, 2001; phylogeny), Hsieh & Hu (*Taiwania* 47: 264, 2002; Taiwan), Barron *et al.* (*J. Clin. Microbiol.* 41: 5302, 2003; mycosis), Sun *et al.* (*Mycosystema* 23: 333, 2004; China), Sun *et al.* (*Mycosystema* 24: 318, 2005; China), Wang & Zheng (*Nova Hedwigia* 81: 247, 2005; China), Kubátová (*Czech Mycol.* 58: 155, 2006; Czech Republic), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny), Chang & Wang (*Taiwania* 53: 85, 2008; key Taiwan spp.).
- Chaetomonodorus** Bat. & H. Maia (1961) = Microtheliopsis fide Lücking *et al.* (*Lichenologist* 30: 121, 1998).
- Chaetomyces** Thaxt. (1893), Laboulbeniaceae. 1, N. & S. America. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- Chaetonaemosphaera** Schwarzman (1968) = Ceratocystis fide Sutton (*Mycol. Pap.* 141, 1977).
- Chaetonaevia** Arx (1951), Dermateaceae. 3, Europe. See Dennis (*Kew Bull.* 52: 451, 1997), Nauta & Spooner (*Mycologist* 13: 65, 1999; UK).
- Chaetonectrioides** Matsush. (1996), Dothideomycetes. Anamorph *Mirandina*. 1, Malaysia. See Matsushima (*Matsush. Mycol. Mem.* 9: 5, 1996).
- Chaetopatella** I. Hino & Katum. (1958) = Pseudolachnea Ranoj. fide Sutton (*Mycol. Pap.* 141, 1977).
- Chaetopeltaster** Katum. (1975), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, Japan. See Katumoto (*Bulletin of the Faculty of Agriculture, Yamaguchi University* 26: 98, 1975).
- Chaetopeltiopsis** Hara (1913) nom. dub., anamorphic *Pezizomycotina*. 1, Japan.
- Chaetopeltis** Sacc. (1898) [non *Chaetopeltis* Berthold 1878, *Algae*] = Tassia.
- Chaetopeltopsis** Theiss. (1913) = Chaetothyria fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Chaetophiophoma** Speg. (1910), anamorphic *Pezizomycotina*, Cpd.0fH.1. 1, S. America.
- Chaetophoma** Cooke (1878), anamorphic *Pezizomycotina*, Cpd.0eH.15. 30, widespread. See Hughes (*Mycol.* 68: 693, 1976).
- Chaetophomella** Speg. (1918) nom. conf., anamorphic

- Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Chaetophorites** Pratje (1922), Fossil Fungi (mycel.) ? Fungi. 1 (Silurian, Jurassic, Tertiary), widespread.
- Chaetoplaca** Syd. & P. Syd. (1917), ? Schizothyriaceae. 1, Philippines.
- Chaetoplea** (Sacc.) Clem. (1931), Leptosphaeriaceae. Anamorph *Parahendersonia*. 17, widespread (esp. north temperate). See Barr (*Mem. N. Y. bot. Gdn* 62: 1, 1992; key), Yuan & Barr (*Mycotaxon* 52: 495, 1994), Eriksson & Hawksworth (*SA* 14: 48, 1995; posn).
- Chaetoporellaceae** Jülich (1982) = Schizoporaceae.
- Chaetoporellus** Bondartsev & Singer (1944) nom. rej. = Hyphodontia fide Langer (*Bibliotheca Mycol.* 158, 1994).
- Chaetoporus** P. Karst. (1890) = Junghuhnina fide Ryvarden (*Persoonia* 7: 17, 1972).
- Chaetopotius** Bat. (1951) = Aithaloderma fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Chaetopreussia** Locq.-Lin. (1977), Sporormiaceae. 1 (coprophilous), Sahara. See Locquin-Linard (*Revue Mycol. Paris* 41: 185, 1977), Barr (*Mycotaxon* 76: 105, 2000).
- Chaetopsella** Höhn. (1930) = Chaetopsis fide Hughes (*TBMS* 34: 551, 1951).
- Chaetopsina** Rambelli (1956), anamorphic *Cosmospora*, Hso.0eH.15. 14, widespread. See Kirk & Sutton (*TBMS* 85: 709, 1985; key), Samuels (*Mycotaxon* 22: 13, 1985; teleomorphs), Rambelli (*Micol. Ital.* 16: 7, 1987; bibliogr.), Onofri & Zucconi (*Mycotaxon* 41: 451, 1991; SEM *C. fulva*), Goh & Hyde (*MR* 101: 1517, 1997), Okada *et al.* (*Mycoscience* 38: 409, 1997; phylogeny).
- Chaetopsis** Grev. (1825), anamorphic *Pezizomycotina*, Hso.1eP.15. 7, widespread. See DiCosmo *et al.* (*Mycol.* 75: 949, 1983; related genera).
- Chaetopyrena** Pass. (1881), anamorphic *Pezizomycotina*. 1 or 2, Europe.
- Chaetopyrena** Sacc. (1883) = Chaetopyrenis.
- Chaetopyrenis** Clem. & Shear (1931) = Keissleriella fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Chaetosaccardinula** Bat. (1962) = Strigopodia fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Chaetosartorya** Subram. (1972), Trichocomaceae. Anamorph *Aspergillus*. 3, Costa Rica. See Subramanian & Rajendran (*Revue Mycol. Paris* 43: 193, 1979; ontogeny), Kuraishi *et al.* (*NATO ASI Series A: Life Sciences* 185: 407, 1990; ubiquinones), Chang *et al.* (*J. gen. appl. Microbiol. Tokyo* 37: 289, 1991; DNA), Peterson (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 323, 2000; phylogeny), Tamura *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 357, 2000; phylogeny).
- Chaetosclerophoma** Petr. (1924), anamorphic *Pezizomycotina*, St.0eH.?. 1, Europe.
- Chaetoscorias** W. Yamam. (1955) = Phragmocapnias fide Hughes (*Mycol.* 68: 693, 1976).
- Chaetoscutula** E. Müll. (1959), Dothideomycetes. 1, France; Scotland. See Müller (*Sydowia* 12: 190, 1958).
- Chaetoscypha** Syd. (1924) ? = Lachnum fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Chaetoseptoria** Tehon (1937), anamorphic *Pezizomycotina*, Cpd.0fH.?. 1, N. America. See Sutton (*Mycol. Pap.* 97, 1964).
- Chaetosira** Clem. (1931) = Wiesneriomycetes.
- Chaetospermella** Chardón & Toro (1934) = Spermochaetella.
- Chaetospermella** Naumov (1929) = Chaetospermum fide Sutton (*Mycol. Pap.* 141, 1977).
- Chaetospermopsis** Katum. & Y. Harada (1979) = Amphichaetella fide Katumoto & Harada (*TMSJ* 20: 424, 1979), Alcorn (*Australas. Mycol.* 21: 111, 2002).
- Chaetospermum** Sacc. (1892), anamorphic *Pezizomycotina*, St.0eH.1. 5, widespread. See Sutton (*The Coelomycetes*, 1980), Muntañola-Cvetkovic & Gómez-Bolea (*Mycotaxon* 47: 59, 1993; Iberian peninsula).
- Chaetosphaerella** E. Müll. & C. Booth (1972), Chaetosphaerellaceae. Anamorphs *Oedemium*, *Veramykina*. 2 (from wood etc.), Europe. See Réblová (*Mycotaxon* 70: 387, 1999), Huhndorf *et al.* (*Mycol.* 96: 368, 2004; phylogeny), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Chaetosphaerellaceae** Huhndorf, A.N. Mill. & F.A. Fernández (2004), Coronophorales. 5 gen. (+ 7 syn.), 8 spp.
Lit.: Réblová (*Mycotaxon* 70: 387, 1999), Réblová (*Mycotaxon* 71: 45, 1999), Huhndorf *et al.* (*Mycol.* 96: 368, 2004), Huhndorf *et al.* (*MR* 108: 1384, 2004).
- Chaetosphaeria** Tul. & C. Tul. (1863), Chaetosphaeriaceae. Anamorphs very diverse, including *Cacumisporium*, *Catenularia*, *Chalara*-like, *Chloridium*, *Codinaea*, *Craspedodidymum*, *Cryptophiale*, *Cylindrotrichum*, *Dictyochaeta*, *Exserticlava*, *Fusichalara*, *Gonytrichum*, *Menispora*, *Phaeostalagmus*, *Phialophora*-like and *Zanclospora*. 68, widespread. See Booth (*Mycol. Pap.* 68, 1957), Gams & Holubová-Jechová (*Stud. Mycol.* 13, 1976), Barr & Crane (*CJB* 57: 835, 1979; anamorph), Barr (*Mycotaxon* 39: 43, 1990; posn), Réblová (*Stud. Mycol.* 45: 149, 2000), Réblová & Gams (*Mycoscience* 41: 129, 2000), Réblová & Winka (*Mycol.* 92: 939, 2000; phylogeny), Huhndorf *et al.* (*Mycol.* 93: 1072, 2001), Réblová & Seifert (*Sydowia* 55: 313, 2003; Thailand), Huhndorf *et al.* (*Mycol.* 96: 368, 2004; phylogeny), Réblová (*Stud. Mycol.* 50: 171, 2004; New Zealand), Fernández & Huhndorf (*Fungal Diversity* 18: 15, 2005), Huhndorf & Fernández (*Fungal Diversity* 19: 23, 2005; anamorph connexions), Fernández *et al.* (*Mycol.* 98: 121, 2006; morphology, phylogeny), Réblová *et al.* (*MR* 110: 104, 2006; *Menispora* anam.), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny), Atkinson *et al.* (*N.Z. Jl Bot.* 45: 685, 2007; New Zealand).
- Chaetosphaeriaceae** Réblová, M.E. Barr & Samuels (1999), Chaetosphaeriales. 28 gen. (+ 33 syn.), 306 spp.
Lit.: Gams & Holubová-Jechová (*Stud. Mycol.* 13, 1976), Barr (*Mycotaxon* 39: 43, 1990), Kuthubutheen & Nawawi (*MR* 95: 1224, 1991), Réblová (*Czech Mycol.* 50: 73, 1997), Samuels *et al.* (*Mycol.* 89: 156, 1997), Hyde *et al.* (*MR* 103: 1432, 1999), Réblová (*Sydowia* 51: 210, 1999), Réblová (*Mycotaxon* 71: 45, 1999), Réblová *et al.* (*Sydowia* 51: 49, 1999), Gams (*Stud. Mycol.* 45: 192, 2000), Réblová (*Stud. Mycol.* 45: 149, 2000), Réblová & Winka (*Mycol.* 92: 939, 2000; phylogeny), Koster *et al.* (*CJB* 81: 633, 2003), Huhndorf *et al.* (*Mycol.* 96: 368, 2004), Fernández *et al.* (*Mycol.* 98: 121, 2006).
- Chaetosphaeriales** Huhndorf, A.N. Mill. & F.A.

- Fernández (2004). Sordariomycetidae. 1 fam., 31 gen., 311 spp. Fam.:
- Chaetosphaeriaceae**
For *Lit.* see under fam.
- Chaetosphaerides** Matsush. (2003), ? Trichosphaeriales. 1, Japan. See Matsushima (*Matsush. Mycol. Mem.* 10: 146, 2001), Réblová (*in litt.*, 2008).
- Chaetosphaerites** Félix (1894), Fossil Fungi. 3 (Carboniferous, Tertiary), widespread.
- Chaetosphaeronema** Moesz (1915), anamorphic *Pezizomycotina*, Cpd.1eH.15. 3, widespread. See Punithalingam & Spooner (*Kew Bull.* 57: 534, 2002; UK).
- Chaetosphaeropsis** Curzi & Barbaini (1927) = Coniothyriopsis Speg. fide Clements & Shear (*Gen. Fung.*, 1931), Sutton (*Mycol. Pap.* 141, 1977).
- Chaetosphaerulina** I. Hino (1938), Tubeufiaceae. Anamorph *Xenosporium*. 5, S. & S.E. Asia. See Sivanesan (*TBMS* 81: 325, 1983; key, as *Thaxteriellopsis*), Rossman (*Mycol. Pap.* 157, 1987; synonym of *Herpotrichia*), Crane *et al.* (*CJB* 76: 602, 1998).
- Chaetosporea** Faurel & Schotter (1965) [non *Chaetosporea* R. Br. 1918, *Cyperaceae*] = Neochaetosporea fide Sutton & Sankaran (*MR* 95: 1021, 1991).
- Chaetosporium** Corda (1833) nom. dub., Fungi. See Saccardo (*Syll. fung.* 4: 761, 1886).
- Chaetosticta** Petr. & Syd. (1925), anamorphic *Lasio-stemma*, Cpd.≡ eH.15. 3, N. America; Japan. See Crane (*CJB* 49: 31, 1971), Matsushima (*Matsush. Mycol. Mem.* 10, 2001).
- Chaetostigme** Syd. & P. Syd. (1917) = Wentiomyces fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Chaetostigmella** Syd. & P. Syd. (1917) = Phaeodimeriella Speg. fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Chaetostroma** Corda (1829) nom. conf., nom. dub., anamorphic *Pezizomycotina*, Hsp.???. 10, widespread. See Tulloch (*Mycol. Pap.* 130, 1972), Holubová-Jechová (*Sydowia* 46: 238, 1994).
- Chaetostromella** P. Karst. (1895) nom. conf., anamorphic *Pezizomycotina*. See Petrak (*Sydowia* 7: 299, 1953).
- Chaetostylum** Tiegh. & G. Le Monn. (1873) = Helicostylum fide Lythgoe (*TBMS* 41: 135, 1958), Upadhyay (*Mycol.* 65: 735, 1973).
- Chaetotheca** Zukai (1890), ? Trichocomaceae. 1, Europe.
- Chaetothiersia** B.A. Perry & Pfister (2008), Pyrenomataceae. 1, USA. See Perry & Pfister (*Fungal Diversity* 28: 65, 2008).
- Chaetothyriaceae** Hansf. ex M.E. Barr (1979), Chaetothyriales. 13 gen. (+ 27 syn.), 98 spp.
Lit.: Batista & Ciferri (*Sydowia Beih.* 3, 1962), Eriksson & Yue (*Mycotaxon* 22: 269, 1985), Pohlád (*Mycol.* 80: 757, 1988), Constantinescu *et al.* (*Stud. Mycol.* 31: 69, 1989), Panwar & Jagtap (*Geobios New Rep.* 9: 121, 1990), Winka *et al.* (*Mycol.* 90: 822, 1998), Haase *et al.* (*Stud. Mycol.* 43: 80, 1999), Cannon (*IMI Descr. Fungi Bact.* 141: [22] pp., 1999).
- Chaetothyriales** M.E. Barr (1987). Chaetothyriomycetidae. 3 fam., 37 gen., 213 spp. Mycelium varied, if external with narrow cylindrical brown hyphae, sometimes with setose appendages. Ascomata erumpent or superficial, sometimes formed beneath a subiculum, spherical or flattened, sometimes setose, often collapsing when dry, the apex ± papillate, with a well-developed periphysate ostiole; peridium thin-walled, composed of compressed pseudoparenchymatous cells, varied in pigmentation; hymenium usually J+; interascal tissue of short apical periphysoids. Asci saccate to clavate, fissitunicate, the inner wall layer often conspicuously thickened in the apical region, sometimes polysporous; ascospores hyaline or pale greyish, transversely septate or muriform. Anamorphs hyphomycetous, sometimes yeast-like (black yeasts, see yeasts). Epiphytic or biotrophic on leaves or saprobic on plants or other fungi, cosmop. Fams.:
- (1) **Chaetothyriaceae**
 - (2) **Coccodiniaceae**
 - (3) **Herpotrichiellaceae**
- For *Lit.* see under fam.
- Chaetothyrina** Theiss. (1913), Micropeltidaceae. 7, widespread (tropical). *C. musarum* (sooty blotch of banana). See Bitancourt (*Arq. Inst. biol., S. Paulo* 7: 5, 1936), Panwar *et al.* (*Geobios New Rep.* 10: 41, 1991), Reynolds & Gilbert (*Aust. Syst. Bot.* 18: 265, 2005; key).
- Chaetothyriolum** Speg. (1919) nom. dub., anamorphic *Pezizomycotina*. See Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952).
- Chaetothyriomycetes** O.E. Erikss. & Winka (1997) = Eurotiomycetes. See *Chaetothyriomycetidae*
For *Lit.* see ord. and fam.
- Chaetothyriomycetidae** Doweld (2001), Eurotiomycetes. Ascomata perithecial, superficial or immersed within a thallus. Asci usually thick-walled and fissitunicate, rarely evanescent, sometimes accompanied by pseudoparaphyses. Ascospores variable in pigmentation and septation. Lichenized, parasitic (esp. on other fungi) or saprobic.
- The number of families contained within this subclass continues to increase based on new molecular data. Ord.:
- (1) **Chaetothyriales**
 - (2) **Pyrenulales**
 - (3) **Verrucariales**
- Lit.*: Geiser *et al.* (*Mycol.* 98: 1051, 2006; phylogeny), Liu *et al.* (*Mol. Biol. Evol.* 16: 1799, 1999; RNA polymerase phylogeny), Sterflinger *et al.* (*Stud. Mycol.* 43: 5, 1999; phylogeny and ecology), Untereiner *et al.* (*MR* 99: 897, 1995), Winka *et al.* (*Mycol.* 90: 822, 1998; rDNA phylogeny).
- Chaetothyriopsis** F. Stevens & Dorman (1927) ? = Actinopeltis fide Spooner & Kirk (*MR* 94: 223, 1990), Eriksson & Hawksworth (*SA* 9: 6, 1991; status).
- Chaetothyrium** Speg. (1888), Chaetothyriaceae. Anamorph *Merismella*. 26, widespread (esp. tropical). See Hansford (*Mycol. Pap.* 15, 1946), Panwar & Jagtap (*Geobios New Rep.* 9: 121, 1990; India), Reynolds & Gilbert (*Aust. Syst. Bot.* 18: 265, 2005).
- Chaetotrichum** Rabenh. (1844) nom. dub. ≡ Chaetosporium.
- Chaetotrichum** Syd. (1927) ≡ Anellophora.
- Chaetotyphula** Corner (1950), Pterulaceae. 7, tropical. See Dentinger & McLaughlin (*Mycol.* 98: 746, 2006; phylogeny).
- Chaetozythia** P. Karst. (1888) nom. dub., Fungi. Based on a mite fide v. Höhnelt (*Öst. bot. Z.* 63: 238, 1913).
- Chaetyllis** Clem. (1931) ≡ Raciborskiomyces.
- chaga fungus**, see birch canker.
- Chailletia** Fuckel (1863) [non *Chailletia* DC. 1811, *Chailletiaceae*] ? = Truncatella fide Sutton (*in litt.*).
- Chailletia** Jacz. (1913), Valsaceae. 1, Switzerland. See

- also *Azbukinia*.
- Chaillietia** P. Karst. (1871) [non *Chaillietia* DC. 1811, *Chaillietiaceae*] $\equiv$ *Karstenia* Fr.
- Chain** (Ernst Boris; 1906-1979; Germany). Friedrich Wilhelm University (1930); Cambridge (1933-1935); Oxford (1935-1946); Istituto Superiore di Sanità, Rome (1946-1964); Imperial College, London (1964-1979). Biochemist who, with Florey (q.v.) organized the first large-scale production of penicillin, the fungal antibiotic discovered by Fleming (q.v.). *Biogs, obits etc.* Mansford (*Nature* 281: 715, 1979).
- Chainia** Thirum. (1955), Actinobacteria. q.v.
- Chainoderma** Masee (1890) = *Podaxis* fide Cunningham (*Gast. Austr. N.Z.*: 196, 1944).
- Chalara** (Corda) Rabenh. (1844), anamorphic *Pezizomycotina*, Hso.0-1eH.22. c. 103, widespread. *C. quercina* (oak wilt). See Nag Raj & Kendrick (*Monogr. Chalara Allied Genera*, 1975), Kile & Walker (*Aust. J. Bot.* 35: 1, 1987; *C. australis*, pathogenicity), Nag Raj & Kendrick in Wingfield *et al.* (Eds) (*Ceratocystis and Ophiostoma Taxonomy, Ecology and Pathogenicity*, 1993; anamorphs ophiostomatoid fungi), Réblová (*Sydowia* 51: 210, 1999; teleomorph), Paulin & Harrington (*Stud. Mycol.* 45: 209, 2000; phylogeny), McKenzie *et al.* (*Fungal Diversity* 11: 129, 2002; key), Paulin-Mahady *et al.* (*Mycol.* 94: 62, 2002; phylogeny), Wu (*Mycosystema* 23: 313, 2004; China).
- Chalarodendron** C.J.K. Wang & B. Sutton (1984), anamorphic *Pezizomycotina*, Hsy.0eH.22. 1, USA. See Wang & Sutton (*Mycol.* 76: 569, 1984).
- Chalarodes** McKenzie (1991), anamorphic *Pezizomycotina*, Hso.0eH.15. 2, Pacific Islands. See McKenzie (*Mycotaxon* 42: 89, 1991).
- chalaroplectenchyma**, see plectenchyma.
- Chalaropsis** Peyronel (1916) = *Thielaviopsis* fide Paulin-Mahady *et al.* (*Mycol.* 94: 62, 2002; phylogeny).
- Chalastospora** E.G. Simmons (2007), Pleosporaceae. 1. See Simmons (*Alternaria: an Identification Manual*, 2007).
- Chalazion** Dissing & Sivertsen (1975), ? Pyronemataceae. 3, Europe. See Kristiansen (*Agarica* 10/11: 83, 1990; ecology), van Brummelen in Hawksworth (Ed.) (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. 269 269: 401, 1994; posn), Francesco *et al.* (*Riv. Micol.* 3: 203, 1998; key).
- Chalciporus** Bataille (1908), Boletaceae. 25, widespread. See Singer (*Sydowia* 31: 196, 1979; key), Šutara (*Czech Mycol.* 57: 1, 2005; European), Šutara (*Czech Mykol.* 44: 59, 2005; *Rubinoboletus* in Europe), Klofac & Krisai (*Öst. Z. Pilzk.* 15: 33, 2006).
- Chalcosphaeria** Höhn. (1917) = *Plagiostoma* fide Müller & von Arx in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 87, 1973).
- Chalymmota** P. Karst. (1879) = *Panaeolus* fide Singer & Smith (*A monograph on the genus Galerina* Earle, 1964).
- Chamaeascus** L. Holm, K. Holm & M.E. Barr (1993), Hyponectriaceae. 1, Svalbard. See Holm & Holm (*Blyttia* 51: 121, 1993), Wang & Hyde (*Fungal Diversity* 3: 159, 1999).
- Chamaeceras** Rebert. ex Kuntze (1898) = *Marasmius* fide Singer (*Agaric. mod. Tax.* edn 3, 1975).
- Chamaemyces** Earle (1909), Agaricaceae. 1, widespread (north temperate). See Didukh *et al.* (*Mycol. Balcanica* 1: 89, 2004; Israel), Hausknecht & Pidlich-Aigner (*Öst. Z. Pilzk.* 13: 1, 2004; Austria), Vellinga (*MR* 108: 354, 2004; phylogeny).
- Chamaenema** Kütz. (1833) nom. dub., ? Fungi.
- Chamaeota** (W.G. Sm.) Earle (1909), Pluteaceae. 9, widespread. See Singer (*Sydowia* 31: 197, 1979; key), Ying (*Mycotaxon* 54: 303, 1995; China), Minnis *et al.* (*Mycotaxon* 96: 31, 2006; USA).
- Chamonixia** Rolland (1899), Boletaceae. 8, widespread (north temperate). See Bruns *et al.* (*Mol. Ecol.* 7: 257, 1998; phylogeny), Cléménçon (*Persoonia* 18: 499, 2005; ontology).
- Chamonixiaceae** Jülich (1982) = Boletaceae.
- chantarelle**, basidioma of the edible *Cantharellus cibarius*.
- Chanterel** Adans. (1763) = *Cantharellus* fide Stalpers (*in litt.*).
- Chantransiopsis** Thaxt. (1914), anamorphic *Pezizomycotina*, Hso.0eH.1. 3 (entomogenous), Java; Europe. See Rossi & Blackwell (*Mycol.* 82: 138, 1990).
- Chaos** L. (1753) nom. dub., Fungi. Included protozoa believed to be derived from fungus spores.
- Chapeckia** M.E. Barr (1978), Sydowiellaceae. 2 (from bark), N. America. See Barr (*Mycol. Mem.* 7, 1978), Rossman *et al.* (*Mycoscience* 48: 135, 2007; review).
- Chapmanium** E.I. Hazard & Oldacre (1975), Microsporidia. 2.
- Chapsa** A. Massal. (1860), Thelotremataceae (L). 15, pantropical. See Frisch (*Biblhca Lichenol.* 92: 3, 2006; monogr.), Frisch *et al.* (*Biblhca Lichenol.* 92: 517, 2006; phylogeny), Mangold *et al.* (*Lichenologist* 40: 39, 2008; phylogeny).
- Characonidia** Bat. & Cavalc. (1965), anamorphic *Pezizomycotina*, Cpt.0fH.?. 1, Brazil. See Batista & Cavalcanti (*Atas Inst. Micol. Univ. Pernambuco* 2: 297, 1965).
- Charcotia** Hue (1915) = *Arthonia* fide Hawksworth (*SA* 10: 127, 1991).
- Chardón** (Carlos Eugenio; 1897-1965; Puerto Rico). Plant Pathologist, Insular Agricultural Experiment Station, Rio Piedras (1921-1923); Commissioner of Agriculture, San Juan (1923-1930); Chancellor, University of Puerto Rico (1931-1936); Administrator, Puerto Rican Reconstruction Administration (1936); Director, Institute of Tropical Agriculture (1943-1946). Carried out mycological exploration of Colombia, Puerto Rico, Venezuela and the American Virgin Islands in collaboration with Seaver (q.v.), Toro, Whetzel (q.v.) and others. *Publs.* (with Toro) Mycological explorations of Colombia, *Journal of the Department of Agriculture, Porto Rico* (1930); (with Toro) Mycological explorations of Venezuela, *Monographs of the University of Porto Rico Series B* (1932). *Biogs, obits etc.* Kern (*Mycol.* 57: 839, 1965) [portrait].
- Chardonía** Cif. (1930), anamorphic *Pezizomycotina*, Hsy.1eH.?. 1, S. America.
- Chardoniella** F. Kern (1939), Pucciniosiraceae. 4 (on *Compositae* (0, III)), S. America. See Buriticá & Hennen (*Fl. Neotrop.* 24: 39, 1980), Pardo-Cardona (*Caldasia* 25: 283, 2003).
- Charomyces** Seifert (1987), anamorphic *Pezizomycotina*, Hso.0eP.40. 2, Hawaii; Cuba. See Seifert (*CJB* 65: 230, 1987).
- Charonectria** Sacc. (1880), Hyponectriaceae. 5 (from dead leaves or lichenicolous), widespread (temperate). See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Wang & Hyde (*Fungal Diversity* 3: 159,

- 1999).
- Charrinia** Viala & Ravaz (1894) nom. dub., Fungi. See Müller (*SA* 6: 121, 1987).
- chartaceous**, paper-like.
- chasmothecium**, a closed fruitbody having no predefined opening but with the asci arranged in a single basal fascicle, e.g. an ascoma of *Erysiphe* (Braun *et al.* in Belanger *et al.* (Eds). *The Powdery Mildews: A comprehensive Treatise*, 2000). cf. cleistothecium.
- Chaudhuria** Zahlbr. (1932) = *Heterodermia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Chaunopycnis** W. Gams (1979), anamorphic *Ophiocordycipitaceae*, Hsp/St.0eH.15. 3 (from soil), widespread. See Gams (*Persoonia* 11: 75, 1980), Möller *et al.* (*MR* 99: 681, 1995; population biology), Möller *et al.* (*J. Industr. Microbiol. Biotechnol.* 17: 359, 1996; chemistry), Bills *et al.* (*Mycol. Progr.* 1: 3, 2002; phylogeny, chemistry), Matsushima (*Matsush. Mycol. Mem.* 10, 2001).
- Cheese**. Fungi are used in the manufacture of many cheeses, some of which have characteristic spp., e.g. camembert (*Penicillium camemberti*), roquefort and other blue cheeses (*P. roqueforti*). See Babel (*Econ. Bot.* 7: 27, 1953), Marth (in Reed, Prescott & Dunn's *Industrial microbiology*, edn 4: 65, 1982), Thom (*Bull. Bur. Anim. Ind. USDA* 82, 1906); blue cheeses. Fungi known to produce mycotoxins have been detected in some cheeses (Moubasher *et al.*, *Mycopathologia* 66: 187, 1979).
- Cheilaria** Lib. (1830), anamorphic *Pezizomycotina*, St.≡ eH.15. 1, widespread. See Sutton (*The Coelomycetes*, 1980).
- Cheilariopsis** Petr. (1959) ≡ *Apomelasmia*.
- cheilocystidium**, see cystidium.
- Cheilodonta** Boud. (1885) = *Orbilina* fide Baral (*SA* 13, 1994).
- Cheilophlebium** Opiz & Gintl (1856) nom. dub., ? Agaricales. See Donk (*Beih. Nova Hedwigia* 5: 50, 1962).
- Cheilymenia** Boud. (1885), *Pyronemataceae*. 66, widespread (esp. temperate). See Denison (*Mycol.* 56: 718, 1964; key), Moravec (*Česká Mykol.* 22: 32, 1968), Moravec (*Česká Mykol.* 38: 146, 1984), Moravec (*Mycotaxon* 36: 169, 1989), Wu & Kimbrough (*Bot. Gaz.* 152: 421, 1992; ascospores), Moravec (*Czech Mycol.* 47: 7, 1993), Landvik *et al.* (*Nordic Jl Bot.* 17: 403, 1997; DNA), Moravec (*Czech Mycol.* 50: 189, 1998), Prokhorov (*Mikol. Fitopatol.* 32: 14, 1998; key), Moravec (*Czech Mycol.* 55: 215, 2003; revn), Moravec (*Czech Mycol.* 54: 135, 2003; revn), Moravec (*Czech Mycol.* 54: 113, 2003; revn), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Moravec (*Czech Mycol.* 58: 149, 2006; anatomy), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Cheimonophyllum** Singer (1955), *Cyphellaceae*. 3, widespread. See Singer (*Sydowia* 9: 417, 1955).
- Cheiroconium** Höhn. (1910) = *Sirothecium* fide Hughes (*CJB* 36: 727, 1958), Sutton (*Proc. Indian Acad. Sci. Pl. Sci.* 94: 229, 1985).
- cheiroid**, see chiroid.
- Cheiromoniliophora** Tzean & J.L. Chen (1990), anamorphic *Pleosporales*, Hso.#eP.10. 1, widespread. See Tzean & Chen (*MR* 94: 424, 1990), Castañeda Ruíz *et al.* (*Mycotaxon* 61: 319, 1997), Ho *et al.* (*Mycol.* 92: 582, 2000; Hong Kong), Belomesyatseva (*Nov. sist. Niz. Rast.* 35: 55, 2001; Belarus), Tsui *et al.* (*Fungal Diversity* 21: 157, 2006; phylogeny), Cai *et al.* (*Persoonia* 20: 53, 2008; phylogeny).
- Cheiromycella** Höhn. (1910), anamorphic *Hyaloscypha*, Hsp.1bH.?. 2, Europe; Japan. See Sutton (*Proc. Indian Acad. Sci. Pl. Sci.* 94: 229, 1985; disposition of names), Kendrick (*CJB* 81: 75, 2003; morphogenesis).
- Cheiromyceopsis** Mercado & J. Mena (1988), anamorphic *Pezizomycotina*, Hsp.0bP.1. 1, Cuba. See Mercado & Mena (*Acta Bot. Cubana* 53: 2, 1988), Delgado-Rodríguez *et al.* (*Cryptog. Mycol.* 23: 277, 2002), Mercado Sierra *et al.* (*Mycol.* 95: 860, 2003).
- Cheiromyces** Berk. & M.A. Curtis (1857), anamorphic *Pezizomycotina*, Hsp.0bP.1. 5, widespread. See Sutton (*Proc. Indian Acad. Sci. Pl. Sci.* 94: 229, 1985; disposition of names), Ho *et al.* (*Mycol.* 92: 582, 2000; Hong Kong), Kendrick (*CJB* 81: 75, 2003; morphogenesis), Promputtha *et al.* (*Nova Hedwigia* 80: 527, 2005; Thailand).
- Cheiromycina** B. Sutton (1986), anamorphic *Pezizomycotina*, Hsp.0bP.1 (L). 1, Sweden. See Sutton (*Nordic Jl Bot.* 6: 831, 1986), Aptroot & Schiefelbein (*MR* 107: 104, 2003; key), Egorova & Mel'nik (*Mikol. Fitopatol.* 38: 23, 2004; Russia), Earland-Bennett & Hawksworth (*Lichenologist* 37: 191, 2005; status), Wang & Zheng (*Nova Hedwigia* 81: 247, 2005; Austria), Printzen (*Nova Hedwigia* 84: 261, 2007; key).
- Cheiopodium** Syd. & P. Syd. (1915) = *Clasterosporium* fide Ellis (*Dematiaceous Hyphomycetes*, 1971).
- Cheiopolschema** Matsush. (1980), anamorphic *Pezizomycotina*, Hso.0bP.28. 1, Taiwan. See Matsushima (*Matsush. Mycol. Mem.* 1: 15, 1980).
- Cheiospora** Moug. & Fr. (1825), anamorphic *Pezizomycotina*, Cac.0bP.1. 1, widespread. See Ono & Kobayashi (*Mycoscience* 46: 352, 2005; Japan).
- Cheiosporium** L. Cai & K.D. Hyde (2008), anamorphic *Pleosporales*, Hsp.0bP.1. 1, China. See Cai *et al.* (*Persoonia* 20: 53, 2008; descr.).
- Chelisporium** Speg. (1910) = *Sirothecium* fide Sutton (*Proc. Indian Acad. Sci. Pl. Sci.* 94: 229, 1985).
- chemical race**, a group of chemically differentiated individuals or populations and not of any particular taxonomic rank (i.e. a chemical race may be a species, var., or chemotype); - **strain**, used as an infraspecific taxonomic rank in lichenized taxa distinguished only by chemical characters (Lamb, *Nature* 168: 38, 1951).
- chemosyndrome**, a biogenetically meaningful set of major and minor natural metabolic products produced by a species (Culberson & Culberson, *Syst. Bot.* 1: 325, 1977).
- chemotaxis**, a taxis (q.v.) in response to a chemical stimulus. Gooday (in Carlile (Ed.), *Primitive sensory and communication systems*, 155, 1975; chemotaxis in fungi), Bonner (*Mycol.* 69: 443, 1977; in cellular slime moulds).
- Chemotaxonomy** (biochemical systematics; chemical fungal taxonomy), taxonomy using chemical characteristics, in a broad sense including both primary and secondary metabolites and physiological/chemical tests. Frisvad *et al.* (*MR* 112: 231, 2008) noted the mycologists and bacteriologists define the term differently. Mycologists limit the term to carbohydrate or lipid-based taxonomy whereas for bacteriologists the term also encompasses the amino acid and nucleic acid complement of the organism. As a result, in mycology, chemotaxonomy declined in importance with the advent of molecular taxonomy (based

on PCR technology & DNA sequence analysis), although there have been recent developments (e.g. Frisvad *et al.*, *MR* 112: 231, 2008; Bitzer *et al.*, *MR* 112: 251, 2008) which may be enhanced further with developments in metabolomics (see Genomics). Ubiquinone and fatty acid profiles are still used widely in yeast taxonomy (see Barnett *et al.*, *Yeasts: Characteristics and identification* Edn 3, 2000: 18; Deák, *Handbook of food spoilage yeasts*, 2008: 211).

Lit.: Non-lichen-forming fungi: Botha & Kock (*Int. J. Food Microbiol.* 19: 39, 1993; fatty acid profiles, yeasts), Frisvad (*Chemom. Intell. Lab. Syst.* 14: 253, 1992; secondary metabolites, chemometrics), Frisvad, in Hawksworth (Ed.) (*Identification and characterization of pest organisms*: 303, 1994), Frisvad *et al.* (Eds) (*Chemical fungal taxonomy*, 1998; secondary metabolites review, survey), Gómez-Miranda *et al.* (*Exp. Mycol.* 12: 258, 1988; cell wall composition), Klich & Mullaney (in Arora *et al.*, *Handbook of Applied Mycology* 4: 35, 1992; DNA methods), Meixner (*Chemische Farbreaktionen von Pilzen*, 1975; asco- and basidiomycetes), Micales *et al.* (in Arora *et al.*, *Handbook of Applied Mycology* 4: 57, isozyme analysis), Murray (*J. gen. Microbiol.* 52: 213, 1968; biochemical tests, pathogenic fungi), Paterson (in Frisvad *et al.*, 1998; unsaponifiable lipids review); Rast & Pfyffer (*Bot. J. Linn. Soc.* 99: 1989; polyols), Rosendahl & Banke (in Frisvad *et al.*, 1998; isozyme analysis), Tyrrell (*Bot. Rev.* 35: 305, 1969; review), Vogel (*Am. Naturalist* 48: 435, 1964; evolutionary implications of lysine pathways).

Lichens: Culberson & Elix (*Meth. Plant Biochem.* 1: 509, 1993; review), Feige & Lumbsch (Eds) (*Bibl. Lich.* 53, 1993; review), Hawksworth (in Brown *et al.* (Eds), 1976: 139; review, bibliogr., use), Lumbsch (in Frisvad *et al.*, 1998; review), Rogers (*Bot. J. Linn. Soc.* 101: 229, 1989; chemistry and species concept). See also Metabolic products, Phylogeny.

chemotropism, see tropism.

chemotype, a group of chemically differentiated individuals of a species of unknown or of no taxonomic significance.

Chermomyces Brain (1923) nom. dub., ? Dothideomycetes. See Batra in Subramanian (Ed.) (*Taxonomy of fungi* 1: 187, 1978; applied to yeast-like cells in insect mycetomas).

Cheshunt compound, Copper sulphate (CuSO₄) 2 parts, ammonium carbonate ((NH₄)₂CO₃) 11 parts; used (at least 24 hr after mixing) at the rate of 56.7 g per 4.5 l of water as a soil disinfectant against damping-off.

chestnut blight, *Cryphonectria parasitica* (syn. *Endothia parasitica*). See Anagnostakis (*Mycol.* 79: 23, 1987).

Chevalieria G. Arnaud (1920) [non *Chevalieria* Gaudich. ex Beer 1857, *Bromeliaceae*] = *Chevalieropsis*.

Chevalieropsis G. Arnaud (1923), *Parodiopsidaceae*. Anamorph *Septoidium*. 1, Africa. See Petrak (*Sydowia* 5: 346, 1951).

Chiajaea (Sacc.) Höhn. (1920) = *Hypomyces* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).

chiastobasidium, see basidium.

Chiastospora Riess (1852), anamorphic *Pezizomycotina*, Cac.1bH.?. 1, Europe. See Sutton (*Mycol. Pap.* 141, 1977).

Chiastosporum Dughi (1956) nom. inval. = *Collema* F.H. Wigg. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Chikaneeia B. Sutton (1973), anamorphic *Pezizomycotina*, Hso.≡ eH.10. 1, Canada. See Sutton (*Mycol. Pap.* 132: 29, 1973), Sinclair *et al.* (*Mycotaxon* 64: 365, 1997), Marvanová *et al.* (*Nova Hedwigia* 75: 255, 2002).

Chilemyces Speg. (1910) = *Dimerina* fide Petrak & Sydow (*Annls mycol.* 32: 1, 1934).

Chiliospora A. Massal. (1860) = *Biatoridium* fide Hafellner (*Acta Bot. Fenn.* 150: 39, 1994), Jørgensen (*Taxon* 53: 521, 2004; nomencl.).

Chiloella Syd. (1928) = *Glomerella* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).

Chilonectria Sacc. (1878) = *Nectria* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).

Chimaeroscypha Raitv. (2004), *Hyaloscyphaceae*. 1, Tadzhikistan. See Raitviir (*Scripta Mycologica Tartu* 20: 19, 2004).

chimeroid (of lichen thalli), see Lichens, Phycotype.

Chinese cheese, see sufu.

Chinese mushroom, see straw mushroom.

Chinese rice, see starters.

Chiodecton Ach. (1814), *Roccellaceae* (L). 24, widespread (esp. tropical). See Tehler (*CJB* 68: 2458, 1990; cladistics), Thor (*Op. Bot.* 103, 1990; monogr., key), Henssen & Thor (*Nordic Jl Bot.* 18: 95, 1998; ontogeny), Cáceres *et al.* (*Lichenologist* 33: 503, 2001), Thor (*J. Jap. Bot.* 77: 47, 2002; Japan, Taiwan), Thor (*Biblthca Lichenol.* 95: 543, 2007; Malaysia).

Chiodectonaceae Zahlbr. (1905) = *Roccellaceae*.

Chiodectonomyces Cif. & Tomas. (1953) = *Enterographa*.

Chiographa Leight. (1854) = *Phaeographis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Chionaster Wille (1903) nom. dub., *Algae*. Based on an alga having no chlorophyll.

Chionomyces Deighton & Piroz. (1972), anamorphic *Pezizomycotina*, Hso.≡ eH.10. 4 (on *Meliolaceae*), widespread (tropical). See Deighton & Pirozynski (*Mycol. Pap.* 128: 74, 1972).

chionophilous, having a preference for growing nearby snow.

Chionosphaera D.E. Cox (1976), *Chionosphaeraceae*. 4, N. America; Europe. See Kirschner (*MR* 105: 1403, 2001; new sp. associated with conifer inhabiting bark beetles).

Chionosphaeraceae Oberw. & Bandoni (1982), *Agaricostilbales*. 4 gen., 18 spp.

Lit.: Oberwinkler & Bandoni (*CJB* 60: 1726, 1982), Oberwinkler & Bauer (*Sydowia* 41: 224, 1989), Seifert *et al.* (*Boln Soc. argent. Bot.* 28: 215, 1992), Diederich (*Biblthca Lichenol.* 61: 198 pp., 1996), Boekhout in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 627, 1998), Kwon-Chung in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 643, 1998), Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 1351, 2000; mol. phylogeny), Scorzetti *et al.* (*FEMS Yeast Res.* 2: 495, 2002), Bauer *et al.* (*Mycol. Progr.* 5: 41, 2006).

Chionyphe Thienem. (1839) = *Mucor* Fresen. fide Hesseltine (*Mycol.* 47: 344, 1955).

chiroid (**cheiroid**), shaped like a hand with the fingers together and not divergent, e.g. the conidia of *Cheiromyces*; cf. digitate, palmate.

Chithramia Nag Raj (1988), anamorphic *Pezizomycotina*, St.1eP.1. 1, India. See Nag Raj (*CJB* 66: 903, 1988).

chitinoclastic, chitin decomposing.

- Chitinonectria** M. Morelet (1968) = *Neonectria* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Chitinozoa**, fossil chitinous organisms of uncertain affinity found in the Upper Precambrian to the Devonian.
- Chitonia** (Fr.) P. Karst. (1879) [non *Chitonia* D. Don 1823, *Melastomataceae*] = *Clarkeinda*.
- Chitoniella** Henn. (1898) = *Clarkeinda* fide Singer (*Agaric. mod. Tax.*, 1951).
- Chitonis** Clem. (1909) = *Chitonia*.
- Chitonomyces** Peyr. (1873), *Laboulbeniaceae*. 98, widespread. See Sugiyama (*TMSJ* 18: 155, 1977; Japanese spp.), Sugiyama & Nagasawa (*TMSJ* 26: 3, 1985; Borneo), Santamaria (*Nova Hedwigia* 73: 339, 2001; Spain).
- Chitonospora** E. Bommer, M. Rousseau & Sacc. (1891), *Xylariales*. 1 (from dead grasses), Europe. See Eriksson (*Svensk bot. Tidskr.* 60: 320, 1966), Kang *et al.* (*Fungal Diversity* 2: 135, 1999; posn).
- chitosan**, a partially deacetylated form of chitin characteristic of zygomycetes; **chitases**, enzymes (EC 3.2.1.99) from fungi and bacteria able to hydrolyse chitosan (Monaghan *et al.*, *Nature (New Biol.)* 245: 78, 1973).
- chitosome**, a small spheroidal structure (40-70 nm diam.), containing chitin synthetase zymogen, found in many fungi (Bracker *et al.*, *Proc. Nat. Acad. Sci. USA* 73: 4570, 1976).
- Chlamydoabsidia** Hesselt. & J.J. Ellis (1966), *Cunninghamellaceae*. 1, India; USA. See Hesseltine & Ellis (*Mycol.* 58: 761, 1966), Behera & Mukerji (*Norw. J. Bot.* 21: 1, 1974), Braun (*Int. J. Mycol. Lichenol.* 3: 271, 1988).
- Chlamydoaleurosporia** Grigoraki (1924) = *Trichophyton* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- chlamydocyst**, a two-walled resting zoosporangium of *Blastocladiaceae* within a hypha.
- Chlamydomucor** Bref. (1889) = *Mucor* Fresen. fide Hesseltine (*Mycol.* 47: 344, 1955) See, Ellis *et al.* (*Mycol.* 68: 131, 1976).
- Chlamydomyces** Bainier (1907), anamorphic *Pezizomycotina*, Hso.1eP.1. 2, widespread. See Mason (*Mycol. Pap.* 2: 37, 1928), Claudia (*Mycotaxon* 27: 255, 1986), Hambleton *et al.* (*Stud. Mycol.* 53: 29, 2005; key).
- Chlamydopsis** Hol.-Jech. & R.F. Castañeda (1986), anamorphic *Pezizomycotina*, Hso.#bP.1/3. 1, Cuba. See Holubová-Jechová & Castañeda (*Česká Mykol.* 40: 74, 1986).
- Chlamydopus** Speg. (1898), *Agaricaceae*. 1, widespread (desert areas). See Long & Stouffer (*Mycol.* 38: 619, 1947), Lughini (*Bollettino dell'Associazione Micologica ed Ecologica Romana* 17: 22, 2001).
- Chlamydorubra** K.B. Deshp. & K.S. Deshp. (1966), anamorphic *Pezizomycotina*, Hso.0eP.?. 1, India. See Deshpande & Deshpande (*Mycopath. Mycol. appl.* 29: 272, 1966).
- Chlamydosauromyces** Sigler, Hambl. & Paré (2002), *Onygenaceae*. 1 (from lizard skin), USA. See Sigler *et al.* (*Stud. Mycol.* 47: 127, 2002).
- chlamydospore**, an asexual 1-celled spore (primarily for perennation, not dissemination) originating endogenously and singly within part of a pre-existing cell, by the contraction of the protoplast and possessing an inner secondary and often thickened hyaline or brown wall, usually impregnated with hydrophobic material. Originally proposed by de Bary in 1859 for *Asterophora* anamorphs. See Griffiths (*Nova Hedw.* 25: 503, 1974; origin, structure, function), Hughes (*in* Arai (Ed.), *Filamentous microorganisms*: 1, 1985; definition, occurrence).
- Chlamydosporites** Paradkar (1975), Fossil Fungi ? *Ustilaginales*. 1 (Cretaceous), India.
- Chlamydosporium** Peyronel (1913) = *Phoma* Sacc. fide Mouchacca & Sutton (*Cryptog. Mycol.* 12: 251, 1991).
- Chlamydotomus** Trevis. (1879) nom. dub., ? *Algae*.
- Chlamydozyma** Wick. (1964) = *Metschnikowia* fide Pitt & Miller (*Mycol.* 60: 663, 1968).
- Chlamydozymaceae** Wick. (1964) = *Metschnikowiaceae*.
- Chlorangium** Link (1849) nom. rej. = *Aspicilia* fide Laundon & Hawksworth (*Taxon* 37: 478, 1988; nomencl.), Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Chlorangium** Rabenh. (1857) nom. dub., *Lecanorales*.
- Chlorea** Nyl. (1855) nom. rej. = *Letharia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Obermayer (*Progr. Probl. Lichenol. Nineties. Proc. Third Symp. Intern. Assoc. Lichenol. [Biblthca Lichenol.* 68]: 45, 1997).
- Chlorenchelia** J.R. Dixon (1975), *Hemiphacidiaceae*. 3, widespread (north temperate). See Zhuang (*Mycotaxon* 31: 261, 1988), Zhuang *et al.* (*Mycosystema* 19: 478, 2000; phylogeny), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006; phylogeny).
- Chloridiaceae** Nann. (1934) = *Chaetosphaeriaceae*.
- Chloridiella** Arnaud (1953) nom. nud. = *Idriella* fide Nicot & Charpentier (*BSMF* 87: 621, 1972).
- Chloridium** Link (1809), anamorphic *Chaetosphaeria*, Hso.0eH.15/18. c. 27, widespread. See Gams & Holubová-Jechová (*Stud. Mycol.* 13, 1976), Wang & Wilcox (*Mycol.* 77: 951, 1985), Morgan-Jones & Goos (*Mycol.* 84: 921, 1992; nomencl.), Réblová (*Stud. Mycol.* 45: 149, 2000; review), Réblová & Gams (*Mycoscience* 41: 129, 2000), Réblová & Winka (*Mycol.* 92: 939, 2000; phylogeny), Fernández *et al.* (*Mycol.* 98: 121, 2006; phylogeny).
- Chlorocaulum** Clem. (1909) = *Stereocaulon* Hoffm. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Chlorociboria** Seaver ex C.S. Ramamurthi, Korf & L.R. Batra (1958) nom. cons., ? *Helotiales*. Anamorph *Dothiorina*. 17, widespread. See Tunbridge Ware. See Korf (*Mycol.* 51: 298, 1951; status), Dixon (*Mycotaxon* 1: 193, 1975; key), Holst-Jensen *et al.* (*Mycol.* 89: 885, 1997; DNA), Johnston & Park (*N.Z. J. Bot.* 43: 679, 2005; New Zealand), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006; phylogeny), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Chlorocyphella** Speg. (1909) = *Pyrenotrichum* fide Santesson (*Symb. bot. ups. 12* no. 1: 1, 1952), Gams (*Taxon* 54: 520, 2005; nomencl.).
- Chlorodictyon** J. Agardh (1870) = *Ramalina* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Chlorodothis** Clem. (1909) = *Tomasellia* fide Harris (*in litt.*).
- Chlorogaster** Laessøe & Jalink (2004), *Sclerodermataceae*. 1, Sabah. See Læssøe & Jalink (*Persoonia* 18: 421, 2004).
- Chlorolepiota** Sathe & S.D. Deshp. (1979), *Agaricaceae*. 1, India. See Sathe & Deshpande (*Curr. Sci.* 48:

- 693, 1979).
- Chloroneuron** Murrill (1911) = *Gomphus* Pers. fide Petersen (*The genera Gomphus and Gloeocantharellus in North America*, 1972).
- Chloropeltigera** (Gyeln.) Gyeln. (1934) nom. inval. = *Peltigera* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Chloropeltis** Clem. (1909) = *Peltigera* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- chlorophycophilous** (of fungi), lichenized with a green photobiont (Pike & Carroll, in Alexopoulos & Mims, *Introductory mycology*, edn 3, 1980).
- Chlorophyllum** Massee (1898), Agaricaceae. 16, widespread (esp. tropical). Recognition would make *Macrolepiota* non-monophyletic; conservation over *Chlorophyllum* has not yet been proposed. See Heinemann (*Rev. Mycol. nat. Belg.* 31: 317, 1966; *C. molybdites*, poisonous), Heinemann (*Bull. Jard. bot. nat. Belg.* 38: 195, 1968), Sundberg (*Madroño* 21: 15, 1971), Johnson & Vilgalys (*Mycol.* 90: 971, 1998), Sarasini & Contu (*Rivista di Micologia* 44: 247, 2001; as *Endoptychum*, Italy), Vellinga (*Mycotaxon* 83: 415, 2002), Vellinga (*Mycotaxon* 85: 259, 2003; *Chlorophyllum rachodes* and allies), Hausknecht & Pidlich-Aigner (*Öst. Z. Pilzk.* 13: 1, 2004; Austria), Vellinga (*MR* 108: 354, 2004; phylogeny), Ge & Yang (*Mycotaxon* 96: 181, 2006; China).
- Chlorophyllum** Murrill (1910) = *Gomphus* Pers. fide Petersen (*The genera Gomphus and Gloeocantharellus in North America*, 1972).
- chloroplast endoplasmic reticulum** (CER), a layer of ribosome studded membrane surrounding the plastid.
- Chloroscypha** Seaver (1931), Helotiales. c. 14 (on conifers), widespread (north temperate). See Gremmen (*Nova Hedwigia* 2: 547, 1963; Netherlands spp.), Kobayashi (*Bull. Govt For. Exp. Stn* 176, 1965), Butin (*Sydowia* 37: 15, 1984; S America), Baral (*Z. Mykol.* 53: 119, 1987; asci), Shoji (*Bulletin of the Forestry and Forest Products Research Institute* Ibaraki, Japan 368: 23, 1994; ecology), Gernandt *et al.* (*Mycol.* 93: 915, 2001; phylogeny), Garcia *et al.* (*BSMF* 118: 125, 2002), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006; phylogeny).
- Chlorosperma** Murrill (1922) = *Melanophyllum* fide Singer (*Agaric. mod. Tax.*, 1951).
- Chlorospleniella** P. Karst. (1885), ? Helotiales. 1, Brazil. See Groves & Wilson (*Taxon* 16: 39, 1967).
- Chlorosplenium** Fr. (1849), Dermateaceae. 5, widespread. See also *Chlorociboria*. See Dixon (*Mycotaxon* 1: 65, 1974; key), Verkley (*Sydowia* 56: 343, 2004).
- Chlorospora** Massee (1898) non *Chlorospora* Speg. 1891 = *Melanophyllum*.
- Chlorostroma** A.N. Mill., Lar.N. Vassiljeva & J.D. Rogers (2007), ? Xylariaceae. 1, USA. See Miller *et al.* (*Sydowia* 59: 138, 2007).
- Chlorovibrissa** L.M. Kohn (1989), Vibrissaceae. Anamorph *Phialophora*-like. 4, Australasia. See Kohn (*Mem. N. Y. bot. Gdn* 49: 112, 1989), Korf (*Mycosystema* 3: 19, 1991; posn), Buchanan & May (*N.Z. Jl Bot.* 41: 407, 2003; conservation), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006; phylogeny).
- Chmelia** Svob.-Pol. (1966) = *Alternaria* fide de Hoog & Hermanides-Nijhof (*Stud. Mycol.* 18, 1976), Hoog & Horré (*Mycoses* 45: 259, 2002).
- Chnoopsora** Dietel (1906) = *Melampsora* fide Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983).
- Choanatiara** DiCosmo (1984), anamorphic *Pezizomycotina*, St.OeH.15. 2, India; Canada. See Vujanovic (*Can. J. Pl. Path.* 20: 319, 1998).
- Choanephora** Curr. (1873), Choanephoraceae. 2, widespread (esp. tropical). *C. cucurbitarum* (blossom blight and fruit rot of cucurbits and other plants). See Thaxter (*Rhodora* 5: 97, 1903), Barnett & Lilly (*Phytopathology* 40: 80, 1950), Barnett & Lilly (*Mycol.* 47: 26, 1955; culture), Hesseltine & Benjamin (*Mycol.* 49: 723, 1957), Higham & Cole (*CJB* 60: 2313, 1982; sporangium ultrastr.), Kirk (*Mycol. Pap.* 152: 61 pp., 1984; key), Yu & Ko (*MR* 103: 684, 1999; azygospore formation), Sakai *et al.* (*Am. J. Bot.* 87: 440, 2000; pollination mutualism), Donnell *et al.* (*Mycol.* 93: 286, 2001; phylogeny), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny), Papp *et al.* (*Acta Biol. Hung.* 54: 393, 2003; phylogeny), Feofilova (*App. Biochem. Microbiol.* 42: 439, 2006; heterothallism), Gareth Jones (*Mycoscience* 47: 167, 2006; spore appendages).
- Choanephoraceae** J. Schröt. (1894), Mucorales. 4 gen. (+ 3 syn.), 6 spp.
Lit.: Higham & Cole (*CJB* 60: 2313, 1982), Kirk (*Mycol. Pap.* 152: 61 pp., 1984; revision, keys), Benny (*Mycol.* 83: 150, 1991), Yu & Ko (*MR* 103: 684, 1999), Sakai *et al.* (*Am. J. Bot.* 87: 440, 2000), Tanabe *et al.* (*Mol. Phylogen. Evol.* 30: 438, 2004).
- Choanephorella** Vuill. (1904) = *Choanephora* fide Zycha *et al.* (*Mucorales*, 1969).
- Choanephoroidea** I. Miyake & S. Ito (1935) ? = *Choanephora* fide Kirk (*in litt.*).
- chocolate spot**, a disease of *Vicia* and other legumes (*Botrytis cinerea* and *B. fabae*); see Wilson (*Ann. appl. Biol.* 24: 258, 1937), Harrison (*Pl. Path.* 37: 168, 1988).
- Choeromyces** Tul. & C. Tul. (1862) = *Choiromyces* fide Fischer (*Nat. Pflanzenfam.* 5b: viii, 1938).
- Choiromyces** Vittad. (1831), Tuberaceae. 5 (hypogaeous), widespread. See Zhang & Minter (*MR* 92: 91, 1989; cytology), Pegler *et al.* (*British truffles*, 1993), O'Donnell *et al.* (*Mycol.* 89: 48, 1997; phylogeny), Percudani *et al.* (*Mol. Phylogen. Evol.* 13: 169, 1999; phylogeny), Ferdman *et al.* (*MR* 109: 237, 2005; phylogeny), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny).
- choke**, a disease of grasses (*Epichloë typhina*).
- Chondroderris** Maire (1937), Helotiales. 1, Spain.
- Chondrogaster** Maire (1925), Mesophelliaceae. 2, Mauritania; Brazil; Europe. See Petrak (*Sydowia* 4: 373, 1950), Petrak (*Sydowia* 4: 171, 1950).
- chondroid axis**, the cartilaginous axis occupying the central portion of the medulla in *Usnea*.
- Chondroplea** Kleb. (1933) = *Discosporium* Höhn. fide Sutton (*Mycol. Pap.* 141, 1977).
- Chondropodiella** Höhn. (1917), anamorphic *Godronia*, St.OeH.?. 1, USA.
- Chondropodiola** Petr. & Cif. (1932) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Chondropodium** Höhn. (1916) = *Corniculariella* fide DiCosmo (*CJB* 56: 1665, 1978).
- Chondropsis** Nyl. (1879) nom. rej. = *Xanthoparmelia* fide Rogers (*New Phytol.* 70: 1069, 1971), Elix & Child (*Brunonia* 9: 113, 1986), Lumbsch & Kothe (*Lichenologist* 20: 25, 1988; anatomy), Elix (*Flora of*

- Australia* 55: 34, 1994), Blanco *et al.* (*Taxon* 53: 959, 2004; phylogeny), Gams (*Taxon* 53: 1067, 2004; nomencl.).
- Chondrospora** A. Massal. (1860) nom. rej. = Anzia Stizenb. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Chondrostereum** Pouzar (1959), Cyphellaceae. 4, widespread. *C. purpureum* (silver leaf of plum, etc.). See Ekramoddoullah *et al.* (*CJB* 15: 7, 1993; Canadian isolates).
- Chondrostroma** Syd. (1940) [non *Chondrostroma* Gürich 1906, fossil ? *Algae*] = Phacidiopycnis fide Rupprecht (*Sydowia* 13: 10, 1959).
- Chondrus** Stackh. (1797), Algae. Algae.
- Chordecystia** C.B. Foster (1979), Fossil Fungi. 1.
- Chordostylum** Tode (1790) nom. dub., Mucoraceae.
- Choreospora** Constant. & R. Sant. (1987), anamorphic *Pezizomycotina*, Hsp.1bH.15. 1 (on lichens), Australia. See Constantinescu & Santesson (*Lichenologist* 19: 177, 1987).
- Chorioactidaceae** Pfister (2008), Pezizales. 3 gen., 7 spp.
Lit.: Pfister *et al.* (*MR* 112: 513, 2008).
- Chorioactis** Kupfer (1902), Chorioactidaceae. 1, USA. fide Bellemère *et al.* (*Nova Hedwigia* 58: 49, 1994; ultrastr.), Rudy & Keller (*Mycologist* 10: 33, 1996), Harrington *et al.* (*Mycol.* 91: 41, 1999; phylogeny), Pfister & Kurogi (*Mycotaxon* 89: 277, 2004; morphology), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny), Pfister *et al.* (*MR* 112: 513, 2008).
- Choriphyllum** Velen. (1922) = Phaeolus fide Donk (*Persoonia* 8: 281, 1975).
- Chorostate** (Nitschke ex Sacc.) Traverso (1906) = Diaporthe fide Barr (*Mycol. Mem.* 7, 1978).
- Chorostella** (Sacc.) Clem. & Shear (1931) = Cryptodiaporthe fide Barr (*Mycol. Mem.* 7, 1978).
- Chrimofulvea** Marbach (2000), Caliciaceae (L.). 4, widespread. See Marbach (*Biblthca Lichenol.* 74: 151, 2000).
- Christiansenia** Hauerslev (1969), Carcinomycetaceae. 7, widespread (north temperate). See Hauerslev (*Friesia* 9: 43, 1969), Rath (*Rivista di Micologia* 30: 112, 1987).
- Christianseniaceae** F. Rath (1991) = Carcinomycetaceae.
- Christianseniales** F. Rath (1991) = Tremellales.
- Christiaster** Kuntze (1891) = Gonatobotryum.
- Chromatium** Link (1824) = Dematium fide Mussat (*Syll. fung.* 15: 86, 1901).
- Chromatochlamys** Trevis. (1860) = Thelenella fide Mayrhofer (*Biblthca Lichenol.* 26, 1987; monogr., key), Fryday & Coppins (*Lichenologist* 36: 89, 2004).
- chromatography**. Physico-chemical diffusion technique for the identification of chemical products in which a moving *mobile* phase (which may be liquid or gas) is passed over an immobile *stationary* phase (which may be solid or liquid). Phases may be polar or non-polar. Different forms of chromatography may be defined according to the type of matrix used, the physico-chemical principles of separation or even the equipment used; **gas** -, in a gaseous phase with solid support, used in e.g. fatty acid analyses (see Kendrick & Ratledge, *Lipids* 27: 15, 1992; Stahl & Klug, *App. Env. Microbiol.* 62: 4136, 1996), but is a destructive method: the sample is not eluted/retained for future use; **high-pressure liquid** - (h.p.l.c.), in solvent under pressure, method of choice for screening non-volatile metabolites and has been used widely in mycotoxin screening; often in conjunction with *diode array detector* which allows detection of metabolite maxima/minima across the entire UV range via a polychromator and the diode array (a chip containing a large number of light sensitive diodes) [see Meyer, *Practical high performance liquid chromatography* edn 4, 2004, general text; Frisvad & Thrane, in Betina (Ed.) *Chromatography of Mycotoxins*, 253, 1993, use in mycotoxin detection; Smedsgard, *J. Chromatogr. A* 760: 264, method for screening fungal cultures]; **paper** -, on filter paper, now rarely used (but see Lund, *Lett. Appl. Microbiol.* 21: 11, 1995 for rapid method with *Penicillium*); **thin-layer** - (t.l.c.), in thin silicate layers on glass, aluminium or plastic plates. Much used in lichenology, e.g. Feige *et al.*, (*J. Chromatogr.* 646: 417, 1993; h.p.l.c. lichen products), Mietzsch *et al.*, (*Mycotaxon* 47: 475, 1993; computer progr. lichen products), and for mycotoxin producing fungi, e.g. Abrunhosa *et al.*, (*Lett. Appl. Microbiol.* 32: 240, 2001), (see Chemotaxonomy, Metabolic products); **preparative** - thicker layered plates used for re-extraction of particular metabolites prior to purification and further analysis.
Lit.: **General**: Harborne, (*Phytochemical methods*, 1973), Smith, (*Chromatographic and electrophoretic techniques* 1, 1960), Frisvad *et al.* (Eds), (*Chemical Fungal Taxonomy*, 1998).
- Chromelosporium** Corda (1833) = Ostracoderma. *C. fulvum* (peat mould). fide Hughes (*CJB* 36: 727, 1958; segregation from *Botrytis*), Hughes & Bisalputra (*CJB* 48: 361, 1970; ultrastructure of conidiogenesis), Hennebert (*Persoonia* 7: 183, 1973), Hennebert & Korf (*Mycol.* 67: 214, 1975), Norman & Egger (*Mycol.* 91: 820, 1999; phylogeny).
- Chromendothia** Lar.N. Vassiljeva (1993) = Camarops fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Castlebury *et al.* (*Mycol.* 94: 1017, 2002; phylogeny, links to *Endothia*), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- chromo-** (combining form), colour.
- Chromocleista** Yaguchi & Udagawa (1993), Trichocomaceae. Anamorph *Geosmithia*-like. 2, Japan. See Yaguchi *et al.* (*TMSJ* 34: 101, 1993), Ogawa *et al.* (*Mycol.* 89: 756, 1997; DNA), Ogawa & Sugiyama (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 149, 2000; phylogeny), Kolarik *et al.* (*MR* 108: 1053, 2004; phylogeny).
- Chromocrea** Seaver (1910) = Creopus fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Chromocreopsis** Seaver (1910) = Thuemenella fide Corlett (*Mycol.* 77: 272, 1985), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Chromocyphella** De Toni & Levi (1888), ? Inocybaceae. 5, widespread.
- Chromocytospora** Speg. (1910) = Phomopsis (Sacc.) Bubák. fide Petrak (*Sydowia* 5: 335, 1951), Sutton (*Mycol. Pap.* 141, 1977).
- chromogen**, a stain-producing organism (Erlich, 1941).
- chromogenesis**, colour production.
- chromogenic** (chromogenous), colour-producing.
- chromomycosis** (**chromoblastomycosis**), a chronic skin disease in humans caused by traumatic inoculation by certain species of various black-yeast genera, including *Exophiala*, *Fonsecaea*, *Phialophora*;

- mostly on adult males in the tropics; dermatitis verrucosa; see Al-Doory (*Chromomycosis*, 1972).
- chromophilous**, deeply staining.
- Chromosera** Redhead, Ammirati & Norvell (1995), Hygrophoraceae. 1, widespread (north temperate). See Redhead *et al.* (*Beih. Sydowia* 10: 161, 1995).
- chromosome**, see Chromosome maps, Chromosome numbers.
- Chromosome maps**. A chromosome map is a chart of the linear array of genes on a chromosome. The first chromosome map for a fungus was of the sex chromosome of *Neurospora crassa* (Lindegren, *J. Genet.* 32: 243, 1936), the first for a set of fungal chromosomes was for the 8 chromosomes of *Aspergillus nidulans* (Kafer, *Adv. Genet.* 9: 105, 1958; for revised maps see Dorn, *Genetics* 56: 619, 1967). See also Lindegren *et al.* (*Nature* 183: 800, 1959; *Saccharomyces cerevisiae*). See also Molecular biology.
- Chromosome numbers**. In fungi, chromosomes numbers are generally low; $n=4$ is possibly the basic number, although the very small size of fungal chromosomes has probably frequently led to an underestimation of their number in research studies (Wieloch, *J. microbiol. methods* 67: 1, 2006; visualizing fungal chromosomes). $n=6$ has been reported for *Cenococcum geophilum* (Portugal *et al.*, *Nucleus* 45: 14, 2002) and $n=5$ or $n=6$ for *Tuber aestivum* (Poma *et al.*, *FEMS microbiol. letters* 167: 101, 1998). 2- and 3-ploid series are frequent among *Chromista*, and higher polyploids can occur. *Allomyces* has 8-50+ chromosomes (Emerson & Wilson, *Mycol.* 46: 393, 1954); *Puccinia graminis* $n=3$ (fide McGinnis, *CJB* 31: 522, 1953); *Dermatocarpon weberi* $n=6$ or 8; *Porpidia crustulata* $n=2$; *Agaricales*, $n=2-12$ (Ueda, *Trans. mycol. Soc. Japan* 10: 23, 1969). See also: karyotype.
- Rather few fungi have so far been studied in this respect, although pulsed field gel electrophoresis (q.v.) as a technique will accelerate this process and has already been used to show that fungal nuclei contain 3 (*Schizosaccharomyces pombe*) to c. 21 (*Ustilago hordei*) chromosomes (see Mills & McCluskey, *Molecular plant-microbe interactions* 3: 351-357, 1990). (see Cytology). See Altman & Dittmer (*Biological data book*, 1964), Burges (*in* Lousley, *Species studies in the British flora*: 76, 1955), Ornduff (*Index to plant chromosome numbers* [Regnum veg. 50], 1968), Rogers (*Evolution* 27: 153, 1973; polyploidy in fungi).
- Chromosporium** Corda (1829), anamorphic *Pezizomycotina*, Hso.0eH.15. 20, widespread.
- Chromostylium** Giard (1889) ? = *Metarhizium* fide Tulloch (*TBMS* 66: 409, 1976).
- Chromotorula** F.C. Harrison (1927) = *Rhodotorula* fide Lodder (*Die anaskosporogenen Hefen* 1, 1934), Fell & Statzell-Tallman *in* Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 800, 1998).
- Chroocybe** Räsänen (1943) nom. inval. ? = *Coniocybe* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Chroodiscus** (Müll. Arg.) Müll. Arg. (1890), Thelotremataceae (L). 30, widespread (tropical). See Lumbsch & Vězda (*Nova Hedwigia* 50: 245, 1990), Lücking (*Cryptog. Mycol.* 20: 193, 1999), Kantvilas & Vězda (*Lichenologist* 32: 325, 2000; Tasmania), Galloway (*Australasian Lichenology* 49: 16, 2001), Messuti *et al.* (*Lichenologist* 35: 241, 2003; Argentina), Frisch (*Biblthca Lichenol.* 92: 3, 2006; Africa), Frisch *et al.* (*Biblthca Lichenol.* 92: 517, 2006; phylogeny).
- Chroogomphus** (Singer) O.K. Mill. (1964) nom. cons. prop., Gomphidiaceae. 18, widespread (north temperate). See Singer & Kuthan (*Česká Mykol.* 30: 81, 1976), Agerer (*Nova Hedwigia* 50: 1, 1990; ecology), Miller & Aime (*Trichomycetes and Other Fungal Groups, Robert W. Lichwardt Commemoration Volume*: 315, 2001), Miller (*Mycol.* 95: 176, 2003).
- Chrooicia** Trevis. (1861) = *Pyrenula* Ach. (1809) fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Chroolepus** C. Agardh (1824) = *Cystocoleus* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Chroostroma** Corda (1837) = *Pactilia* fide Saccardo (*Syll. fung.* 4: 673, 1886).
- Chrysachne** Cif. (1938), anamorphic *Pezizomycotina*, Hsp.0eH.?. 1, West Indies.
- Chrysalidopsis** Steyaert (1961), anamorphic *Pezizomycotina*, Cac.≡ eP.?. 1, Chile. See Steyaert (*Darwiniana* 12: 171, 1961).
- Chryseidea** Onofri (1981) ? = *Phaeoisaria*.
- Chrysella** Syd. (1926), Pucciniaceae. 1 (on *Mikania* (0, III) (*Compositae*)), C. America.
- chryseous**, golden yellow.
- Chrysobostrychodes** G. Kost (1985) ≡ *Chrysomphalina*.
- Chrysocelis** Lagerh. & Dietel (1913), ? Mikronegeriaceae. 6 (on dicots, 1 on monocots), widespread (esp. tropical). See Ono & Hennen (*TMSJ* 24: 369, 1983).
- Chrysoconia** McCabe & G.A. Escobar (1979), Coniophoraceae. 1, Réunion. See McCabe & Escobar (*Mycotaxon* 9: 240, 1979).
- Chrysoconiaceae** Jülich (1982) = Coniophoraceae.
- Chrysocyclus** Syd. (1925), Pucciniaceae. 3 (on *Compositae*, *Solanaceae*), America (tropical). See Davidson (*Mycol.* 24: 221, 1932).
- chrysocystidium**, see cystidium.
- Chrysoderma** Boidin & Gilles (1991), Meruliaceae. 1, Réunion. See Boidin & Gilles (*Cryptog. Mycol.* 12: 126, 1991).
- Chrysogloeum** Petr. (1959), anamorphic *Blasdalea*, Cac.0eH.?. 1, Peru. See Petrak (*Sydowia* 12: 254, 1958).
- Chrysogluten** Briosi & Farneti (1904) nom. rej. = *Cosmospora* fide Rossman & Samuels (*Taxon* 47: 723, 1998; nomencl.), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Chrysoglutenaceae** Jatta (1911) = Nectriaceae.
- chrysogonidia**, photobiont cells of *Trentepohlia* (obso.).
- Chrysomma** Acloque (1893) = *Caloplaca* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Chrysomphalina** Cléménçon (1982), Hygrophoraceae. 4, Europe. See Lutzoni (*Syst. Biol.* 46: 373, 1997; phylogeny), Hibbett *et al.* (*Nature* 407: 506, 2000; suggested placement in *Marasmiaceae*), Moncalvo *et al.* (*Syst. Biol.* 49: 278, 2000), Redhead *et al.* (*Mycotaxon* 83: 19, 2002; phylogeny), Barassa *et al.* (*Mycotaxon* 88: 113, 2003; Spain).
- Chrysomyces** Theiss. & Syd. (1917) = *Perisporiopsis* Henn. fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Chrysomyxa** Unger (1840), Coleosporiaceae. c. 23 (on *Picea* (0, I); II (*Caeoma*-like and often (?) with evanescent peridium); III on dicots, or microcyclic III (= *Melampsoropsis*) on *Picea* or *Tsuga* (*Pinaceae*)),

- widespread (northern hemisphere). See Savile (*Can. J. Res. C* 28: 318, 1950), Crane (*CJB* 79: 957, 2001), Crane (*Mycol.* 97: 534, 2005).
- Chrysomyxaceae** Gäum. ex Leppik (1972) = Coleosporiaceae.
- Chrysonilia** Arx (1981), anamorphic *Neurospora*, Hso.0eH.38. 3, widespread. *C. sitophila* (syn. *Monilia sitophila*), red bread mould. See Zeng *et al.* (*FEMS Microbiol. Lett.* 237: 79, 2004; detection).
- Chrysophlyctis** Schilb. (1896) = *Synchytrium* fide Fitzpatrick (*The lower fungi. Phycomycetes*, 1930).
- Chrysoportha** Gryzenh. & M.J. Wingf. (2004), Cryphonectriaceae. Anamorph *Chrysoporthella*. 5, widespread. See Hodges (*Mycol.* 72: 542, 1980; on *Eucalyptus*), van Heerden & Wingfield (*MR* 105: 94, 2001; genetic diversity of *C. cubensis*), Myburg *et al.* (*Mycoscience* 44: 187, 2003; on *Myrtaceae*), Roux *et al.* (*Pl. Dis.* 87: 1329, 2003; on *Eucalyptus*), Roux *et al.* (*Plant Dis.* 87: 1329, 2003), Gryzenhout *et al.* (*Stud. Mycol.* 50: 129, 2004), Gryzenhout *et al.* (*Fungal Diversity* 20: 39, 2005; Ecuador), Rodas *et al.* (*Pl. Path.* 54: 460, 2005; Colombia), Gryzenhout *et al.* (*MR* 110: 833, 2006; Colombia), Gryzenhout *et al.* (*Mycol.* 98: 239, 2006; phylogeny), Gryzenhout *et al.* (*FEMS Microbiol. Letters* 258: 161, 2006), Heath *et al.* (*Pl. Dis.* 90: 433, 2006; South Africa), Nakabonge *et al.* (*Plant Dis.* 90: 734, 2006).
- Chrysoporthella** Gryzenh. & M.J. Wingf. (2004), anamorphic *Chrysoportha*. 1. No independent species have been recognized. See Gryzenhout *et al.* (*Stud. Mycol.* 50: 130, 2004).
- Chrysopsora** (Vain.) M. Choisy (1951) = *Psora* Hoffm. (1796) fide Timdal (*Nordic Jl Bot.* 4: 525, 1984).
- Chrysopsora** Lagerh. (1892), Pucciniaceae. 1 (on *Gynoxis*, *Mikania* (0, III) (*Compositae*)), America (tropical).
- Chrysorhiza** T.F. Andersen & Stalpers (1996), anamorphic *Waitea*. 1, widespread. See Stalpers & Andersen in Sneh *et al.* (Eds) (*Rhizoctonia Species Taxonomy, Molecular Biology, Ecology, Pathology and Disease Control*: 58, 1996).
- Chrysosplenium** Allesch. (1898) [non *Chrysosplenium* L. 1753, *Saxifragaceae*] ≡ *Chlorosplenium* fide Dixon (*Mycotaxon* 1: 65, 1974).
- Chrysospora** (orthographic variant), see *Chrysopsora* (Vain.) M. Choisy.
- Chrysosporium** Corda (1833), anamorphic *Onygenaceae*, Hso.0eH.1. c. 62, widespread. Teleomorphs various (also in *Arthrodermataceae*). See Carmichael (*CJB* 40: 1137, 1962), Boekhout (*Stud. Mycol.* 31: 29, 1989; septal ultrastr.), Hoog *et al.* (*Medical Mycology* 36 Suppl. 1: 52, 1998; review), Gräser *et al.* (*Medical Mycology* 37: 105, 1999; phylogeny), Roilides *et al.* (*J. Clin. Microbiol.* 37: 18, 1999; human disease), Sugiyama *et al.* (*Mycoscience* 40: 251, 1999; phylogeny), Kushwaha (*Revta Iberoamer. Micol.* 17 [Special]: 66, 2000; physiology, biotechnology), Vidal *et al.* (*Revta Iberoamer. Micol.* 17 [Special]: 22, 2000; phylogeny), Vidal & Guarro (*Stud. Mycol.* 47: 189, 2002; diagnosis).
- Chrysothallus** Velen. (1934), Hyaloscyphaceae. 8, former Czechoslovakia. See Korf (*Lloydia* 14: 129, 1951), Huhtinen (*Karstenia* 29: 45, 1990), Galán & Raitviir (*Nova Hedwigia* 58: 453, 1994).
- Chrysothricaceae** Zahlbr. (1905), Arthoniales (L). 2 gen. (+ 4 syn.), 17 spp.
Lit.: Thor (*Bryologist* 91: 360, 1988), Tønsberg (*Graphis Scripta* 6: 31, 1994), Grube (*Bryologist* 101: 377, 1998).
- Chrysothrix** Mont. (1852) nom. cons., Chrysothricaceae (L). 11, widespread. See Laundon (*Lichenologist* 13: 101, 1981; key), Thor (*Bryologist* 91: 360, 1988; S America), Tønsberg (*Graphis Scripta* 6: 31, 1994), Grube (*Bryologist* 101: 377, 1998; phylogeny), Jagadeesh Ram *et al.* (*Lichenologist* 38: 127, 2006; India), Elix & Kantvilas (*Lichenologist* 39: 361, 2007; Australia), Harris & Ladd (*Opuscula Philolichenum* 5: 29, 2008; N America).
- Chuppia** Deighton (1965), anamorphic *Pezizomycotina*, Hso.#eP.1. 1, Venezuela. See Deighton (*Mycol. Pap.* 101: 32, 1965).
- Chytrella** Kirschst. (1941) = *Unguicularia* fide Raschle (*Sydowia* 29: 170, 1977).
- chytrid**, one of the *Chytridiales*. See Canter-Lund & Lund, *Freshwater Algae* (1995) for general account.
- Chytridhaema** Moniez (1887), ? *Olpidiaceae*. 1, France.
- Chytridiaceae** Nowak. (1878), Chytridiales. 33 gen. (+ 5 syn.), 238 spp.
Lit.: Sparrow (*Aquatic Phycomycetes* Edn 2: 1187 pp., 1960), Barr in Margulis *et al.* (Eds) (*Handbook of Protoctista*: 454, 1990), James *et al.* (*CJB* 78: 336, 2000).
- Chytridiales** Cohn (1879). Chytridiomycetes. 4 fam., 75 gen., 494 spp. Thallus monocentric or polycentric, endogenous or exogenous; zoospores mostly with one conspicuous lipid globule; rhizoids tapering to fine (<0.5µm) tips; generally aquatic but also in soil; saprobic or parasitic; on algae, microfauna, other fungi, pollen, plant debris, chitin and keratin, rarely terrestrial on higher plants (*Synchytrium*); *Batrachomyces* pathogen in amphibian skin; cosmop.
- The *Spizellomycetales* were removed from *Chytridiales sensu* Sparrow and *Chytridiales* emended using ultrastructural characters of zoospore (Barr, 1980): microtubules extending from one side of kinetosome in a parallel array; non-flagellate centriole parallel and connected to the kinetosome; rumposome often present on surface of lipid globule; ribosomes usually in mass, which is more or less enclosed by endoplasmic reticulum. Families in order are based on type of development, not on phylogeny. Sparrow (1960) divided the order into an operculate and inoperculate series; Karling (1977) used Whiffen's (1944) system based on thallus development types, a system followed by Barr, which is used herein. Fams:
- (1) **Chytridiaceae**
 - (2) **Cladochytriaceae**
 - (3) **Endochytriaceae**
 - (4) **Synchytriaceae**
- The placement of many genera within the revised *Chytridiales* is still uncertain.
- Lit.: Sparrow (1960), Karling (*Chytridiomycetorum iconographia*, 1977; 175 pl.), Barr (*CJB* 58: 2380, 1980; 1990), Barr & Désaulniers (*CJB* 66: 869, 1988; precise configuration of organelles in zoospore), Powell & Roychoudhury (*CJB* 70: 750, 1992; redefinition of chytridial types of MLC), Longcore (*CJB* 71: 414, 1993; new type of MLC, *Mycol.* 87: 25, 1995; discussion of taxonomic characters), James *et al.* (*Mycol.* 98: 860, 2006; molecular phylogeny), Hibbett *et al.* (*MR* 111: 109, 2007), and see under Families.
- Chytridioides** Tregnohoff (1913) = *Chytridiopsis* fide

- Karling (*Chytriomyc. Iconogr.*: 37, 1977), Canning in Margulis *et al.* (Eds) (*Handbook of Protoctista*: 53, 1990; systematic position).
- Chytridiomycetes** Caval.-Sm. (1998), Chytridiomycota. 3 ord., 10 fam., 98 gen., 678 spp. Ords:
- (1) **Chytridiales**
 - (2) **Rhizophydiales**
 - (3) **Spizellomycetales**
- Lit.*: James *et al.* (*Mycol.* 98: 860, 2006; molecular phylogeny), Hibbett *et al.* (*MR* 111: 109, 2007), and see under Orders.
- Chytridiomycota** M.J. Powell (2007), Fungi. 2 class., 4 ord., 14 fam., 105 gen., 706 spp. (Chytridiomycetes, Rumpomycetes). Thallus coenocytic, holocarpic or eucarpic, monocentric, polycentric, or mycelial; cell walls chitinous (at least in hyphal stages); mitochondrial cristae flat; zoospores posteriorly (whiplash) monoflagellate or (rarely) polyflagellate, lacking mastigonemes or scales, with unique flagellar 'root' systems. Aquatic saprobes or parasites growing on decaying and living organic material (incl. nematodes, insects, amphibian skin, plant parts, other chytrids and fungi), in freshwater and soils; a few are marine, some are obligate anaerobes on cellulosic substrata in guts of herbivores.
- The presence of flagellate zoospores has led to these fungi sometimes being classified as *Mastigomycotina* or being placed with the fungal phyla of the *Chromista* rather than in the *Fungi* (Kendrick, 1992; Kreissel, 1988). Retained in the *Fungi* (Barr, 1992; Bruns *et al.*, 1991; Corliss, 1994; Alexopoulos *et al.* 1996) on ultrastructural (flattened mitochondrial cristae), cell wall chemistry (chitinous) and molecular evidence (see Phylogeny).
- Two classes are now recognized (zygospore ultrastructure in *Deckenbachia* and *Thalassochytrium* is sufficiently distinct that it cannot be satisfactorily placed):
- (1) **Chytridiomycetes**
 - (2) **Monoblepharidomycetes**
- Lit.*: Barr (in Margulis *et al.* (Eds), *Handbook of Protoctista*: 454, 1990; *Mycol.* 84: 1, 1992), Bruns *et al.* (*Ann. Rev. Ecol. Syst.* 22: 525, 1991), Karling (*Sydowia Beih.* 6, 1966; Indian spp., keys; *Chytridiomycetarum iconographia*, 1977), Powell (*Mycol.* 85: 1, 1993; roles in environment), Sparrow (in Ainsworth *et al.*, *The Fungi* 4B: 85, 1973; ecology), Longcore (*Mycotaxon* 60: 149, 1996; taxonomic change since 1960), James *et al.* (*CJB* 78: 336, 2000; molecular phylogeny), James *et al.* (*Mycol.* 98: 860, 2006; molecular phylogeny), Hibbett *et al.* (*MR* 111: 109, 2007), and see under Classes and Orders.
- Chytridiopsis** W.G. Schneid. (1884), Microsporidia. 3, Europe; S. America. See Canning in Margulis *et al.* (Eds) (*Handbook of Protoctista*: 53, 1990; systematic position).
- Chytridium** A. Braun (1851), Chytridiaceae. c. 45, widespread (temperate). See Karling (*Chytriomyc. Iconogr.*, 1977; in algae).
- Chytriomycetes** Karling (1945), Chytridiaceae. 34, widespread. See Johnson (*J. Elisha Mitchell scient. Soc.* 87: 200, 1971; Icelandic spp.), Karling (*Chytriomyc. Iconogr.*, 1977), Letcher & Powell (*Mycotaxon* 84: 447, 2002; monogr., key).
- Cibalocoryne** Hazsl. (1881) = *Geoglossum* fide Saccardo (*Syll. fung.* 8: 1, 1889).
- Cibdelia** Juel (1925), ? Olpidiaceae. 1, Europe. See Juel (*Ark. Bot.* 19: 9, 1925).
- Cibiessia** Crous (2007), anamorphic *Teratosphaeriaceae*. 3, Australia; S. Africa. See Crous *et al.* (*Fungal Diversity* 26: 1, 2007), Crous *et al.* (*Stud. Mycol.* 58: 1, 2007; phylogeny).
- Ciboria** Fuckel (1870), Sclerotiniaceae. Anamorph *Myrioconium*. c. 21, widespread (temperate). See also *Moellerodiscus*. See Schumacher (*Norw. J. Bot.* 25: 145, 1978; Norwegian amenticolous spp.), Spooner (*Bibliotheca Mycol.* 116, 1987; 3 spp. Australasia), Holst-Jensen *et al.* (*Mycol.* 89: 885, 1997; phylogeny), Holst-Jensen *et al.* (*Nordic J. Bot.* 18: 705, 1999; phylogeny), Galán & Palmer (*Czech Mycol.* 52: 277, 2001; Europe), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006; phylogeny).
- Ciboriella** Seaver (1951) = *Hymenoscyphus* fide Schumacher (*Mycotaxon* 38: 233, 1990).
- Ciborinia** Whetzel (1945), Sclerotiniaceae. Anamorphs *Myrioconium*, *Sclerotium*. 16, widespread. See Batra (*Am. J. Bot.* 47: 819, 1960; key), Holst-Jensen *et al.* (*Mycol.* 89: 885, 1997; phylogeny), Zhuang & Wang (*Mycosystema* 16: 161, 1997), Holst-Jensen *et al.* (*Nordic J. Bot.* 18: 705, 1999; phylogeny), Cook (*Bulletin OEPP EPPO Bulletin* 33: 257, 2003; diagnostics), Toor *et al.* (*Australas. Pl. Path.* 34: 319, 2005; genetic diversity), Saito & Kaji (*Mycoscience* 47: 41, 2006; on *Gentiana*).
- Ciboriopsis** Dennis (1962) = *Moellerodiscus* fide Dumont (*Mycol.* 68: 233, 1976), Johnston (*N.Z. J. Bot.* 40: 105, 2002).
- Cicadocola** Brain (1923), anamorphic *Pezizomycotina*, Hso.0eH.4. 1 (in *Insecta*), S. Africa.
- Cicadomyces** Šulc (1911), ? Saccharomycetales. 10 (in *Insecta*), widespread.
- cicatricose**, with longitudinal ridges (Fig. 20.15).
- cicatrized** (of conidiogenous cells and conidia), having thickened scars.
- Cicinnobella** Henn. (1904) = *Perisporina*. Also used for *Dimerium* anamorphs. fide Höhnelt (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt. 1* 120: 379, 1911).
- Cicinobolus** Ehrenb. (1853) = *Ampelomyces* fide Rogers (*Mycol.* 51: 96, 1959), Donk (*Taxon* 15: 149, 1966).
- Cidaris** Fr. (1849), ? Helvellaceae. 1, N. America. Affinities are unclear. See van Brummelen in Hawksworth (Ed.) (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. 269 269: 399, 1994; posn).
- cider**, an alcoholic drink obtained by the fermentation of apple juice by various yeasts. Cf. beer.
- Ciferri** (Raffaele; 1897-1964, Italy, later Dominican Republic). Founder and Director of the Experimental Agricultural Station, Santiago de los Caballeros, Dominican Republic (1925-1932; Vice Director, Italian Cryptogamic Laboratory, Botanical Institute, Pavia (1932-1936); Professor of Botany, Florence University (1936-1942); Professor of Botany, University of Pavia (1942-1964). A most versatile mycologist who, through more than 1,000 publications, made notable contributions to tropical mycology, particularly in Brazil with Batista (q.v.) and the Dominican Republic, with González Fragoso (q.v.); also known for his work with the *Ustilaginales* (q.v.), plant pathogenic fungi (q.v.), medical mycology (q.v.), and the compilation of a mycological bibliography. Founder of the journal *Mycopathologia et Mycologia Applicata*. *Publs. G. Lindau & P. Sydow*

- Thesaurus Literaturae Mycologicae et Lichenologicae Supplementum 1911-1930* 4 vols (1957-1960) [these volumes are freely available on-line; see Internet: catalogues & thesauri]. *Biogs, obits etc.* Baldacci (*Mycol.* 57: 198, 1965) [portrait]; Grumann (1974: 516); Stafleu & Cowan (*TL-2* 1: 503, 1976); Tomaselli (*Atti dell'Istituto Botanico della Università e Laboratorio Crittogamico di Pavia Serie 5*, 21 (Suppl.), 1964; bibliography).
- Ciferria** Gonz. Frag. (1925), anamorphic *Pezizomycotina*, ?0fH.?. 1, West Indies.
- Ciferriella** Petr. (1930), anamorphic *Pezizomycotina*, Cac.≡ eP.19. 1, West Indies.
- Ciferrina** Petr. (1932), anamorphic *Pezizomycotina*, St.0fH.?. 1, West Indies.
- Ciferriolichen** Tomas. (1952) = *Arthopyrenia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Ciferriomyces** Petr. (1932) ? = *Pyrenostigme* fide Hansford (*Mycol. Pap.* 15, 1946).
- Ciferriopeltis** Bat. & H. Maia (1965), anamorphic *Pezizomycotina*, Cpt.0eP.?. 1, Dominican Republic. See Batista & Maia (*Publções Inst. Micol. Recife* 463: 4, 1965).
- Ciferriotheca** Bat. & I.H. Lima (1959) = *Metathyriella* fide Luttrell in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 213, 1973).
- Ciferrioxylum** Bat. & H. Maia (1963), anamorphic *Aithaloderma*, Hsy.≡ eH.15. 2, widespread (tropical). See Batista & Maia (*Quad. Lab. crittogam., Pavia* 31: 65, 1963).
- Ciferriusia** Bat. (1962) = *Yatesula* fide von Arx & Müller (*Stud. Mycol.* 9, 1975), Reynolds & Gilbert (*Cryptog. Mycol.* 27: 249, 2006; Panamá).
- Ciglides** Chevall. (1826) = *Gymnosporangium* fide Sydow & Sydow (*Monographia Uredinearum seu Specierum Omnium ad hunc usque Diem Descriptio et Adumbratio Systematica* 3, 1915).
- Cigliidiaceae** Chevall. (1826) = *Pucciniaceae*.
- Ciliaria** Qué. (1885) [non *Ciliaria* Stackh. 1809, *Algae*] ≡ *Scutellinia* fide Clements & Shear (*Gen. Fung.*, 1931).
- ciliate**, edged with hairs.
- Ciliatosporidium** I. Foissner & W. Foissner (1995), *Microsporidia*. 1.
- Ciliatula** Velen. (1922) = *Pezoloma* fide Korf (*Phytologia* 21: 201, 1971).
- ciliatulate**, thinly ciliate.
- Cilicia** Fr. (1825), *Agaricomycetes* (L). 2, Europe. See Donk (*Reinwardtia* 2: 435, 1954) See, Laundon (*Lichenologist* 13: 101, 1981).
- Ciliciocarpus** Corda (1831) = *Gautieria* fide Pilát (*Fl. ČSR* B1: 211, 1958).
- Ciliciopodium** Corda (1831), anamorphic *Nectria*, Cpt.0eH.?. 5, widespread. See Booth (*Mycol. Pap.* 73, 1959).
- Ciliciopus** Clem. & Shear (1931) ≡ *Ciliciopodium*.
- Ciliella** Sacc. & P. Syd. (1902), *Helotiales*. 1, Brazil.
- Ciliochora** Höhn. (1919), anamorphic *Pezizomycotina*, St.0eH.19. 2, paleotropical. See Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993), Sutton *et al.* (*MR* 100: 405, 1996; Italy), Moriondo & Menguzzato (*Inflore fitopatol.* 50: 55, 2000; status as endophyte).
- Ciliochorella** Syd. (1935), anamorphic *Pezizomycotina*, St.1eP.15. 2, widespread (tropical). See Subramanian & Ramakrishnan (*TBMS* 39: 314, 1956), Punithalingam (*Stud. Mycol.* 31: 113, 1989; cytology), Masilamani & Muthumary (*MR* 98: 857, 1994; ontogeny).
- Ciliofusa** Clem. & Shear (1931) ≡ *Ciliofusarium*.
- Ciliofusarium** Rostr. (1892) = *Menispora* fide Hughes (*CJB* 36: 727, 1958).
- Ciliofusospora** Bat. & J.L. Bezerra (1963), *Pezizomycotina*. 1, Brazil. See Batista & Bezerra (*Publções Inst. Micol. Recife* 385: 15, 1963).
- Ciliolarina** Svrček (1977), *Hyaloscyphaceae*. Anamorph *Septonema*-like. 6, N. America; Europe (northern). See Huhtinen (*Biblthca Mycol.* 150: 93, 1993; key), Raitviir (*Scripta Mycologica Tartu* 20, 2004).
- Ciliomyces** Höhn. (1906) = *Paranectria* fide Hawksworth & Pirozynski (*CJB* 55: 2555, 1977), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Ciliophora** Petr. (1929), anamorphic *Pezizomycotina*, St.0eH.19. 1, C. America.
- Ciliophorella** Petr. (1940), anamorphic *Pezizomycotina*, Cpd.0eH.?. 1, Austria.
- Cilioplea** Munk (1953), *Lophiostomataceae*. 9, widespread. See Crivelli (*Über die heterogene Ascomycetengattung Pleospora Rbh.*, 1983; key), Barr (*SA* 5: 125, 1986; posn), Barr (*Mem. N. Y. bot. Gdn* 62: 92 pp., 1990; North America).
- Ciliosculum** Kirschst. (1941), ? *Hyaloscyphaceae*. 1, Germany.
- Ciliosira** Syd. (1942) = *Acarosporium* fide Petrak (*Sydowia* 14: 347, 1960).
- Ciliospora** Zimm. (1902) = *Chaetospermum* fide Sutton (*Mycol. Pap.* 141, 1977), Matsushima (*Matsush. Mycol. Mem.* 5, 1987).
- Ciliosporella** Petr. (1927), anamorphic *Pezizomycotina*, Cpd.0eH.15. 2, Austria; Australia. See Yuan & Mohammed (*MR* 101: 1531, 1997; n.sp. Australia).
- cilium** (pl. *cilia*), (1) an appendage of animal cells, e.g. protozoa; sometimes used for the flagellum (q.v.) of a zoospore; (2) a hair-like out-growth, e.g. from the edge of an apothecium or lichen thallus.
- cillin** (suffix), for penicillins; derivatives of carboxy-6-amino-penicillanic acid (*WHO Chron.* 17: 400, 1963).
- cinnate** (*cinnal*), rolled round; curled.
- Cinereomyces** Jülich (1982), *Polyporaceae*. 1, widespread. See Jülich (*Biblthca Mycol.* 85: 396, 1981), Spirin (*Karstenia* 45: 103, 2005; Russia).
- cingulate**, edged all round.
- Cintractia** Cornu (1883), *Anthracoideaceae*. c. 15, widespread (tropical to subtropical). The sorus of agglutinated ustilospores is characterized by a sterile stroma; the name has been widely used also for *Anthracoidea* (q.v.). See Ingold (*MR* 99: 140, 1995; spore germination), Piepenbring *et al.* (*Mycol.* 91: 485, 1999), Piepenbring (*Nova Hedwigia* 70: 289, 2000; classification).
- Cintractiaceae** Vánky (2000) = *Anthracoideaceae*.
- Cintractiella** Boedijn (1937), *Cintractiellaceae*. 2 (induces hypertrophy in *Diplasia* & *Hypolytrum* (*Cyperaceae*)), East Indies; S. America. See Vánky (*Fungal Diversity* 13: 167, 2003).
- Cintractiellaceae** Vánky (2003), *Ustilaginales*. 2 gen., 3 spp.
Lit.: Vánky (*Fungal Diversity* 13: 167, 2003).
- Cintractionomyxa** Golovin (1952) = *Anthracoidea* fide Nannfeldt & Lindeberg (*Svensk bot. Tidskr.* 51: 503, 1957).
- Cionothrix** Arthur (1907), *Pucciniosiraceae*. 6 (on

- Compositae*, 1 on *Sapindaceae* (0, III), S. America. See Buriticá & Hennen (*Fl. Neotrop.* 24: 18, 1980), Buriticá (*Rev. Acad. Colomb. Cienc.* 18 no. 69: 131, 1991), Berndt (*Mycol.* 94: 523, 2002; Argentina).
- Ciposia** Marbach (2000), Caliciaceae (L). 1, USA. See Marbach (*Bibliotheca Lichenol.* 74: 158, 2000).
- circadian**, pertaining to a day, e.g. a 24-hr rhythm. Cf. diel, diurnal.
- Circinaria** Bonord. (1851) = *Valsa* Fr. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Circinaria** Fée (1825) = *Coccocarpia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Circinaria** Link (1809) nom. rej. = *Aspicilia* fide Laundon & Hawksworth (*Taxon* 37: 478, 1988).
- Circinaria** M. Choisy (1929) = *Lecanora* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Circinastrum** Clem. (1909) = *Weinmannodora* fide Sutton (*Mycol. Pap.* 141, 1977).
- circinate**, twisted round; coiled (Fig. 23.37).
- Circinella** Tiegh. & G. Le Monn. (1873), Mucoraceae. 9, widespread. See Hesseltine & Fennell (*Mycol.* 47: 193, 1955; key), Naganishi (*TMSJ* 15: 175, 1974), Ho (*Fungal Science Taipei* 10: 23, 1995; ultrastr.), Arambarri & Cabello (*Mycotaxon* 57: 145, 1996; key to spp.), Roux *et al.* (*Proc. Microsc. Soc. S. Afr.* 28: 45, 1998; ultrastr.), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny).
- Circinoconis** Boedijn (1942), anamorphic *Pezizomycotina*, Hso.0 = hP.1. 1, East Indies; Australasia. See Aptroot & Iperen (*Nova Hedwigia* 67: 485, 1998; Papua New Guinea).
- Circinomucor** Arx (1982) = *Mucor* Fresen. fide Kirk (*in litt.*).
- Circinoniesslia** Samuels & M.E. Barr (1998), Niessliaceae. 1 (on dead bark or fungicolous), Puerto Rico. See Samuels & Barr (*CJB* 75: 2165, 1998).
- Circinostoma** Gray (1821) ? = *Valsa* Fr. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Circinotrichum** Nees (1816), anamorphic *Pezizomycotina*, Hso.0eH.6. 17, widespread. See Pirozynski (*Mycol. Pap.* 84, 1962; key), Castañeda Ruíz *et al.* (*Mycotaxon* 63: 169, 1997).
- Circinumbella** Tiegh. & G. Le Monn. (1872) = *Circinella* fide Hesseltine (*Mycol.* 47: 344, 1955).
- Circulocolumella** S. Ito & S. Imai (1957), Hysterangiaceae. 1, Bonin Island. See Ito & Imai (*Science Rep. Yokohama Nat. Univ. Section 2* 6: 4, 1957).
- circum-** (prefix), all round; round about.
- circumcinct**, having a band around the middle.
- circumscissile**, opening or cracking along a circle.
- cirrate** (cirrose), rolled round (curled) or becoming so.
- Cirrenalia** Meyers & R.T. Moore (1960), anamorphic *Halosphaeriaceae*, Hso.0 = hP.1. 17 (marine and terrestrial), widespread (temperate). See Kohlmeyer (*Ber. dt. bot. Ges.* 79: 27, 1966), Goos (*Proc. Indian Acad. Sci. Pl. Sci.* 94: 245, 1985), Ravikumar & Purushothaman (*Curr. Sci.* 57: 674, 1988; India), Matsushima (*Matsush. Mycol. Mem.* 9: 1, 1996), Somrithipol *et al.* (*Nova Hedwigia* 75: 477, 2002; Thailand), Zhao & Liu (*Fungal Diversity* 18: 201, 2005; review), Tsui & Berbee (*Mol. Phylogen. Evol.* 39: 587, 2006; phylogeny).
- Cirrhoholus** Mart. (1821) nom. dub., Fungi.
- Cirrhomyces** Höhn. (1903) = *Chloridium* fide Hughes (*CJB* 36: 727, 1958).
- Cirrosporium** S. Hughes (1980), anamorphic *Pezizomycotina*, St. = eP.23. 1, New Zealand. See Hughes (*N.Z. J. Bot.* 18: 329, 1980).
- cirrus** (cirrhus), a curl-like tuft; a tendril-like mass or 'spore horn' of forced-out spores.
- Cirsosia** G. Arnaud (1918), Asterinaceae. 7, widespread (tropical). See Batista & Maia (*Rev. brasil. Biol.* 2: 115, 1960), Hosagoudar & Pillai (*MR* 98: 127, 1994; India), Reynolds & Gilbert (*Aust. Syst. Bot.* 18: 265, 2005; Australia), Thaung (*Australas. Mycol.* 25: 5, 2006; Burma).
- Cirsosiella** G. Arnaud (1918) = *Cirsosia* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Cirsosina** Bat. & J.L. Bezerra (1960), ? Microthyriaceae. 2 (on *Rhododendron*), Europe; Borneo. See Batista & Bezerra (*Revta Biol. Lisb.* 2: 132, 1960).
- Cirsiosiopsis** Butin & Speer (1979), Microthyriaceae. 1 (on *Araucaria*), Brazil. See Butin & Speer (*Sydowia* 31: 10, 1978).
- Cissococcomyces** Brain (1923), anamorphic *Pezizomycotina*, Hso.???. 1 (in *Insecta*), S. Africa.
- Cistella** Qué. (1886) nom. cons., Hyaloscyphaceae. Anamorph *Phialophora*-like. 38, widespread (temperate). See Dennis (*Mycol. Pap.* 32, 1949), Raitviir (*Scripta Mycol.* 1, 1970; keys), Matheis (*Friesia* 11: 85, 1976), Raitviir (*Scripta Mycol.* 8: 147, 1978), Helfer (*Libri Botanici* 1, 1991; anamorph), Cantrell & Hanlin (*Mycol.* 89: 745, 1997; DNA), Raitviir & Järv (*Proc. Est. Acad. Sci. Biol. Ecol.* 46: 94, 1997), Gams (*Stud. Mycol.* 45: 187, 2000; anamorph), Yu & Zhuang (*Mycosystema* 22: 42, 2003; phylogeny), Raitviir (*Scripta Mycol.* 20, 2004).
- Cistellina** Raitv. (1978) = *Hyphodiscus* fide Svrček (*Česká Mykol.* 41: 193, 1987), Haines (*Mycotaxon* 35: 324, 1989), Raitviir (*Scripta Mycol.* 20, 2004), Zhuang *et al.* (*Flora Fungorum Sinicorum* 21, 2004; China).
- cisternal ring**, a ring-like arrangement of the endoplasmic reticulum which appears to bud and give rise to vesicles.
- Citeromyces** Santa María (1957), Saccharomycetales. 1, widespread. See Kurtzman *in* Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 146, 1998), Suzuki & Nakase (*J. gen. appl. Microbiol.* Tokyo 45: 239, 1999), Nagatsuka *et al.* (*Int. J. Syst. Evol. Microbiol.* 52: 2315, 2002; Thailand), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- citreoviridin**, a polyene toxin of *Penicillium citreoviride*; the cause of cardiac beri-beri in humans.
- citrinin**, a toxic yellow pigment of *Penicillium citrinum*, *P. viridicatum*, etc.; the cause of nephrotoxicosis in pigs.
- Citromyces** Wehmer (1893) = *Penicillium* Link fide Thom (*The Penicillia*, 1930), Peterson & Sigler (*MR* 106: 1109, 2002; nomencl.).
- Civisubramania** Vittal & Dorai (1986), anamorphic *Pezizomycotina*, Hso.0eP.1. 1, India. See Vittal & Dorai (*TBMS* 87: 482, 1986).
- CK**, see Metabolic products.
- Cladaria** Ritgen (1828) nom. rej. = *Ramaria* Fr. ex Bonord. fide Corner (*Ann. Bot. Mem.* [A monograph of *Clavaria* and allied genera, addenda] 17: 347, 1953).
- Cladaspergillus** Ritgen (1831) = *Aspergillus* fide Mussat (*Syll. fung.* 15: 89, 1901).
- clade**, a monophyletic group of any magnitude (first used by Huxley, *Nature* 180: 454, 1957); the recognition and hierarchical arrangement of such taxa constitutes the practice of cladistics (q.v.).
- Cladia** Nyl. (1870), Cladoniaceae (L). 14, widespread. See Filson (*J. Hattori bot. Lab.* 49: 1, 1981; monogr.,

- key), Ahti (*Regnum veg.* 128: 58, 1993; names in use), Stenroos *et al.* (*Pl. Syst. Evol.* 207: 43, 1997), Wedin *et al.* (*Lichenologist* 32: 171, 2000; phylogeny), Stenroos *et al.* (*Mycol. Progr.* 1: 267, 2002; phylogeny), Guo & Kashiwadani (*National Science Museum Monographs* 24: 207, 2004; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Cladiaceae** Filson (1981) = Cladoniaceae.
- Cladidium** Hafellner (1984), Lecanoraceae (L). 2, western USA. See Ryan (*Mycotaxon* 34: 697, 1989), Ryan & Nash (*Nova Hedwigia* 64: 393, 1997).
- Cladina** (Nyl.) Nyl. (1866) = *Cladonia* fide Ahti (*Ann. bot. Soc. zool.-bot. fenn. Vanamo* 32 no. 1, 1961), Ahti (*Beih. Nova Hedwigia* 79: 25, 1984), Huovinen & Ahti (*Ann. bot. fenn.* 23: 93, 1986; chemistry 30 spp.), Wei *et al.* (*Acta Mycol. Sin.* 5: 240, 1986; 9 spp. China), Rouss & Ahti (*Lichenologist* 21: 29, 1989), Ahti (*Regnum veg.* 128: 58, 1993; names in use; accepted gen.), Burgaz & Ahti (*Nova Hedwigia* 59: 399, 1994), Hammer (*Mycol.* 89: 461, 1997; morphology), Stenroos *et al.* (*Pl. Syst. Evol.* 207: 43, 1997; phylogeny), Burgaz & Ahti (*Nova Hedwigia* 66: 549, 1998; Spain), Ito *et al.* (*Mycopathologia* 144: 169, 1998; nomencl.), Carbonero *et al.* (*Phytochem.* 61: 681, 2002; polysaccharides), Guo & Kashiwadani (*National Science Museum Monographs* 24: 207, 2004; phylogeny).
- Cladinomyces** Cif. & Tomas. (1953) = *Cladonia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Cladistics.** See Phylogenetic analysis.
- Cladobotryum** Nees (1816), anamorphic *Hypomyces*, Hso.≡ eH.15. 35, widespread. See Gams & Hoozemans (*Persoonia* 6: 96, 1970; key), de Hoog (*Persoonia* 10: 33, 1978; key 11 spp.), Pöldmaa *et al.* (*Sydowia* 49: 80, 1997; 3 new holomorphic spp.), Pöldmaa *et al.* (*CJB* 77: 1756, 1999; phylogeny).
- Cladobysus** Ritgen (1831) = *Hypha* fide Mussat (*Syll. fung.* 15, 1901).
- Cladochaete** Sacc. (1912) [non *Cladochaete* DC. 1838, *Compositae*] = *Chaetomium* fide Petrak & Sydow (*Reprum nov. Spec. Regni veg., Beih.* 42: 487, 1927).
- Cladochasiella** Marvanová (1997), anamorphic *Pezizomycotina*, Hso.?.?. 1, Czech Republic. See Marvanová (*Cryptog. Mycol.* 18: 285, 1997), Descals (*MR* 109: 545, 2005; diagnostics).
- Cladochytriaceae** J. Schröt. (1892), Chytridiales. 10 gen. (+ 1 syn.), 38 spp.
Lit.: Sparrow (*Aquatic Phycomycetes* Edn 2: 1187 pp., 1960), Longcore (*CJB* 71: 415, 1993), Blackwell *et al.* (*Mycotaxon* 89: 259, 2004).
- Cladochytrium** Nowak. (1877), Cladochytriaceae. c. 10, widespread. See Sparrow (*Aquatic Phycomycetes* Edn 2: 462, 1960; key).
- Cladoconidium** Bandoni & Tubaki (1985), anamorphic *Pezizomycotina*, Hso.≡ eH.10. 1, Japan; Canada. See Bandoni & Tubaki (*TMSJ* 26: 426, 1985), Marvanová & Bärlocher (*Czech Mycol.* 53: 1, 2001; Canada).
- Cladodendron** Lázaro Ibiza (1916) = *Grifola* fide Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974).
- Cladoderris** Pers. ex Berk. (1842) = *Cymatoderma* fide Donk (*Taxon* 6: 17, 1957).
- Cladodium** (Tuck.) Gyeln. (1934) [non *Cladodium* Brid. 1826, *Musci*] = *Cladidium*.
- cladogram**, see Cladistics.
- Cladographium** Peyronel (1918), anamorphic *Pezizomycotina*, Hsy.0eP.?. 1, Europe.
- Cladomeris** Quél. (1886) = *Grifola* fide Pegler (*The polypores [Bull. BMS Suppl.]*, 1973).
- Cladonia** Adans. (1763) nom. rej. prop. = *Cladonia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Cladonia** P. Browne (1756) nom. cons., Cladoniaceae (L). 518, widespread. See also *Cladina*. See Sandstede (*Rabenh. Krypt.-Fl.* 9 4.2: 1, 1931; Eur.), Asahina (*Lichens of Japan* 1, 1950), Thomson (*The lichen genus Cladonia in North America*, 1968), Culberson & Kristinsson (*Bryologist* 72: 431, 1970), Jahns (*Untersuchungen zur Entwicklungsgeschichte der Cladoniaceen*, 1970), Bird & Marsh (*CJB* 50: 915, 1972; Alberta), Ahti (*Ann. bot. fenn.* 10: 163, 1973; *Unciales*), Jahns & Beltman (*Lichenologist* 5: 349, 1973; ontogeny), Ahti (*Ann. bot. fenn.* 15: 7, 1978; Eur.), Ahti (*Ann. bot. fenn.* 17: 195, 1980; *gracilis*-group), Ahti (*Lichenologist* 12: 125, 1980), Ahti (*J. Hattori bot. Lab.* 52: 331, 1982; evol. trends), Ahti (*Lichenologist* 14: 105, 1982; morphology), Honegger (*Lichenologist* 15: 57, 1983; asci), Archer & Bartlett (*N.Z. Jl Bot.* 24: 581, 1986; key 44 NZ spp.), Upreti (*Feddes Repert.* 98: 469, 1987; key 62 spp. India & Nepal), Ahti (*Regnum veg.* 128: 58, 1993; names in use), Hammer (*Bryologist* 96: 299, 1993; sect. *Perviae* N. Am.), Ahti & Marcelli (*Biblhca Lichenol.* 52: 5, 1995; *Cladonia verticillaris*-group), Hammer (*Bryologist* 98: 1, 1995; 57 NW USA spp.), Hammer (*Mycol.* 87: 46, 1995; ontogeny), Stenroos *et al.* (*Pl. Syst. Evol.* 207: 43, 1997), Burgaz & Ahti (*Nova Hedwigia* 66: 549, 1998; Spain), Hammer (*Lichenologist* 30: 567, 1998; ontogeny), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998; DNA), Burgaz *et al.* (*Portugaliae Acta Biologica Série B* 18: 121, 1999; Portugal), Hammer (*Mycol.* 91: 334, 1999), Woranovicz-Barreira *et al.* (*FEMS Microbiol. Lett.* 181: 313, 1999; chemistry), Hammer (*Am. J. Bot.* 87: 33, 2000; ontogeny), Wedin *et al.* (*Lichenologist* 32: 171, 2000; phylogeny), Azuaga *et al.* (*Mycotaxon* 79: 433, 2001; Andorra), Hammer (*Bryologist* 104: 560, 2001; Australia), Ahti *et al.* (*Lichenologist* 34: 305, 2002; India), Stenroos *et al.* (*Mycol. Progr.* 1: 267, 2002; phylogeny), Hammer (*Bryologist* 106: 410, 2003; New Zealand), Herk & Aptroot (*Biblhca Lichenol.* 86: 193, 2003; *C. cervicornis* group), Myllys *et al.* (*Mol. Phylogen. Evol.* 27: 58, 2003; phylogeny), Piercey-Normore (*Mycotaxon* 86: 233, 2003; Canada), Guo & Kashiwadani (*National Science Museum Monographs* 24: 207, 2004; phylogeny), Litterski & Ahti (*Symb. bot. upsal.* 34 no. 1: 205, 2004; distribution), Piercey-Normore (*CJB* 82: 947, 2004; photobionts), Ahti & DePriest (*Taxon* 54: 183, 2005; nomencl.), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Ahti (*Biblhca Lichenol.* 96: 5, 2007; E Asia, N America), Beiggi & Piercey-Normore (*J. Mol. Evol.* 64: 528, 2007; ITS secondary structure).
- Cladoniaceae** Zenker (1827), Lecanorales (L). 17 gen. (+ 26 syn.), 570 spp.
Lit.: Jahns (*Nova Hedwigia* 20: 1, 1970; ontogeny), Ahti (*Lichenologist* 14: 105, 1982; interpretation of thallus), Galloway & James (*Notes R. bot. Gdn Edinb.* 44: 561, 1987), Stenroos *et al.* (*Ann. bot. fenn.* 25: 207, 1988; Melanesia), Stenroos *et al.* (*Fl. cryptog. Tierra del Fuego* 43: 95, 1991), Ahti (*Regnum veg.* 128: 58, 1993; gen., spp. names in use), Burgaz

- & Ahti (*Nova Hedwigia* 59: 399, 1994), DePriest (*Cryptog. bot.* 5: 60, 1995), Goward & Ahti (*J. Hattori bot. Lab.* 82: 143, 1997), Stenroos *et al.* (*Pl. Syst. Evol.* 207: 43, 1997), Ahti (*Lichenology in Latin America. History, Current Knowledge and Applications* [Proceedings of GLAL-3, Terceiro Encontro do Grupo Latino-Americano de Liqueólogos, São Paulo, Brazil, 24-28 September, 1997]: 109, 1998), Stenroos (*Nova Hedwigia* 66: 457, 1998), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998; DNA), Ahti (*Fl. Neotrop. Monogr.* 78, 2000), Hammer (*Am. J. Bot.* 87: 33, 2000; thallus morphology), Wedin *et al.* (*Lichenologist* 32: 171, 2000; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny).
- Cladoniicola** Diederich, van den Boom & Aptroot (2001), anamorphic *Pezizomycotina*. 1, Netherlands. See Diederich *et al.* (*Belg. J. Bot.* 134: 127, 2001).
- Cladoniomyces** E.A. Thomas ex Cif. & Tomas. (1953) $\equiv$ *Pyxidium* Hill.
- Cladoniopsis** Zahlbr. (1941) = *Baeomyces* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Cladophialophora** Borelli (1980), anamorphic *Capronia*, Hso.1eP+0eH.15. 4, widespread. See Honbo *et al.* (*Sabouraudia* 22: 209, 1984; relationship to *Cladosporium carrionii*), Kwon-Chung *et al.* (*J. Med. Vet. Mycol.* 27: 413, 1989; taxonomy of *C. trichoides*), Yegres & Richard-Yegres in Miyaji (Ed.) (*Current problems of opportunistic fungal infections*: 12, 1989; epidemiology of *C. carrionii*), Sekhon *et al.* (*Europ. J. Epidemiol.* 8: 387, 1992; cerebral phaeohyphomycosis by *C. bantiana*), Kawasaki *et al.* (*Mycopathologia* 124: 149, 1993; molecular epidemiology of *C. carrionii*), Braun & Feiler (*Microbiol. Res.* 150: 81, 1995; key, n. sp. and comb.), Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 2: 493, 1998; relationship to *Fusicladium*, *Phaeoramularia* and *Pseudocladosporium*), Haase *et al.* (*Stud. Mycol.* 43: 80, 1999; phylogenetic posn.), Abliz *et al.* (*J. Clin. Microbiol.* 42: 404, 2004; molecular diagnostics), Guillot *et al.* (*J. Clin. Microbiol.* 42: 4901, 2004; from dog), Levin *et al.* (*J. Clin. Microbiol.* 42: 4374, 2004; review of medical lit.), Crous *et al.* (*Stud. Mycol.* 58: 185, 2007; phylogeny), Davey & Currah (*MR* 111: 106, 2007; key, from bryophytes), de Hoog *et al.* (*Stud. Mycol.* 58: 219, 2007; phylogeny, pathogenicity).
- Cladophytum** Leidy (1849) nom. dub., ? *Fungi*. 1, USA.
- Cladoporus** (Pers.) Chevall. (1826) nom. rej. = *Laetiporus* fide Donk (*Persoonia* 1: 173, 1960; based on an abnormal polypore).
- Cladopsis** Nyl. (1885) = *Pyrenopsis* fide Henssen (*Lichenologist* 21: 101, 1989).
- Cladopycnidium** H. Magn. (1940) = *Lecidea* fide Hertel (*Ergebn. Forsch. Unternehmens Nepal Himalaya* 6: 145, 1977).
- Cladoriella** Crous (2006), anamorphic *Dothideomycetes*. 1, S. Africa. See Crous (*Stud. Mycol.* 55: 56, 2006).
- Cladorrhinum** Sacc. & Marchal (1885), anamorphic *Apiosordaria*, *Cercophora*, Hso.0eH.15. 6, widespread. See Domsch *et al.* (*Compendium of soil fungi*, 1980), Mouchacca & Gams (*Mycotaxon* 48: 415, 1993; key), Chopin *et al.* (*J. Med. Vet. Mycol.* 35: 53, 1997; keratomycosis).
- Cladosarum** E. Yuill & J.L. Yuill (1938) ? = *Aspergillus* fide Raper & Fennell (*The genus Aspergillus*, 1965).
- Cladosphaera** Dumort. (1822), ? *Pezizomycotina*. 1, Europe.
- Cladosphaeria** Nitschke ex Jacz. (1894) = *Cryptosphaeria* Ces. & De Not. fide Petrak (*Sydowia* 15: 186, 1962).
- Cladosporiaceae** Nann. (1934) = *Davidiellaceae*.
- Cladosporiella** Deighton (1965), anamorphic *Pezizomycotina*, Hso. $\equiv$ eP.3. 1, Malaysia. See Deighton (*Mycol. Pap.* 101: 34, 1965), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003).
- Cladosporites** Félix (1894), *Fossil Fungi*. 3 (Tertiary), Europe; USA.
- Cladosporium** Link (1816), anamorphic *Davidiella*, Hso. $\equiv$ eP.3. c. 150, widespread. *C. herbarum* is ubiquitous and generally saprobic. Medical species are now included in *Cladophialophora*. See de Vries (*Contribution to the knowledge of the genus Cladosporium Link ex Fr.*, 1952; [reprint 1967]), Yamamoto (*Sci. Rep. Hyogo Univ. Agr.* 4: 1, 1959; spp. from Japan), Ellis (*DH*, 1971), Ellis (*MDH*, 1976), Latgé *et al.* (*J. Microbiol.* 34: 1325, 1988; wall ultrastr. *C. cladosporioides*), Morgan-Jones & McKemy (*Mycotaxon* 39: 185, 1990; taxonomy of *C. uredinicola*), McKemy & Morgan-Jones (*Mycotaxon* 41: 135, 1991; taxonomy of *C. chlorocephalum*), McKemy & Morgan-Jones (*Mycotaxon* 41: 397, 1991; taxonomy of *C. oxysporum*), McKemy & Morgan-Jones (*Mycotaxon* 43: 163, 1992; taxonomy of *C. cucumerinum*), Morgan-Jones & McKemy (*Mycotaxon* 43: 9, 1992; taxonomy of *C. vignae*), David (*Mycol. Pap.* 172, 1997; subgen. *Heterosporium*), Ho *et al.* (*Mycotaxon* 72: 115, 1999; key), Crous *et al.* (*Stud. Mycol.* 45: 107, 2000; review), Crous *et al.* (*Mycol.* 93: 1081, 2001; phylogeny), Wirsal *et al.* (*Fungal Genetics Biol.* 35: 99, 2002; molecular ecology), Braun *et al.* (*Mycol. Progr.* 2: 3, 2003; phylogeny, teleomorph), Dugan *et al.* (*Schlechtendalia* 11, 2004; checklist), Park *et al.* (*Mycotaxon* 89: 441, 2004; indoor environment), Schubert & Braun (*Sydowia* 56: 296, 2004; morphology), Heuchert *et al.* (*Schlechtendalia* 13, 2005; fungicolous taxa), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny), Crous *et al.* (*Stud. Mycol.* 58: 33, 2007; phylogeny, definition), Crous *et al.* (*Stud. Mycol.* 58: 1, 2007; phylogeny), Schubert *et al.* (*Stud. Mycol.* 58: 105, 2007; morphology, biodiversity), Zalar *et al.* (*Stud. Mycol.* 58: 157, 2007; *C. sphaerospermum* complex).
- Cladosporothyrium** Katum. (1984) = *Zelopelta* fide Sutton (*in litt.*).
- Cladostigma** Pat. (1892), ? *Exobasidiales*. 1, Ecuador. See Petch (*TBMS* 8: 212, 1923), Seifert (*TBMS* 85: 123, 1985), Seifert & Bandoni (*Sydowia* 53: 156, 2001).
- Cladotrichum** Corda (1831) = *Oedemium* fide Hughes (*CJB* 36: 727, 1958).

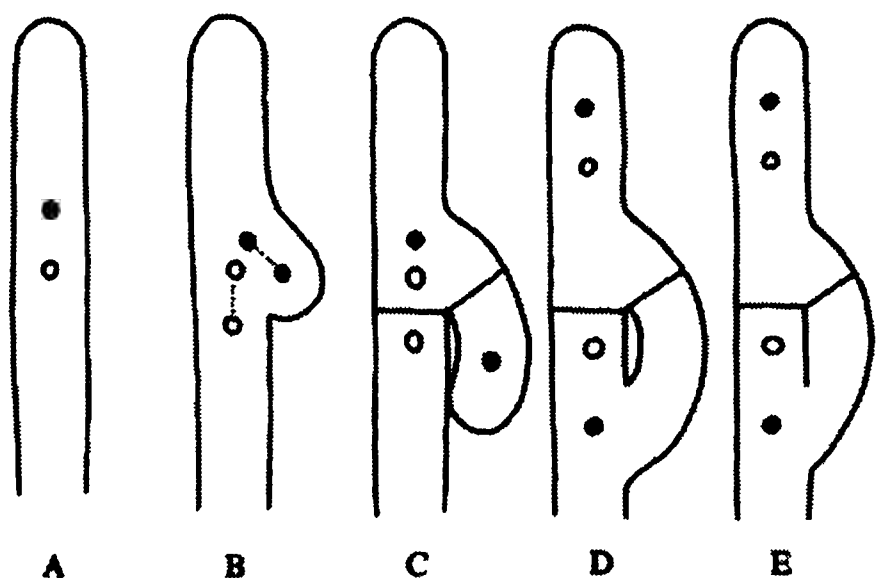


Fig. 11. Clamp connexion formation (diagrammatic). A, dikaryotic hyphal apex; simultaneous nuclear division and formation of a backwardly directed lateral branch into which one of the daughter nuclei passes; C, formation of two cross-walls cutting off an apical cell which contains two compatible nuclei, and a lateral branch with a single nucleus; D, fusion of lateral branch with subapical cell which then becomes dikaryotic; E, final stage.

clamp-connexion (-connection, **clamp**, **clamp-cell**) (of basidiomycetes), a hyphal outgrowth which, at cell division, makes a connection between the resulting two cells by fusion with the lower; buckle; nodose septum; by-pass hypha (Fig. 11).

Clarkeinda Kuntze (1891), Agaricaceae. 5, widespread. See Pegler (*J. Linn. Soc. Bot.* 91: 245, 1985; key).

Classicula R. Bauer, Begerow, Oberw. & Marvanová (2003), Classiculaceae. Anamorph *Naiadella*. 1, Germany. See Bauer *et al.* (*Mycol.* 95: 757, 2003).

Classiculaceae R. Bauer, Begerow, Oberw. & Marvanová (2003), Classiculales. 2 gen., 2 spp.

Lit.: Bauer *et al.* (*Mycol.* 95: 757, 2003).

Classiculales R. Bauer, Begerow, Oberw. & Marvanová (2003). Classiculomycetes. 1 fam., 2 gen., 2 spp. Fam.:

Classiculaceae.

For *Lit.* see under fam.

Classiculomycetes R. Bauer, Begerow, J.P. Samp., M. Weiss & Oberw. (2006), Pucciniomycotina. 1 ord., 1 fam., 2 gen., 2 spp. Ord.:

Classiculales

For *Lit.* see ord. and fam.

Classification. The assigning of objects to defined categories; taxonomy. The application of scientific names to the categories into which fungi may be placed and the relative order of those categories is governed by an internationally agreed code (see Nomenclature). The rank of **species** is basic (code Art. 2), but as yet there is no universally applicable definition of species (q.v.). There is fairly general agreement on the ranks to be used for the main infraspecific ranks (although taxa based on pathogenic, physiological, or biochemical characters present difficulties), and on ranks above species from genus to order. Above order, and particularly above class there is more diversity in usage, not least because the code's rules of priority do not apply above family. In the example in Table 3, group-name endings in heavy type are those authorized for fungi in the *Code* (Arts 16-19). The relative order of the various ranks must not be altered

(Art. 5) or the names become invalid (Art. 33.5; an exception is made in Art. 33.6 for wrong use of 'tribe' within a genus by Fries in the *Systema mycologicum*, 1821-32). Additional ranks may be intercalated or added, 'provided confusion or error is not thereby introduced' (Art. 4.3).

There is particular instability in the use of ranks above order, and different authors prefer to use or avoid particular categories. 'Division' is peculiar to the code governing fungi, but from 1993 'phylum', familiar to zoologists, was authorized as an alternative which could be used in its place, and this has been used by mycologists (see Kingdoms of fungi). Above the rank of kingdom, additional categories justified by evidence from molecular phylogeny (q.v.) are becoming necessary, 'domain' now being the most widely used.

Different suffixes are available for the terminations of higher taxonomic categories according to whether the code of nomenclature in used, and further under the code governing fungi according to whether the names are considered to be of fungi or algae (i.e. '-phyta' not '-mycota' as the phylum termination; '-phyceae' not '-mycetes' for class names; for consistency in this *Dictionary*, and to clearly indicate where phyla are ones traditionally studied by mycologists, the fungal termination has been retained throughout. This also has the practical advantage of keeping phylum names the same regardless of the kingdom in which they are placed.

It is important to note that not all available ranks are used for particular fungi, and there is an increasing tendency for mycologists not to use ranks between the principal ones, or below subspecies.

The rank of special form (q.v.; Art. 4) is available to mycologists wishing to separate morphologically identical fungi by host reactions. Special forms are not regulated by the Code, nor are notations for physiologic races (q.v.) designated by numbers by agreement between interested mycologists.

Any characters judged to represent significant discontinuities, whether biological, morphological, ultrastructural, or molecular, can be used in classifications. Particular emphasis is placed on reproductive structures, ultrastructure, and molecular evidence at levels above family.

Practice as regards the typography of scientific names has varied in different nations. The codes all rule that species names should be differentiated, and *italic* is usually employed, but practice at the family level and above has been inconsistent. The current code governing fungi (Greuter *et al.*, *Regnum Veg.* 138, 2000) uses *italic* for all scientific names regardless of rank (e.g. *Fungi*, *Ascomycota*, *Lecanorales*, *Russulaceae*).

See Chemotaxonomy, Cladistics, Kingdoms of fungi, Nomenclature, Phylogeny, Species.

Clasterisporium orthographic variant; see *Clasterosporium*.

Clasteropycnis Bat. & Cavalc. (1963), anamorphic *Pezizomycotina*, Cpd.0eP.?. 1, Brazil. See Batista & Cavalcanti (*Quad. Lab. crittogam.*, *Pavia* 31: 69, 1963)

Clasterosphaeria Sivan. (1984), Magnaporthaceae. Anamorph *Clasterosporium*. 1, Malaysia. See Sivanesan (*TBMS* 83: 710, 1984).

Clasterosporiaceae Nann. (1934) = Magnaporthaceae.

TABLE 3. Principal, secondary and some other ranks in the nomenclatural hierarchy (botanical).

Domain	<i>Eukaryota</i>
Kingdom	<i>Fungi</i>
Subkingdom	†
Phylum	<i>Basidiomycota</i>
Subphylum	† <i>-mycotina</i>
Class	<i>Teliomycetes</i>
Subclass	† <i>-mycetidae</i>
Order	<i>Uredinales</i>
Suborder	† <i>-ineae</i>
Family	<i>Pucciniaceae</i>
Subfamily	† <i>-oideae</i>
Tribe	<i>Puccinieae</i>
Subtribe	† <i>-inae</i>
Genus	<i>Puccinia</i>
Subgenus	<i>Puccinia</i>
Section	(<i>Hetero-Puccinia</i>)
Subsection	†
Series	†
Subseries	†
Species	<i>Puccinia graminis</i>
Subspecies	<i>Puccinia graminis</i> subsp. <i>graminis</i>
Variety	<i>P. graminis</i> var. <i>stackmanii</i>
Subvariety	†
Form	†
Subform	†
Special form	§ <i>Puccinia graminis</i> f.sp. <i>avenae</i>
Physiologic Race	<i>P. graminis</i> f.sp. <i>avenae</i> Race 1
Individual	†

† Not necessary for this example.
§ See text.

Clasterosporites Pia (1927), Fossil Fungi. 1 (Eocene), Europe.

Clasterosporium Schwein. (1832), anamorphic *Clasterosphaeria*, Hso.≡ eP.1/19. 10 (mostly on *Cyperaceae*), widespread. Also used for anamorphs of *Asterinaceae*. See Ellis (*Mycol. Pap.* 70, 1958; key), Sutton *et al.* (*Pl. Path.* 43: 1066, 1994; *C. flexum* on *Chamaecyparis*), Taylor & Crous (*MR* 104: 618, 2000), Hosagoudar (*Zoos' Print Journal* 19: 1437, 2004).

Clathraceae Chevall. (1826) = Phallaceae.
Lit.: Dring (*Kew Bull.* 35: 1, 1980; monogr.).

clathrate (clathroid), like a network; latticed.

Clathrella E. Fisch. (1898) = *Clathrus* fide Dring (*Kew Bull.* 35: 1, 1980).

Clathridium, see *Clethridium*.

Clathrina Müll. Arg. (1883) = *Cladia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Clathrococcum Höhn. (1911) ? = *Epicoccum* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Clathroconium Samson & H.C. Evans (1982), anamorphic *Pezizomycotina*, Hso.0≡ hP.10. 1 (on *Arachnida*), Ghana. See Samson & Evans (*CJB* 60: 1577, 1982), Samson *et al.* (*Atlas of Entomopathogenic Fungi*: 187 pp., 1988).

Clathrogaster Petri (1900), *Hysterangiaceae*. 2, Borneo.

Clathroporina Müll. Arg. (1882) = *Porina* Müll. Arg. fide McCarthy (*Lichenologist* 27: 321, 1995), McCarthy & Malcolm (*Nova Hedwigia* 62: 543, 1996), McCarthy & Malcolm (*Lichenologist* 29: 1,

1997), Lücking & Vezda (*Willdenowia* 28: 181, 1998; foliicolous spp.).

Clathroporinopsis M. Choisy (1929) ? = *Topelia* fide Hafellner & Kalb (*Biblthca Lichenol.* 57: 161, 1995), McCarthy (*Taxon* 45: 533, 1996; synonymy with *Porina*).

Clathrosphaera Zalewski (1888) nom. conf., anamorphic *Pezizomycotina*. See *Clathrosphaerina*. See van Beverwijk (*TBMS* 34: 280, 1951).

Clathrosphaerina Beverw. (1951), anamorphic *Hyaloscypha*, Hso.0bP.1. 1 (conidia hollow, net-like), Europe. See Beverwijk (*TBMS* 34: 289, 1951), Goos (*Mycol.* 79: 1, 1987; review).

Clathrospora Rabenh. (1857) nom. rej., *Pleosporaceae*. Anamorph *Alternaria*-like. 5, widespread. See Shoemaker & Babcock (*CJB* 70: 1617, 1992), Kruys *et al.* (*MR* 110: 527, 2006; posn).

Clathrosporium Nawawi & Kuthub. (1987), anamorphic *Helotiales*, Hso.#eP.1. 1 (aero-aquatic, conidia hollow, net-like), Malaysia. See Nawawi & Kuthubutheen (*TBMS* 89: 408, 1987), Hennebert (*CJB* 76: 1596, 1998), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).

Clathrotrichum Pat. (1921) = *Beniowskia* fide Mason (*Mycol. Pap.* 2: 27, 1928).

Clathrus P. Micheli ex L. (1753), *Phallaceae*. c. 16, widespread (subtropical; tropical). See Burk (*Mycotaxon* 8: 463, 1979), Dring (*Kew Bull.* 35: 1, 1980).

Claudopus Gillet (1876) = *Entoloma* fide Kuyper (*in litt.*).

Clauxia D. Hawksw. (1988), ? *Candelariaceae* (L.). 1, Europe. See Hawksworth (*SA* 7: 65, 1988).

- Clausaria** Nyl. (1861) = *Pertusaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Claussenomyces** Kirschst. (1923), Helotiaceae. Anamorph *Dendrostilbella*. 19, widespread. See Iturriaga (*Mycotaxon* 42: 327, 1991), Gamundí & Gaiotti (*N.Z. Jl Bot.* 33: 515, 1995), Verkley (*MR* 99: 187, 1995; asci), Gamundí & Romero (*Fl. criptog. Tierra del Fuego* 10, 1998), Medardi (*Czech Mycol.* 59: 101, 2007; review).
- Claustula** K.M. Curtis (1926), Claustulaceae. 1, New Zealand. See Buchanan & May (*N.Z. Jl Bot.* 41: 407, 2003; conservation).
- Claustulaceae** G. Cunn. (1931), Phallales. 4 gen., 10 spp.
- Clautriavia** (Pat.) Lloyd (1909) = *Phallus* fide Stalpers (*in litt*).
- Clauzadea** Hafellner & Bellem. (1984), ? Porpidiaceae (L). 4, Europe. See Hafellner & Bellemère (*Nova Hedwigia* Beih. 79: 319, 1984), Pietschmann (*Nova Hedwigia* 51: 521, 1990; asci), Meyer (*Sendtnera* 8: 85, 2002; monogr.), Buschbom & Mueller (*Mol. Phylogen. Evol.* 32: 66, 2004; phylogeny).
- Clauzadeana** Cl. Roux (1984), Lecanoraceae (L). 1, widespread. See Roux (*Bull. Soc. linn. Provence* 35: 101, 1983).
- Clauzadella** Nav.-Ros. & Cl. Roux (1996), Verrucariaceae (L). 1, France. See Navarro-Rosinés & Roux (*CJB* 74: 1533, 1996).
- Clauzadeomyces** Diederich (1994), anamorphic *Pezizomycotina*, Hso.???. 1 (lichenicolous), Belgium. See Diederich (*Bull. Soc. linn. Provence* 45: 418, 1994).
- clava**, a club-like fruiting structure, e.g. of *Cordyceps*.
- clavacin**, see patulin.
- Clavaria** Vaill. ex L. (1753) nom. cons., Clavariaceae. 28, widespread. See Corner (*Ann. Bot. Mem.* [A monograph of *Clavaria* and allied genera] 1, 1950), Donk (*Reinwardtia* 2: 441, 1954), Pine *et al.* (*Mycol.* 91: 944, 1999; phylogeny), Dentinger & McLaughlin (*Mycol.* 98: 746, 2006; phylogeny) sensu Linnaeus = *Clavariadelphus* fide.
- Clavariaceae** Chevall. (1826), Agaricales. 7 gen. (+ 8 syn.), 120 spp.
Lit.: Coker (*The Clavarias of the United States and Canada* [reprint, 1973], 1923; review), Corner (*Ann. Bot. Mem.* [A monograph of *Clavaria* and allied genera] 1, 1950), Corner (*Ann. Bot. Mem.* [A monograph of *Clavaria* and allied genera] 1: 1, 1950), Donk (*Reinwardtia* 1, 1951; gen. names), Corner (*Ann. Bot. Mem.* [A monograph of *Clavaria* and allied genera, addenda] 16, 1952), Corner (*TBMS* [A monograph of *Clavaria* and allied genera, addenda] 35: 285, 1952), Corner (*Ann. Bot. Mem.* [A monograph of *Clavaria* and allied genera, addenda] 17, 1953), Pilát (*Acta Mus. Nat. Prag.* 14B: 129, 1958; European spp.), Thind (*The Clavariaceae of India*, 1961; 15 gen., 92 spp.; keys), Donk (*Persoonia* 3: 199, 1964), Henry (*Ann. Carnegie Mus.* 39: 125, 1967; keys 30 spp. W. Penn.), Petersen (*TBMS* 50: 641, 1967; fam. interrelationships), Petersen (*Sydowia* 21: 105, 1968), Corner (*Beih. Nova Hedwigia* 33: 1, 1970), Petersen (*Friesia* 9: 369, 1971; type studies of *Clavaria* and *Clavulinopsis*), Pilát (*Sborn. národ. muz. Praze* 27B: 113, 1971; former Czechoslovakia), Berthier (*Bibliotheca Mycol.* 98, 1976; world monogr.), Maas Geesteranus (*De fungi van Nederland Die Clavaroide fungi. Auriscalpiaceae, Clavariaceae, Clavulinaceae, Gomphaceae* [Wetensch. Med. KNVV 113], 1976), Pegler & Young (*TBMS* 84: 207, 1985), Thind & Sharda (*Kavaka* 14: 9, 1986), Petersen (*Bull. N.Z. Dept. Sci. Industr. Res., Pl. Dis. Div.* [The clavarioid fungi of New Zealand] 263: 143, 1988), Petersen (*Mycosystema* 2: 159, 1989), Villarreal & Pérez-Moreno (*Micol. Neotrop. Aplic.* 4: 119, 1991), Rodríguez-Armas *et al.* (*Docums Mycol.* 22: 21, 1992), Pine *et al.* (*Mycol.* 91: 944, 1999), Dentinger & McLaughlin (*Mycol.* 98: 746, 2006), García-Sandoval *et al.* (*Mycotaxon* 94: 265, 2005).
- Clavariachaeta** Lloyd (1922) nom. nud. ≡ *Clavariachaete*.
- Clavariachaete** Corner (1950), Hymenochaetaceae. 2, America (tropical). See Corner (*Ann. Bot. Mem.* [A monograph of *Clavaria* and allied genera] 1: 268, 1950).
- Clavariadelphaceae** Corner (1970), Gomphales. 2 gen. (+ 1 syn.), 26 spp.
- Clavariadelphus** Donk (1933), Clavariadelphaceae. 19, widespread (temperate). See Wells & Kempton (*Mich. Bot.* 7: 35, 1968; key N. Am. spp.), Methven (*Mycotaxon* 34: 153, 1989; N. Am. spp.).
- Clavariana** Nawawi (1976), anamorphic *Pezizomycotina*, Hso.1bH.10. 1 (aquatic), widespread. See Nawawi (*TBMS* 67: 217, 1976), Marvanová (*Tropical Mycology*: 169, 1997), Descals (*MR* 109: 545, 2005).
- Clavarichaetaceae** Jülich (1982) = Hymenochaetaceae.
- Clavariella** P. Karst. (1881) = *Ramaria* Fr. ex Bonord. fide Corner (*Ann. Bot. Mem.* [A monograph of *Clavaria* and allied genera] 1, 1950).
- Clavariopsis** De Wild. (1895), anamorphic *Pleospores*, Hso.1bH.1. 2, widespread. See Petersen (*Mycol.* 55: 21, 1963; key), Nawawi (*TBMS* 88: 428, 1987; Malaysia), Belliveau & Bärlocher (*MR* 109: 1407, 2005; phylogeny).
- Clavariopsis** Holterm. (1898) ≡ *Holtermannia*.
- Clavascidium** Breuss (1996), Verrucariaceae (L). 4, widespread. See Breuss (*Annl. naturh. Mus. Wien* Ser. B, Bot. Zool. 98: 41, 1996), Gueidan *et al.* (*MR* 111: 1145, 2007; phylogeny).
- Clavascina** Beneš (1961), Fossil Fungi. 1 (Carboniferous), former Czechoslovakia.
- clavate** (1) club-like; narrowing in the direction of the base; (2) (of stipes of agarics), narrowing to the apex (Fig. 23.16). Cf. obclavate. See also clava.
- clavatin**, see patulin.
- Clavatisporella** K.D. Hyde (1995), ? Hyponectriaceae. 1, Irian Jaya.
- Clavatospora** Sv. Nilsson ex Marvanová & Sv. Nilsson (1971), anamorphic *Corollospora*, Hso.1bH.1. 3 (aquatic), widespread. See Marvanová & Nilsson (*TBMS* 57: 531, 1971), Chen (*Fungal Science Taipei* 15: 47, 2000), Campbell *et al.* (*Fungal Diversity Res. Ser.* 7: 15, 2002; phylogeny), Descals (*MR* 109: 545, 2005).
- Claviceps** Tul. (1853), Clavicipitaceae. Anamorph *Sphacelia*. 41 (mainly on *Poaceae*, rarely *Cyperaceae*), widespread. See Ergot, Poisonous fungi. See Brady (*Lloydia* 25: 1, 1962; hosts), Loveless (*TBMS* 47: 205, 1964; identification from honey dew), Tanda (*J. Agric. Sci., Tokyo* 5: 85, 1981; vars.), Taber in Demain & Solomon (Eds) (*Biology of industrial microorganisms*: 449, 1985; review biology), Düvell (*Bibliotheca Mycol.* 126, 1989; linear plasmid), Smit (*Bibliotheca Mycol.* 143, 1992; transformation), Kulda *et al.* (*Mycol.* 89: 431, 1997; DNA), Anon. in Kren &

- Cvak (Eds) (*Ergot. The Genus Claviceps. Medicinal and Aromatic Plants Industrial Profiles* 6, 1999), Pažoutová *et al.* (*Pl. Dis.* 84: 437, 2000; genetic diversity), Scott *et al.* (*Lett. Appl. Microbiol.* 31: 95, 2000; DNA extraction), Tooley *et al.* (*Phytopathology* 90: 1126, 2000; population biology), White *et al.* (*Stud. Mycol.* 45: 95, 2000), Pažoutová (*MR* 105: 275, 2001; phylogeny), Tooley *et al.* (*Mycol.* 93: 541, 2001; on sorghum), Tsukiboshi *et al.* (*JARQ Japan Agricultural Research Quarterly* 35: 221, 2001; on sorghum), Tooley *et al.* (*Pl. Dis.* 86: 1247, 2002; population biology), Alderman (*Mycology Series* 19: 195, 2003; speciation), Pažoutová (*Mycology Series* 19: 329, 2003; evolutionary strategy), Alderman *et al.* (*Pl. Dis.* 88: 63, 2004; USA), Pažoutová *et al.* (*MR* 108: 126, 2004; pleomorphism), Walker (*Australas. Pl. Path.* 33: 211, 2004; Australia), Fisher *et al.* (*Can. J. Pl. Path.* 27: 389, 2005; diagnostics), Fisher *et al.* (*MR* 109: 439, 2005; diversity in *C. purpurea*), Pažoutová & Frederickson (*Pl. Path.* 54: 749, 2005; genetic diversity), Muthusubramanian *et al.* (*MR* 110: 452, 2006; infraspecific variation), Tooley *et al.* (*MR* 110: 441, 2006; India), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny), van der Linde & Wehner (*Mycol.* 99: 586, 2007; S Africa).
- Clavicipitaceae** O.E. Erikss. (1982), Hypocreales. 43 gen. (+ 28 syn.), 321 spp.
- Lit.*: Doguet (*BSMF* 76: 171, 1960; status), Kobayasi & Shimizu (*Iconography of Vegetable Wasps and Plant Worms*): 280 pp., 1983), Koval' (*Klavitsipitalnyie Grib SSSR*, 1984), Rykard *et al.* (*Mycol.* 76: 1095, 1984; conidiomata), Jones & Clay (*CJB* 65: 1027, 1987; ascus ontogeny), Clay (*Ecology* 69: 10, 1988), Samson *et al.* (*Atlas of Entomopathogenic Fungi*: 61, 1988), Samson *et al.* (*Atlas of Entomopathogenic Fungi*: 187 pp., 1988), Rehner & Samuels (*CJB* 73: S265, 1991), Schardl *et al.* (*Pl. Syst. Evol.* 178: 27, 1991; coevolution of endophytes and teleomorphs with hosts), Morgan-Jones *et al.* (*Mycotaxon* 43: 401, 1992; *Balansieae*), Hywel-Jones & Evans (*MR* 97: 871, 1993), Spatafora & Blackwell (*Mycol.* 85: 912, 1993; DNA), Glenn *et al.* (*Mycol.* 88: 369, 1996), Hodge *et al.* (*Mycol.* 88: 715, 1996), Bacon & Hill (*Neotyphodium/Grass Interactions*, 1997), Glenn & Bacon (*Neotyphodium/Grass Interactions Proceedings of the Third International Symposium on Acremonium/Grass Interactions, held May 28-31, 1997, in Athens, Georgia*: 53, 1997), Tzean *et al.* (*Atlas of Entomopathogenic Fungi from Taiwan*, 1997), Bacon & White (*Microbial Endophytes*, 2000), Bacon & White (*Microbial Endophytes*: 600 pp., 2000), White *et al.* (*Microbial Endophytes*: 49, 2000), White *et al.* (*Stud. Mycol.* 45: 95, 2000), Pažoutová *et al.* (*MR* 108: 126, 2004), Rehner & Buckley (*Mycol.* 97: 84, 2005), Stensrud *et al.* (*MR* 109: 41, 2005), Spatafora *et al.* (*Mol. Ecol.* 16: 1701, 2007), Sung *et al.* (*Stud. Mycol.* 57: 1, 2007; phylogeny, monogr.), Sung *et al.* (*Mol. Phylogenet. Evol.* 44: 1204, 2007; phylogeny).
- Clavicipitales** Nannf. (1932) = Hypocreales.
- Clavicornia** Doty (1947), Auriscalpiaceae. 10, widespread. See Dodd (*Mycol.* 64: 746, 1972; key), Lickey *et al.* (*Sydowia* 55: 181, 2003; phylogeny).
- Clavicornaceae** Corner (1970) = Auriscalpiaceae.
- Clavicybe** Harmaja (2002) = Ampulloclitocybe.
- Clavidisculum** Kirschst. (1938) = *Cistella* fide Svrček (*Česká Mykol.* 41: 193, 1987), Raitviir (*Scripta Mycol.* 20, 2004).
- claviformin**, see patulin.
- clavine alkaloids**, a group of ergoline alkaloids occurring in *Claviceps sclerotia*; also synthesized by *Aspergillus fumigatus* and *Penicillium chermesinum*. See agroclavine, ergoline alkaloids, ergot.
- Clavispora** Rodr. Mir. (1979), Metschnikowiaceae. Anamorph *Candida*. 2, widespread. See Lachance *et al.* (*Int. J. Syst. Bacteriol.* 36: 524, 1986), Hendriks *et al.* (*Syst. Appl. Microbiol.* 15: 98, 1992), Kurtzman in Hawksworth (Ed.) (*Ascomycete Systematics. Problems and Perspectives in the Nineties NATO ASI Series* vol. 269 269: 363, 1994), Lachance & Phaff in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 148, 1998), Lachance *et al.* (*FEMS Yeast Res.* 4: 253, 2003; genetic variation), Arabatzis *et al.* (*Medical Mycology* 42: 27, 2004; molecular delimitation of clinical strains), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Clavocephalis** Bainier (1882) = *Syncephalis* fide Kirk (*in litt.*).
- Clavochytridium** Couch & H.T. Cox (1939) = *Blastocladiella* fide Couch & Whiffen (*Am. J. Bot.* 29: 582, 1942).
- Clavogaster** Henn. (1896), ? Agaricaceae. 1, New Zealand. See Hennings (*Hedwigia* 35: 303, 1896).
- Clavomphalia** E. Horak (1987), Tricholomataceae. 1, China. See Horak (*TMSJ* 28: 176, 1987).
- Clavularia** P. Karst. (1882) = *Cornucopiella* fide Seifert (*TBMS* 85: 123, 1985).
- clavulate**, somewhat club-like.
- Clavulicium** Boidin (1957), Clavulinaceae. 4, widespread. See Dentinger & McLaughlin (*Mycol.* 98: 746, 2006; phylogeny).
- Clavulina** J. Schröt. (1888), Clavulinaceae. c. 40, widespread. See Corner (*Ann. Bot. Mem.* [A monograph of Clavaria and allied genera] 1, 1950), Petersen (*Mycol.* 59: 39, 1967), Dentinger & McLaughlin (*Mycol.* 98: 746, 2006; phylogeny).
- Clavulinaceae** Donk (1970), Cantharellales. 4 gen. (+ 1 syn.), 59 spp.
- Lit.*: Coker (*The Clavarias of the United States and Canada* [reprint, 1973], 1923), Corner (*Ann. Bot. Mem.* [A monograph of Clavaria and allied genera] 1, 1950), Corner (*TBMS* [A monograph of Clavaria and allied genera, addenda] 35: 285, 1952), Pilát (*Acta Mus. Nat. Prag.* 14B: 129, 1958; European spp.), Thind (*The Clavariaceae of India*, 1961; 15 gen., 92 spp.; keys), Donk (*Persoonia* 3: 199, 1964), Henry (*Ann. Carnegie Mus.* 39: 125, 1967; keys 30 spp. W. Penn.), Petersen (*TBMS* 50: 641, 1967; fam. interrelationships), Maas Geesteranus (*De fungi van Nederland Die Clavaroide fungi. Auriscalpiaceae, Clavariaceae, Clavulinaceae, Gomphaceae* [Wetensch. Med. KVV 113], 1976), Petersen (*Mycol.* 77: 903, 1985), Corner (*Aust. J. Bot.* 34: 103, 1986), Petersen (*Bull. N.Z. Dept. Sci. Industr. Res., Pl. Dis. Div.* 263: 143, 1988), Corner (*A monograph of Clavaria and allied genera, addenda* [Ann. Bot., Lond. N.S.] 16, 1989), Corner (*A monograph of Clavaria and allied genera, addenda* [Ann. Bot., Lond. N.S.] 17, 1991), Pine *et al.* (*Mycol.* 91: 944, 1999), Villegas *et al.* (*Mycotaxon* 70: 127, 1999), Henkel *et al.* (*Mycol. Progr.* 4: 343, 2005), Koide *et al.* (*New Phytol.* 165: 305, 2005).
- Clavulinopsis** Overeem (1923), Clavariaceae. 33, widespread. See Petersen (*Mycol. Mem.* 2, 1968; key 10 N. Am. spp.), Petersen (*Mycol.* 70: 660, 1978), Dentinger & McLaughlin (*Mycol.* 98: 746, 2006;

- phylogeny) = *Clavaria* (Clavar.) fide.
- clavus**, the sclerotium of ergot (obsol.).
- Cleidiomyces**, see *Kleidiomyces*.
- Cleistobombardia** J.H. Mirza (1968) = *Tripterosporella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- cleistocarp**, see *cleistothecium*.
- Cleistocystis** Sousa da Câmara (1931), anamorphic *Pezizomycotina*, Cpd.0eH.?. 1, Portugal.
- Cleistoiodophanus** J.L. Bezerra & Kimbr. (1976), *Pezizaceae*. 1, USA.
- Cleistonium** Speer (1986), anamorphic *Glonium*, St.0eH.?. 1, Brazil. See Speer (*BSMF* 102: 104, 1986).
- Cleistophoma** Petr. & Syd. (1927), anamorphic *Pezizomycotina*, Cpd.0eH.?. 2, N. America; Europe. See Sutton (*Mycol. Pap.* 141, 1977), Aa & Vanev (*A Revision of the Species Described in Phyllosticta*, 2002).
- Cleistosoma** Harkn. (1884) = *Emericella* fide Peek & Solheim (*Mycol.* 50: 844, 1959).
- Cleistosphaera** Syd. & P. Syd. (1916), *Parodiopsidaceae*. 1, S. America.
- Cleistotheca** Zukal (1893) = *Pleospora* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- cleistothecium**, a closed fruitbody having no predefined opening; in ascomycota with asci not regularly arranged, e.g. an ascoma of *Thielavia*. cf. *chasmothecium*.
- Cleistothecopsis** F. Stevens & E.Y. True (1919) = *Pleospora* fide Clements & Shear (*Gen. Fung.*, 1931).
- Cleistothelebolus** Malloch & Cain (1971), *Pezizomycotina*. 1 (coprophilous), Canada. See van Brummelen in Hawksworth (Ed.) (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. 269 269: 400, 1994), van Brummelen (*Persoonia* 16: 425, 1998; posn).
- Clelandia** Trappe (1979) [non *Clelandia* J.M. Black 1932, *Violaceae*] = *Mycoclelandia*.
- Clematomyces** Thaxt. (1900), *Laboulbeniaceae*. 4 or 5, Asia; west Africa. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- Cleptomyces** Arthur (1918), *Pucciniaceae*. 1 (on *Leguminosae* or *Verbenaceae*), S. America. See Thirumalachar (*Mycol.* 52: 688, 1961; syn. of *Stereostroma*), Lindquist (*Royas de la Republica Argentina y zonas limitrofes, Series Coleccion Cientifica no. 20*, 1982).
- Clethria**, see *Cletria*.
- Clethridium** (Sacc.) Sacc. (1895) = *Discostroma* fide Holm (*Taxon* 24: 475, 1975), Brockmann (*Sydowia* 28: 275, 1976), Kang *et al.* (*MR* 103: 53, 1999).
- Cletria** P. Browne (1756) = *Clathrus* fide Stalpers (*in litt.*).
- Clibanites** (P. Karst.) P. Karst. (1871), ? *Bionectriaceae*. 1 (on rotten wood), Finland. See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Climacocystis** Kotl. & Pouzar (1958), *Fomitopsidaceae*. 1, widespread (north temperate). See Ryvarden & Gilbertson (*Europ. Polyp.* 1: 208, 1993).
- Climacodon** P. Karst. (1881), *Phanerochaetaceae*. 6, widespread. See Candoussau (*Bulletin de la Société Mycologique du Béarn* 104: 3, 1998).
- Climacodontaceae** Jülich (1982) = *Meruliaceae*.
- Climate change**. There is widespread agreement among scientists that Earth's climate is changing as a result of human activity. The impacts of this change, which is towards global warming, cannot yet be predicted accurately, but concern has been expressed about anticipated mass extinctions of animal and plant species. To date, the impact on fungi, their response, and the impact of that response on humanity, have only just begun to be considered: public and political awareness remains very low. If mass extinctions also occur in the fungi as a result of climate change, many will be unrecorded, as so few of the world's fungal species are known (see Numbers of fungi). There is already some evidence that fruiting periods have changed for north-temperate macrofungi. As with animals and plants, the geographical distributions of fungi may move in response to climate change, but at present accessible distributional information is inadequate and there are no agreed criteria for determining whether fungi appearing in new areas are invasives or refugees. The implications for agriculture and forestry, through potential spread of crop diseases, have been largely overlooked. Not enough is known about how fungi will respond to temperature changes, nor about what impact that will have on, for example, the carbon cycle, although Dighton (2003) provides a scholarly introduction to this impending debate. Some habitats are more clearly threatened by global warming than others, and fungi known to occur only in those habitats (nivicolous myxomycetes, other alpine or arctic fungi, specialist mangrove swamp fungi etc.) can confidently be evaluated as under threat. For the rest, the current state of knowledge is rudimentary.
- Lit.*: Aptroot & Herk (*Environmental pollution* 146: 293, 2007; effect of global warming on lichen-forming fungi with *Trentepohlia* phycobionts), Blaustein & Dobson (*Nature* 439: 143, 2006; role of *Batrachochytrium dendrobatidis* and climate change in amphibian decline, reviewed in *MR* 110: 752, 2006), Dighton (*Fungi in ecosystem processes*, 2003), Gange *et al.* (*Science* 316: 71, 2007; changes in fungal fruiting patterns as evidence of climate change), Mattock *et al.* (*British Wildlife* 18: 267, 2007; changes in fruiting patterns of spring fungi as evidence of climate change).
- Clinoconidium** Pat. (1898), *Cryptobasidiaceae*. 2 (on *Lauraceae*), C. & S. America. See Malençon (*BSMF* 69: 94, 1953), Begerow *et al.* (*Frontiers in Basidiomycote Mycology*: 81, 2004).
- Clinotrichum** Cooke (1871) = *Acladium* fide Kendrick & Carmichae in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 390, 1973).
- Clintamra** Cordas & Durán (1977), *Clintamraceae*. 1 (on *Nolina* (*Liliaceae*)), N. America. See Vánky (*Fungal Diversity* 6: 131, 2001).
- Clintamraceae** Vánky (2001), *Ustilaginales*. 1 gen., 1 spp.
- Lit.*: Cordas & Durán (*Mycol.* 68: 1239, 1976), Durán (*Ustilaginales of Mexico. Taxonomy, Symptomatology, Spore Germination and Basidial Cytology*: 331 pp., 1987), Vánky (*Cryptog. Stud.* 1: 159 pp., 1987), Vánky (*Trans. Mycol. Soc. Japan* 32: 381, 1991), Vánky (*MR* 102: 513, 1998), Vánky (*Fungal Diversity* 6: 131, 2001).
- Clinterium** Fr. (1849) = *Topospora* fide Groves (*CJB* 43: 1195, 1965).
- Clintoniella** (Sacc.) Rehm (1900) = *Hypomyces* fide Rogerson (*Mycol.* 62: 865, 1970), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Cliostomum** Fr. (1825), *Ramalinaceae* (L.). 7, Europe; N. America. See Gowan (*Mycol.* 82: 766, 1990; key

- 4 N. Am. spp.), Ekman (*Symb. bot. upsal.* 32 no. 1: 17, 1997), Ekman (*MR* 105: 783, 2001; phylogeny).
- Clisosporium** Fr. (1819) nom. rej. = *Coniothyrium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Clistosoma** Clem. & Shear (1931) ≡ *Cleistosoma*.
- Clithramia** Nag Raj (1988), anamorphic *Pezizomycotina*, St.1eP.1. 1 (on *Oryza*), India. See Nag Raj (*CJB* 66: 903, 1988).
- Clithris** (Fr.) Bonord. (1851) = *Cenangium* fide Minter (*in litt.*).
- Clitocybe** (Fr.) Staude (1857), *Tricholomataceae*. c. 300, widespread (esp. north temperate). *C. augeana* (frequently but incorrectly as *C. dealbata*), a mushroom-bed contaminant. The genus is polyphyletic and several segregate genera have recently been recognised. See Harmaja (*Karstenia* 10: 5, 1969; key 43 spp. Finland), Singer (*Sydowia* 31: 199, 1979; key 202 spp.), Bigelow (*Beih. Nova Hedwigia* 72, 1982), Bigelow (*Beih. Nova Hedwigia* 81, 1985; N. Am. spp.), Moncalvo *et al.* (*Syst. Biol.* 49: 278, 2000; probably non-monophyletic), Harmaja (*Ann. bot. fenn.* 40: 213, 2003), Lachapelle (*Revue du Cercle de Mycologie de Bruxelles* 3: 17, 2003; key Europ. spp.), Mata & Petersen (*Mycotaxon* 86: 303, 2003; type studies of neotropical spp.).
- Clitocybula** (Singer) Singer ex Métrod (1952), *Marasmiaceae*. c. 15, widespread (temperate). See Singer (*Sydowia* 31: 233, 1979; key).
- Clitopilina** Arnaud (1952) nom. nud., *Xenasmataceae*.
- Clitopiloidea** (Romagn.) Largent (1994) = *Entoloma* fide Kuyper (*in litt.*).
- Clitopilopsis** Maire (1937) = *Rhodocybe* fide Singer (*Am. midl. Nat.* 37: 527, 1946).
- Clitopilus** (Fr. ex Rabenh.) P. Kumm. (1871), *Entolomataceae*. c. 30, widespread (north temperate). *C. passeckerianus*, a mushroom-bed contaminant. See Ware (*Gdnrs' Chron.* 97: 325, 1935), Singer (*Sydowia* 31: 235, 1979; key), Baroni *et al.* (*Fungal Diversity* 6: 13, 2001; Thailand), Legon & Roberts (*Mycologist* 16: 114, 2002; Brit. sp.) See cat's ear.
- Clohesyomyces** K.D. Hyde (1993), anamorphic *Pezizomycotina*, Cpd.0eH.1. 1 (aquatic), Australia. See Hyde (*Aust. Syst. Bot.* 6: 170, 1993).
- Clohiesia** K.D. Hyde (1995), *Sordariales*. 2, Australia. See Hyde (*Nova Hedwigia* 61: 119, 1995; similarities with *Clypeosphaeriaceae*), Réblová & Winka (*Mycol.* 93: 478, 2001), Untereiner *et al.* (*CJB* 79: 321, 2001; phylogeny).
- Clonophoromyces** Thaxt. (1931), *Laboulbeniaceae*. 1, West Indies; Japan. See Terada & Tavares (*TMSJ* 34: 357, 1993; Japan).
- Clonostachyopsis** Höhn. (1907) = *Clonostachys* fide Clements & Shear (*Gen. Fung.*, 1931), Schroers (*Stud. Mycol.* 46: 1, 2001).
- Clonostachys** Corda (1839), anamorphic *Bionectriaceae*, Hso.0eH.15. 48, widespread (esp. Europe). See Hawksworth & Punithalingam (*TBMS* 64: 89, 1975), Schroers *et al.* (*Mycol.* 91: 365, 1999), Schroers (*Stud. Mycol.* 45: 63, 2000; phylogeny), Schroers (*Stud. Mycol.* 46: 1, 2001; monogr.).
- Closteroleurosporia** Grigoraki (1924) ≡ *Microsporum*.
- closterospore** (in dermatology), a multinucleate phragmospore, as in *Trichophyton* (obsol.).
- Closterosporia** Grigoraki (1924) = *Microsporum* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Closterosporium** Sacc. (1883), anamorphic *Melanomma*, Cac.≡ eP.?. 1, Europe.
- club fungi**, the *Clavariaceae*.
- club root**, a disease of crucifers (*Plasmodiophora brassicae*), see *Plasmodiophora*.
- cluster-cup**, see *aecium*.
- clypeate**, having a clypeus.
- Clypeispora** A.W. Ramaley (1991), anamorphic *Mycosphaerella*, Cpd.0eH.1. 1, USA. See Ramaley (*Mycotaxon* 40: 13, 1991).
- Clypeocarpus** Kirschst. (1941) = *Mazzantia* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Clypeoceriospora** Sousa da Câmara (1946), *Pezizomycotina*. 1, Europe.
- Clypeochorella** Petr. (1923), anamorphic *Pezizomycotina*, St.0eH.?. 1, Europe.
- Clypeococcum** D. Hawksw. (1977), *Dacampiaceae*. 7 (on lichens), Europe; N. America. See Hawksworth (*J. Linn. Soc. Bot.* 75: 196, 1977).
- Clypeodiplodina** F. Stevens (1927) = *Ascochytulina* fide Clements & Shear (*Gen. Fung.*, 1931).
- Clypeolaria** Tratt. (1825) nom. dub., *Fungi*. See Rudolphi (*Linnaea* 4: 395, 1829; det. as *Insecta*).
- Clypeolella** Höhn. (1910) = *Schiffnerula* fide Hughes (*CJB* 62: 2213, 1984), Hughes *in* Sugiyama (Ed.) (*Pleomorphic Fungi: The Diversity and its Taxonomic Implications*: 103, 1987), Hosagoudar (*Zoos' Print Journal* 18: 1071, 2003).
- Clypeolina** Speg. (1923) ≡ *Clypeolopsis*.
- Clypeolina** Theiss. (1918), *Micropeltidaceae*. 1, Brazil.
- Clypeolinopsis** Bat. (1959) ? = *Stomiopeltis* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Clypeolopsis** F. Stevens & Manter (1925) ? = *Stomiopeltis* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Clypeolum** Speg. (1881), *Pezizomycotina*. 8, widespread (tropical). See Batista (*Publções Inst. Micol. Recife* 56, 1959), Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962; synonymy with *Porina*).
- Clypeomyces** Kirschst. (1935) nom. dub., *Fungi*. See Petrak (*Sydowia* 1: 61, 1947).
- Clypeopatella** Petr. (1942), anamorphic *Pezizomycotina*, St.0eH.?. 1, Rhodes.
- Clypeophialophora** Bat. & Peres (1962), anamorphic *Pezizomycotina*, St.0eH.?. 1, Brazil. See Batista & Peres (*Publções Inst. Micol. Recife* 358: 8, 1962).
- Clypeophysalospora** H.J. Swart (1981), *Clypeosphaeriaceae*. 1 (from dead leaves), Australia. See Kang *et al.* (*Mycoscience* 40: 151, 1999).
- Clypeoporthella** Höhn. (1919), *Valsaceae*. Anamorph *Phaeocytostroma*. 4 (grass culms), widespread (tropical). See Sivanesan & Waller (*Phytopath. Pap.* 29, 1986), Barr (*Mycotaxon* 41: 287, 1991).
- Clypeoporthella** Petr. (1924), ? *Diaporthaceae*. Anamorph *Phomopsis*. 2, Europe; N. America. See Barr (*Mycol. Mem.* 7, 1978).
- Clypeopycnis** Petr. (1925), anamorphic *Pezizomycotina*, Cpd.0eH.15. 3, widespread. See Sutton & Pascoe (*Stud. Mycol.* 31: 177, 1989), Priest (*Fungi of Australia: Septoria* 0, 2006).
- Clypeopyrenis** Aptroot (1991), *Pyrenulaceae* (L.). 1, C. & S. America. See Aptroot (*Biblhca Lichenol.* 44: 40, 1991), Aptroot *et al.* (*Biblhca Lichenol.* 97, 2008; Costa Rica).
- Clypeorhynchus** Kirschst. (1936) = *Diaporthe* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1,

- 1954).
- Clypeoseptoria** F. Stevens & P.A. Young (1925), anamorphic *Pezizomycotina*, St.0fH.?. 3, Hawaii; Brazil. See Ciferri & Batista (*Atti Ist. bot. Univ. Lab. Crittog. Pavia* sér. 5 14: 53, 1957).
- Clypeosphaeria** Fuckel (1870), *Clypeosphaeriaceae*. 31 (dead wood and bark), widespread. See Barr (*SA* 8: 1, 1989), Hyde *et al.* (*Sydowia* 50: 21, 1998), Kang *et al.* (*Mycoscience* 40: 151, 1999), Tsui *et al.* (*Mycol.* 93: 1002, 2001; Hong Kong), Jeewon *et al.* (*MR* 107: 1392, 2003; phylogeny).
- Clypeosphaeriaceae** G. Winter (1886), *Xylariales*. 8 gen. (+ 3 syn.), 49 spp.
Lit.: Barr (*SA* 8: 1, 1989), Barr (*Mycotaxon* 39: 43, 1990), Hyde *et al.* (*Sydowia* 50: 21, 1998), Kang *et al.* (*Fungal Diversity* 1: 147, 1998), Kang *et al.* (*Mycoscience* 40: 151, 1999; broad concept probably polyphyletic), Jeewon *et al.* (*MR* 107: 1392, 2003).
- Clypeosphaerulina** Sousa da Câmara (1939), *Pezizomycotina*. 1, Portugal.
- Clypeostagonospora** Punith. (1981), anamorphic *Pezizomycotina*, St.≡ eH.1. 1, USA. See Punithalingam (*Nova Hedwigia* 34: 67, 1981).
- Clypeostigma** Höhn. (1919) = *Phyllachora* Nitschke ex Fuckel (1870) fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Clypeostroma** Theiss. & Syd. (1914), *Dothideomycetes*. 2, Australasia. See von Arx & Müller (*Stud. Mycol.* 9, 1975), Johnston (*N.Z. Jl Bot.* 40: 265, 2002; revision).
- Clypeothecium** Petr. (1922) = *Exarmidium* fide Barr & Boise (*Mycotaxon* 23: 233, 1985), Aptroot (*Nova Hedwigia* 66: 89, 1998).
- Clypeotrabutia** Seaver & Chardón (1926) = *Phyllachora* Nitschke ex Fuckel (1870) fide Cannon (*Mycol. Pap.* 163, 1991).
- Clypeum** Masee (1896) = *Parmularia* Lév. fide Batista & Vital (*Atas Inst. Micol. Univ. Recife* 1, 1960).
- Clypeus** (Britzelm.) Fayod (1889) = *Inocybe* fide Mus-sat (*Syll. fung.* 15, 1901).
- clypeus**, a shield-like stromatic growth, with or without host tissue, over one or more ascomata or conidio-mata.
- CMA**, see *Media*.
- CMI**, see *IMI*.
- Cnazonaria** Corda (1829) = *Typhula* fide Berthier (*Bull. mens. Soc. linn. Lyon Num. Spéc.* 46, 1976).
- co-** (prefix), together.
- coacervate**, massed (heaped), together.
- coadnate**, united, cohering, connate.
- coalescent**, joined together.
- coarctate**, crushed together, crowded, constricted.
- Coccidiascus** Chatton (1913), ? *Eremotheciaceae*. 1 (in *Drosophila*), Europe; N. America. See Phaff in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 153, 1998), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Coccidiactyon** Oberw. (1989), *Septobasidiaceae*. 1, Spain. See Oberwinkler (*Op. bot.* 100: 188, 1989).
- Coccidioidaceae** Cif. (1932) ? = *Onygenaceae*.
- Coccidioides** G.W. Stiles (1896), anamorphic *Onygenaceae*, ?0eH.?. 3, widespread (esp. America). *C. immitis* on humans and animals (**coccidiomycosis**, coccidioidal granuloma, San Joaquin Valley Fever). See also *Uncinocarpus*. See Fiese (*Coccidioidomycosis*, 1958), Al Doory (*Mycopathologia* 46: 113, 1972; bibliogr.), Sigler & Carmichael (*Mycotaxon* 4: 458, 1976; *Malbranchea* state), Stevens (*Coccidioidomy-*
- cosis. A text*, 1980), Szaniszlo *et al.* in Howard (Ed.) (*Fungi pathogenic for man and animals* Part A, Biology, 1983; life cycle, dimorphism), Pan *et al.* (*Microbiology* 140: 1481, 1994; syst. posn), Kaufman *et al.* (*J. Clin. Microbiol.* 36: 3721, 1998; diagnostics in vivo), Fisher *et al.* (*Mol. Ecol.* 8: 1082, 1999; population studies), Larone *et al.* (*Manual of Clinical Microbiology*: 1259, 1999; review), Greene *et al.* (*Mycol.* 92: 406, 2000; molecular detection and identification), Fisher *et al.* (*Mycol.* 94: 73, 2002; *C. posadasii*), Sugiyama *et al.* (*Stud. Mycol.* 47: 5, 2002; phylogeny), Millar *et al.* (*J. Clin. Microbiol.* 41: 5778, 2003; molecular identification), Bialek *et al.* (*J. Clin. Microbiol.* 42: 778, 2004; molecular identification), Muñoz *et al.* (*J. Clin. Microbiol.* 42: 1247, 2004; Mexico), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny), Pounder *et al.* (*J. Clin. Microbiol.* 44: 2977, 2006; molecular identification), Umeyama *et al.* (*J. Clin. Microbiol.* 44: 1859, 2006; molecular identification), Morrow (*Mycol.* 98: 669, 2006; in Holocene bison).
- coccidioidin**, an antigen prepared from *Coccidioides immitis*, esp. for skin testing. Cf. spherulin.
- coccidiomycosis**, see *Coccidioides*; mycosis.
- Coccidiomyces** Buchner (1912), ? *Saccharomycetidae*. 1 (in *Insecta*), Germany. See Stainhaus (*Insect microbiology*, 1946).
- Coccidophthora** Syd. & P. Syd. (1913) nom. dub., *Fungi*. See Petch (*TBMS* 10: 190, 1925).
- Cocciscia** Norman (1870), ? *Dacampiaceae* (?L). 1, Scandinavia.
- Coccobolus** Wallr. (1833) = *Ceuthospora* Grev. fide Rabenhorst (*Dtschl. Krypt.-Fl.* 1: 144, 1844), Sutton (*Mycol. Pap.* 141, 1977).
- Coccobotrys** Boud. & Pat. (1900), anamorphic *Leptota*. 2, Europe; Chile. See Donk (*Taxon* 11: 82, 1962).
- Coccocarpiia** Pers. (1827), *Coccocarpiaceae* (L). 24, widespread. See Arvidsson (*Op. Bot.* 67, 1983; monogr., key), Awasthi (*Kavaka* 12: 83, 1986; Indian spp.), Marcano *et al.* (*Trop. Bryol.* 10: 215, 1995; Venezuela), Makhija *et al.* (*Trop. Bryol.* 17: 47, 1999), Miadlikowska & Lutzoni (*Am. J. Bot.* 91: 449, 2004; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Lücking *et al.* (*Bibliotheca Lichenol.* 95: 429, 2007; Costa Rica).
- Coccocarpiaceae** Henssen (1986), *Peltigerales* (L). 5 gen. (+ 5 syn.), 36 spp.
Lit.: Awasthi (*Kavaka* 13: 83, 1985), Lumbsch & Kothe (*Mycotaxon* 43: 277, 1992), Lumbsch *et al.* (*Mycotaxon* 43: 277, 1992; thallus SEM), Marcano *et al.* (*Trop. Bryol.* 10: 215, 1995), Wagner (*Bryonora* 15: 8, 1995), Makhija *et al.* (*Trop. Bryol.* 17: 47, 1999), Henssen & Tønsberg (*Bryologist* 103: 108, 2000), Ekman & Jørgensen (*CJB* 80: 625, 2002), Wedin & Wiklund (*Symb. bot. upsala.* 34 no. 1: 469, 2004), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny), Jørgensen (*Nordic Lichen Flora* 3: Cyanolichens: 12, 2007).
- Coccochora** Höhn. (1909), *Dothideales*. 1, Asia. See Bose & Müller (*Indian Phytopath.* 17: 3, 1964).
- Coccochorella** Höhn. (1910) = *Coccochora*.
- Coccochorina** Hara (1927) = *Clypeosphaeria* fide Hara (*Byogaichu-hoten*, 1948).
- Coccodiella** Hara (1910), *Phyllachoraceae*. 21 (biotrophic on leaves of *Poaceae*), widespread (tropical). See Hyde & Cannon (*Mycol. Pap.* 175: 114, 1999),

- Pearce & Hyde (*Fungal Diversity Res. Ser.* 17: 308 pp., 2006; Australia), Seixas *et al.* (*Mycol.* 99: 99, 2007; Brazil).
- Coccodiniaceae** Höhn. ex O.E. Erikss. (1981), Chaetothyriales. 5 gen. (+ 6 syn.), 18 spp.
- Lit.*: Eriksson (*Op. Bot.* 60, 1981), Reynolds (*Mycotaxon* 27: 377, 1986), Winka *et al.* (*Mycol.* 90: 822, 1998; phylogeny), Winka (*Phylogenetic Relationships Within the Ascomycota Based on 18S rDNA Sequences, Akademisk Avhandling* [Thesis (PhD), Department of Ecology and Environmental Science, Umeå University]: [91] pp., 2000), Liu & Hall (*Proc. natn Acad. Sci. U.S.A.* 101: 4507, 2004), Crous *et al.* (*Stud. Mycol.* 58: 1, 2007; morphology).
- Coccodinium** A. Massal. (1860), Coccodiniaceae. 2, Europe. See Eriksson (*Op. Bot.* 60, 1981), Winka *et al.* (*Mycol.* 90: 822, 1998; phylogeny), Crous *et al.* (*Stud. Mycol.* 58: 1, 2007; morphology).
- Coccodiscus** Henn. (1904) = Coccoidea fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Coccodothella** Theiss. & Syd. (1915) = Coccoidella fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Coccodothis** Theiss. & Syd. (1914), Parmulariaceae. 2, America. See Petrak (*Sydowia* 8: 291, 1954), Butin & Marmolejo (*Rev. Mex. Micol.* 4: 9, 1988), Marmolejo & Butin (*MR* 101: 1515, 1997).
- Coccogloeum** Petr. (1955), anamorphic *Pezizomycotina*, Cac.0eH.?. 1, Austria. See Petrak (*Sydowia* 9: 588, 1955).
- Coccoidea** Henn. (1900), Coccoideaceae. 2, Japan; India; C. America. See Eriksson (*Op. Bot.* 60, 1981), Inácio & Cannon (*Fungal Diversity* 9: 71, 2002).
- Coccoideaceae** Henn. ex Sacc. & D. Sacc. (1905), ? Dothideales. 3 gen. (+ 4 syn.), 10 spp.
- Lit.*: Eriksson (*Op. Bot.* 60, 1981), Sivanesan (*TBMS* 89: 265, 1987), Yuan *et al.* (*Mycotaxon* 60: 175, 1996), Inácio & Cannon (*Fungal Diversity* 9: 71, 2002).
- Coccoidella** Höhn. (1909), ? Coccoideaceae. Anamorph *Colletogloeum*-like. 7, America (tropical); Australia. See Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962), Sivanesan (*TBMS* 89: 265, 1987; posn), Yuan *et al.* (*Mycotaxon* 60: 175, 1996; Australia), Inácio & Cannon (*Fungal Diversity* 9: 71, 2002).
- Coccoidiopsis** Hara (1913) = Coccoidella fide Müller & von Arx in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 87, 1973), Cannon (*SA* 11: 168, 1993).
- Cocomycella** Höhn. (1917) = Cocomyces fide Sherwood (*Occ. Pap. Farlow Herb. Crypt. Bot.* 15, 1980).
- Cocomyces** De Not. (1847), Rhytismataceae. 116, widespread. See Sherwood (*Occ. Pap. Farlow Herb. Crypt. Bot.* 15, 1980; monogr., key), Cannon & Minter (*Mycol. Pap.* 155, 1986; India), Johnston (*N.Z. Jl Bot.* 24: 89, 1986; key 19 spp., NZ), Spooner (*Kew Bull.* 45: 451, 1990; key 11 spp., Sabah), Johnston (*Mycotaxon* 52: 221, 1994; ascospores), Johnston (*Aust. Syst. Bot.* 13: 199, 2000; Australia), Lin *et al.* (*Mycosystema* 20: 1, 2001; China), Hou *et al.* (*CJB* 83: 37, 2005; China), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Cocomycetella** Höhn. (1917), Odontotremataceae. 1, Europe. See Sherwood-Pike (*Mycotaxon* 28: 137, 1987).
- Cocconia** Sacc. (1889), Parmulariaceae. 6, widespread (tropical). See Hansford (*Mycol. Pap.* 15, 1946), Batista & Vital (*Atas Inst. Micol. Univ. Recife* 1: 167, 1960), Inácio & Cannon (*Fungal Diversity* 9: 71, 2002).
- Cocconiopsis** G. Arnaud (1918) = Cyclostomella fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Coccopeziza** Har. & P. Karst. (1890) = Arthonia fide Sherwood (*Mycotaxon* 6: 215, 1977).
- Coccophacidium** Rehm (1888) = Therrya fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).
- Coccophysium** Link (1833) nom. dub., ? Fungi.
- Coccopleum** Ehrenb. (1818) = Sclerotium fide Fries (*Syst. Mycol.* 2: 256, 1823).
- Coccospora** Kudo (1925), Microsporidia. 1.
- Coccosporella** P. Karst. (1893) = Mycogone fide Hughes (*CJB* 36: 727, 1958).
- Coccosporium** Corda (1831) nom. rej., anamorphic *Pezizomycotina*. See Hughes (*CJB* 36: 752, 1958), Holubová-Jechová (*Sydowia* 46: 240, 1994; ? = *Corynespora* (*Corynesporasc.*)).
- Coccostroma** Theiss. & Syd. (1914) = Coccodiella fide Hyde & Cannon (*Mycol. Pap.* 175, 1999; typification).
- Coccostromella** Petr. (1968), ? Dothideales. 1, widespread (tropical). See Petrak (*Sydowia* 21: 267, 1967).
- Coccostromopsis** Plunkett (1924) = Coccodiella fide Hyde & Cannon (*Mycol. Pap.* 175, 1999).
- Coccotrema** Müll. Arg. (1888), Coccotremataceae (L.). 19, widespread. See Brodo (*Bryologist* 76: 260, 1973; N. Am. spp.), Messuti (*N.Z. Jl Bot.* 34: 57, 1996; S. Am.), Lumbsch *et al.* (*Organ. Divers. Evol.* 1: 99, 2001; posn), Schmitt *et al.* (*Lichenologist* 33: 315, 2001; generic limits), Messuti (*Mycotaxon* 82: 429, 2002; S America), Messuti (*Biblthca Lichenol.* 86: 129, 2003), Schmitt *et al.* (*J. Hattori bot. Lab.* 100: 753, 2006; phylogeny).
- Coccotremataceae** Henssen ex J.C. David & D. Hawksw. (1991), Pertusariales (L.). 2 gen. (+ 3 syn.), 20 spp.
- Lit.*: Brodo (*Bryologist* 76: 260, 1973), Henssen in Brown *et al.* (Eds) (*Lichenology: progress and problems*: 107, 1976; ontogeny), Galloway & Watson-Gandy (*Bryologist* 95: 227, 1992), Messuti (*N.Z. Jl Bot.* 34: 57, 1996), Schmitt *et al.* (*Lichenologist* 33: 315, 2001), Schmitt *et al.* (*J. Hattori bot. Lab.* 100: 753, 2006; phylogeny).
- Coccotrichum** Link (1824) = Botrytis fide Saccardo (*Syll. fung.* 4: 120, 1886), Hughes (*CJB* 36: 727, 1958; accepted genus).
- Coccularia** Corda (1829) nom. dub., anamorphic *Pezizomycotina*. Rejected by Fries (*Summ. veg. scand.*: 522, 1849).
- coccus**, a spherical bacterium.
- Cochlearia** (Cooke) Lambotte (1888) [non *Cochlearia* L. 1753, *Cruciferae*] = Otidea fide Eckblad (*Nytt Mag. Bot.* 15: 1, 1968).
- cochleariform**, spoon-like in form.
- cochleate**, shell-like in form; twisted like a shell.
- cochliobolin**, see ophiobolin.
- Cochliobolus** Drechsler (1934), Pleosporaceae. Anamorphs *Bipolaris*, *Curvularia*. 22, widespread. Important plant pathogens include: *C. heterostrophus* (anamorph *Bipolaris maydis*; leaf spot of maize), *C. miyabeanus* (anamorph *B. oryzae*; brown spot of rice), *C. sativus* (anamorph *B. sorokiniana*, spot blotch and root rot of temperate cereals), *C. victoriae* (anamorph *B. victoriae*; foot rot of cereals); see victorin. See Sivanesan (*Mycol. Pap.* 158: 261 pp.,

- 1987), Raguchander *et al.* (*Plant Pathology Newsletter* 6: 45, 1990; on triticales), Lakshmanan *et al.* (*Z. PflKrankh. PflPath. PflSchutz* 98: 185, 1991; biocontrol), Panaccione *et al.* (*Phytopathology* 81: 1156, 1991; *tox* genes), Fetch *et al.* (*Phytopathology* 82: 1101, 1992; on *Hordeum*), Simcox *et al.* (*Phytopathology* 82: 621, 1992; isoenzymes), Tzeng *et al.* (*Genetics Bethesda* 130: 81, 1992; population structure), Clay *et al.* (*Protoplasma* 178: 34, 1994; appressoria), Jones & Dunkle (*Molecular Plant-Microbe Interactions* 8: 476, 1995; virulence genes), Scheffer & Walton (*Helminthosporia Metabolites, Biology, Plant Diseases Bipolaris, Drechslera, Exserohilum*: 61, 1995; toxigenic spp.), Gafur *et al.* (*Mycoscience* 38: 455, 1997; mating types), Christiansen *et al.* (*MR* 102: 919, 1998; mating types), Shimizu *et al.* (*J. gen. appl. Microbiol.* Tokyo 44: 251, 1998; phylogeny), Turgeon & Berbee (*Molecular Genetics of Host-Specific Toxins in Plant Disease*: 153, 1998; pathogenesis), Berbee *et al.* (*Mycol.* 91: 964, 1999; phylogeny), Zhong & Steffenson (*Phytopathology* 91: 469, 2001; virulence), Gafur *et al.* (*Mycobiology* 31: 19, 2003; Indonesia), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Cochliomyces** Speg. (1912), Euceratomycetaceae. 2, C. & S. America. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- Cochlonema** Drechsler (1935), Cochlonemataceae. 18, widespread. See Drechsler (*Mycol.* 27: 185, 1935), Drechsler (*Mycol.* 29: 229, 1937), Drechsler (*Mycol.* 31: 128, 1939), Drechsler (*Mycol.* 31: 388, 1939), Drechsler (*Mycol.* 33: 248, 1941), Drechsler (*Mycol.* 34: 274, 1942), Drechsler (*Mycol.* 37: 1, 1945), Drechsler (*Mycol.* 38: 120, 1946), Drechsler (*Mycol.* 43: 161, 1951), Drechsler (*Mycol.* 47: 364, 1955), Drechsler (*Mycol.* 51: 787, 1959), Jones (*TBMS* 42: 75, 1959; Kenya), Jones (*TBMS* 45: 348, 1962; UK), Miura (*J. Jap. Bot.* 47: 204, 1972; Japan), Dyal (*Sydowia* 27: 293, 1976; keys parasites of nematodes and amoebae, bibliogr.), Saikawa & Sato (*Mycol.* 83: 403, 1991; ultrastr.), Michel & Wylezich (*Mikrokosmos* 94: 75, 2005; biology), Koehsler *et al.* (*Mycol.* 99: 215, 2007; EM, phylogeny).
- Cochlonemataceae** Dudd. (1974), Zoopagales. 6 gen., 33 spp.
Lit.: Dyal (*Sydowia* 27: 293, 1976; keys parasites of nematodes and amoebae, bibliogr.), Saikawa & Saito (*TBMS* 87: 337, 1986), Saikawa & Sato (*Mycol.* 83: 403, 1991), Saikawa & Katsurashima (*Mycol.* 85: 24, 1993), Saikawa & Aoki (*Nova Hedwigia* 60: 571, 1995), Tanabe *et al.* (*Mol. Phylogen. Evol.* 16: 253, 2000), Barron (*Biodiversity of Fungi Inventory and Monitoring Methods*: 435, 2004).
- Cocoicola** K.D. Hyde (1995), Phaeochoraceae. 5 (palm leaves), widespread (tropical). See Hyde & Cannon (*Mycol. Pap.* 175, 1999).
- Codinaea** Maire (1937), anamorphic *Chaetosphaeria*. See Gamundi *et al.* (*Darwiniana* 21: 96, 1977), Kuthubutheen & Nawawi (*MR* 95: 1224, 1991), Samuels *et al.* (*Mycol.* 89: 156, 1997; teleomorph).
- Codinaeopsis** Morgan-Jones (1976), anamorphic *Chaetosphaeriaceae*, Hso.0eH.16. 1, N. America; Japan. See Morgan-Jones (*Mycotaxon* 4: 166, 1976), Arambarri & Cabello (*Mycotaxon* 38: 11, 1990), Réblová (*Stud. Mycol.* 45: 149, 2000; review), Réblová & Winka (*Mycol.* 92: 939, 2000; phylogeny).
- Codonmyces** Calat. & Etayo (1999), anamorphic *Pezizomycotina*. 1, Spain. See Calatayud & Etayo (*Lichenologist* 31: 594, 1999).
- Coeloanguillospora** Dyko & B. Sutton (1978) = *Filospora* fide Dyko & Sutton (*Mycotaxon* 7: 323, 1978).
- Coelocaulon** Link (1833) = *Cetraria* fide Aptroot (*in litt.*), Kantvilas (*Flora of Australia* 55: 36, 1994; Australia).
- Coelographium** (Sacc.) Gäum. (1920), anamorphic *Pezizomycotina*, Hsy.0eP.?. 1, Europe.
- Coelomomyces** Keilin (1921), Coelomomycetaceae. *c.* 70 (in *Insecta*), widespread. See Couch (*J. Elisha Mitchell scient. Soc.* 61: 124, 1945), Couch & Dodge (*J. Elisha Mitchell scient. Soc.* 63: 69, 1947), Laird (*Can. J. Zool.* 37: 781, 1959; key), Sparrow (*Aquatic Phycomycetes* Edn 2: 638, 1960; keys), Laird (*J. Elisha Mitchell scient. Soc.* 78: 132, 1962), Anon. in Couch & Bland (Eds) (*The genus Coelomomyces*, 1988), Scholte *et al.* (*J. Insect Sci.* 4: 19, 2004).
- Coelomomycetaceae** Couch ex Couch (1962), Blastocladales. 2 gen. (+ 1 syn.), 71 spp.
Lit.: Weiser & Žižka (*Česká Mykol.* 28: 227, 1975) See also *Lit.* under *Coelomomyces*, Whisler *et al.* (*Proc. natn Acad. Sci. U.S.A.* 72: 693, 1975), Couch & Bland (*The genus Coelomomyces*: 399 pp., 1985), Scholte *et al.* (*J. Insect Sci.* 4: 1943, 2004).
- Coelomorum** Paulet (1793) = *Helvella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Coelomyces**, see *Coelomomyces*.
- Coelomycetes** (obsol.). Widespr., saprobic or parasitic on higher plants, fungi, lichens, vertebrates, also recovered from the widest range of ecological niches. 1000 gen. (+ 500 syn.), 7000 spp. The term 'coelomycetes' merely indicates that conidia are formed within a cavity lined by fungal or fungal/host tissue. The range of conidiogenous events is more limited than in hyphomycetes (q.v.), but solitary, 'phialidic', and 'annellidic' types predominate, and 'tretic' and 'basauxic' are absent. See Anamorphic fungi. For modern reassessments of coelomycete systematics see Sutton (*in Ainsworth et al.* (Eds), *The Fungi* 4A: 513, 1973), Nag Raj (*in Cole & Kendrick* (Eds), *Biology of conidial fungi* 1: 43, 1981), Nag Raj (*Coelomycetous anamorphs with appendage-bearing conidia*, 1993).
Lit.: Höhnelt (*Mykol. Unters.* 1: 301-369, 1923; classification), Grove (*British stem- and leaf- fungi* 1 & 2, 1935, 1937), Petch (*TBMS* 26: 53-70, 1943; *British Nectrioideae*), Sutton (*Coelomycetes* I - VII, *Mycol. Pap.* 1961-1981; VI, 1977, generic names proposed for *Coelomycetes*), Nag Raj *et al.* (*Icones generum coelomycetum* I-XIII, 1972-1982), Nag Raj *et al.* (*CJB* 49-67; *Genera coelomycetum* I-XXVIII), Mathur (*The Coelomycetes of India*, 1979), Kendrick (*The whole fungus*, 1979), Michaelides *et al.* (*Icones generum coelomycetum* suppl.), Sutton (*The Coelomycetes*, 1980), Nag Raj (*in Cole & Kendrick, Biology of conidial fungi*: 43-84, 1981). See also under Mitosporic fungi.
- This artificial class has been traditionally separated into three orders, Sphaeropsidales, characterized by pycnidial conidiomata, *Melanconiales* with acervular conidiomata, and *Pycnothyriales* with pycnothyrial conidiomata. An alternative system for anamorphic fungi as a whole (now obsol.) was suggested by Sutton (1980) where differences in conidiogenesis were used for separation of taxa at the class, subclass and ordinal levels with conidiomatal structure used at the subordinal level. The traditional separation is:

(1) **Melanconiales** (fams. Melanconiaceae, Stilbosporaceae, Coryneaceae - see Sutton, 1973 for discussion for family names). Mycelium is within the host or substratum. Conidiogenous events are various. Conidiomata are subcuticular, epidermal, subepidermal, peridermal or subperidermal and the conidiogenous layer is formed within the substratum. Dehiscence is by rupture of the overlying tissues and conidial masses may be dry or slimy. Conidiomata become erumpent at maturity and grade into sporodochial conidiomata (tuberculariaceous hyphomycetes). In culture such fungi cannot be distinguished from many hyphomycetes.

Lit.: von Arx (*A revision of the fungi classified as Gloeosporium*, 1970), Guba (*Monograph of Monochaetia and Pestalotia*, 1961), Vassiljevsky & Karakulin (*Fungi imperfecti parasitici*, Pt. II. Melanconiales, 1950).

(2) **Sphaeropsidales** (Phomales, Phyllostictales; fams. Sphaerioidaceae, Nectrioidaceae, Leptostromataceae, Excipulaceae, Discellaceae, Asbolisiaceae etc. - see Sutton, 1973 for discussion of family names). Mycelium may be immersed in the substratum or superficial. Conidia may be dry or slimy and conidiogenous events are various. Conidiomata are superficial, semi-immersed or immersed with the conidiogenous layer lining the walls of the locule(s). Diversity in conidiomatal structure is considerable in terms of tissue composition (see tissue types), number and arrangement of locules, relationship to the substrata and type of dehiscence (see Sutton, 1980; Nag Raj, 1981, for the range of variation).

Lit.: Allescher (*Rabenh. Krypt.-Fl.* 1 (6-7), 1900-03), Diedicke (*Krypt.-Fl. Mk Brandenb.* 9 (7), 1914), Petrak & Sydow (*Beih. Rep. spec. nov. regni veg.* 42, 1927; *Macrophoma* and its segregates), Bender (*The Fungi Imperfecti: Order Sphaeropsidales*, 1933), Biga *et al.* (*Sydowia* 12, 1959; *Coniothyrium*), Byzova *et al.* (*Flora Sporovyk rast. Kazak.* 5, 1970), Punithalingam (*Studies on Sphaeropsidales in culture* I-III, *Mycol. Pap.* 1970-81).

(3) **Pycnothyriales** (fams. Pycnothyriaceae, Microthyriopsidaceae, Peltopycnidiaceae, Actinothyriaceae, Actinopeltaceae, Rhizothyriaceae, Peltasteraceae, see Katumoto, 1975, for discussion of family names). Mycelium may be immersed in the substratum or superficial; when superficial it may bear hyphopodia and/or setae. Conidia are produced in several ways. Conidiomata are superficial or subcuticular, flattened, uni- or multi-locular, sometimes attached to the substratum by a central column of tissue or hypostroma, otherwise attached at the periphery; conidiogenous layer may be restricted to the upper or lower surface or occur on both; tissue structure of the pycnothyrium and nature of marginal cells are important generic criteria. Anamorphs of Dothideales.

Lit.: Naumov (*BSMF* 30: 423-432, 1915), Arnaud (*Ann. Ecol. Nat. Agr. Montp.* 16: 1-288, 1918), v. Höhnelt (*Mykol. Unters.* 1: 301-369, 1923), Tehon (*Trans. Ill. St. Acad. Sci.* 33: 63-65, 1940), Batista & Ciferri (*Mycopath. Mycol. Appl.* 11: 1-102, 1959), Katumoto (*Bull. Fac. Agr. Yamaguti Univ.* 26: 45-122, 1975).

Coelomycidium Debais. (1919), Blastocladales. 1, Europe. See Loubès & Manier (*Prototistologica* 10: 47, 1974), Weiser & Žižka (*Česká Mykol.* 28: 159, 1974), Weiser & Žižka (*Česká Mykol.* 28: 227, 1974,

1974).

Coelopogon Brusse & Kärnefelt (1991), Parmeliaceae (L.). 2, south temperate. See Brusse & Kärnefelt (*Mycotaxon* 42: 35, 1991), Thell *et al.* (*Mitteilungen aus dem Institut für Allgemeine Botanik Hamburg* 30-32: 283, 2002; phylogeny, ecology), Thell *et al.* (*Mycol. Progr.* 1: 335, 2002; phylogeny), Mattsson & Articus (*Symb. bot. upsal.* 34 no. 1: 237, 2004; phylogeny).

Coelopus Bataille (1908) = Gyroporus fide Singer (*Am. midl. Nat.* 37: 527, 1946).

Coelorhopalon Overeem (1925) = Xylaria Hill ex Schrank fide Dennis (*Mycol. Pap.* 62, 1956), Læssøe (*SA* 13: 43, 1994; ? synonym of *Xylaria*).

Coelosphaeria Sacc. (1873) = Nitschkia fide Holm (*Taxon* 24: 275, 1975).

Coelosporidium Mesnil & Marchoux (1897) nom. dub., Fungi. Protozoa or Fungi.

Coelosporium Link (1824), anamorphic *Pezizomycotina*, Hso.??, 1, Europe.

Coemansia Tiegh. & G. Le Monn. (1873), Kickxellaceae. 18, widespread. See Linder (*Farlowia* 1: 49, 1943; key), Benjamin (*Aliso* 4: 149, 1959), Chein (*Mycol.* 63: 1046, 1971), Young (*Microbios* 63: 187, 1990; ultrastr.), Kwansa *et al.* (*MR* 103: 900, 1999; isolation), Kwansa *et al.* (*MR* 103: 925, 1999; mycoparasitism), Kurihara & Tokumasu (*Memoirs of the National Science Museum Tokyo* 34: 205, 2000; Japan), Ho & Hsu (*Taiwania* 50: 22, 2005; Taiwan), James *et al.* (*Nature* 443: 818, 2006; phylogeny).

Coemansiella Sacc. (1883) = Kickxella fide Linder (*Farlowia* 1: 49, 1943).

Coemurus, see *Coeomurus*.

Coenicia Trevis. (1861) ? = Pyrenula Ach. (1809) fide Aguirre-Hudson (*Bull. Br. Mus. nat. hist. Bot.* 21: 85, 1991).

coeno- (prefix), living together, e.g. multinucleate.

Coenocarpus Fr. (1825) = Chaenocarpus Spreng.

coenocentrum (of oomycetes), a small deeply staining body at the centre of the multinucleate oosphere to which the egg-nucleus goes.

coenocyte (adj. **coenocytic**), a multinucleate mass of protoplasm; (adj., of fungi), non-cellular, in the sense of non-septate; Vuillemin (1912) used **coenocyte** for a cell usually multinucleate and **apocyte** for one temporarily or secondarily multinucleate; **coenocytium** originally used for a structure resulting from nuclear division not followed by cytoplasmic cleavage, in contrast to a **syncytium**, a multinucleate structure resulting from the fusion of several protoplasts.

coenogametes, multinucleate gametangia (q.v.) which, upon fusion, give a **coenozygote**.

Coenogoniaceae Stizenb. (1862), Ostropales. 1 gen. (+ 13 syn.), 87 spp.

Lit.: Davis (*Bryologist* 97: 186, 1994), Stocker-Worgötter (*Symbiosis* 23: 117, 1997), Lücking & Kalb (*Bot. Jb.* 122: 1, 2000), Kauff & Lutzoni (*Mol. Phylogen. Evol.* 25: 138, 2002), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Rivas Platas *et al.* (*Fungal Diversity* 23: 255, 2006).

Coenogoniomycella Cif. & Tomas. (1954) = Coenogonium Ehrenb. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Coenogoniomyces Cif. & Tomas. (1954) = Coenogonium Ehrenb. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Coenogonium Clem. (1909) = Coenogonium Ehrenb. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

- Coenogonium** Ehrenb. (1820), Coenogoniaceae (L). *c.* 87, widespread (esp. tropical). See Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952), Uyenco (*Bryologist* 66: 217, 1964; taxonomy), Uyenco (*Trans. Am. microsc. Soc.* 84: 1, 1965; *Trentepohlia*), Wang Jang (*Taiwania* 17: 40, 1972), Xavier Filho *et al.* (*Boln Soc. Bot.* II 56: 115, 1983; Brazil), Lücking & Kalb (*Bot. Jb.* 122: 1, 2000; Brazil), Malcolm (*Australasian Lichenology* 54: 19, 2004; generic limits), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Rivas Platas *et al.* (*Fungal Diversity* 23: 255, 2006; Costa Rica).
- Coenoicia** Trevis. (1861) = *Melanotheca* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Coenomyces** K.N. Deckenb. (1901), Chytridiomycota. 1 (on marine cyanobacteria), Europe; N. America.
- Coenomycogonium** Cif. & Tomas. (1954) = *Coenogonium* Ehrenb. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Coenosphaeria** Munk (1953) = *Keissleriella* fide Bose (*Phytopath. Z.* 41, 1961).
- coenozygote**, see coenogametes.
- Coeomurus** Gray (1821) nom. rej. $\equiv$ *Uromyces* fide Berndt (*in litt.*).
- Coevolution**. Reciprocal evolutionary adaptations between disparate organisms leading to their interdependence. A process widespread in fungi as about two-thirds of the spp. form intimate relationships with other organisms as commensals, mutualists, or pathogens. Most studied in pathogen-host gene-for-gene (q.v.) 'arms-races'.
- Lit.*: Cannon (*in* McKey & Sprent (Eds), *Advances in legume systematics* 5, 1994; *in* *Phyllachoraceae* and *Leguminosae*), Hedberg (Ed.) (*Symb. bot. upsal.* 22(4), 1979; parasites as taxonomists), Karatygin (*Koevolutseya gribov i rastenii*, 1993), Kenneth & Palti (*Mycol.* 76: 705, 1984; *in* *Compositae*), Pirozynski & Hawksworth (Eds) (*Coevolution of fungi with plants and animals*, 1988), Savile (*Bot. Rev.* 45: 377, 1979), Stone & Hawksworth (Eds) (*Coevolution and systematics*, 1986), Thompson (*The coevolutionary process*, 1994).
- See also ambrosia fungi, Endophytes, Fungicolous fungi, galls, Insects and fungi, Lichens, Mycorrhiza, symbiosis.
- Coilomyces** Berk. & M.A. Curtis (1853) = *Geastrum* fide Zeller (*Mycol.* 40: 649, 1948).
- Coinostelium** Syd. (1939) = *Prospodium* fide Thirumalachar & Kern (*Bull. Torrey bot. Club* 82: 102, 1955).
- Cokeromyces** Shanor (1950), Mucoraceae. 1, USA. See Shanor *et al.* (*Mycol.* 42: 271, 1950), Benny & Benjamin (*Aliso* 8: 391, 1976), McGough *et al.* (*Clin. Microbiol. Newsl.* 12: 113, 1980; mucormycosis), Jeffries & Young (*Mycol.* 75: 509, 1983; ultrastr.), Benny *et al.* (*Mycotaxon* 22: 119, 1985), Axelrod *et al.* (*J. Infect. Dis.* 155: 1062, 1987; mucormycosis), Murripalli *et al.* (*J. Clin. Microbiol.* 34: 2601, 1996; mucormycosis), O'Donnell *et al.* (*Mycol.* 93: 286, 2001; phylogeny), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny), Tanabe *et al.* (*Mol. Phylogen. Evol.* 30: 438, 2004; phylogeny), White *et al.* (*Mycol.* 98: 872, 2006; phylogeny).
- Colacogloea** Oberw. & Bandoni (1991), Heterogastriaceae. 4, widespread (north temperate). See Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 1351, 2000; mol. phylogeny), Bandoni *et al.* (*Czech Mycology* 54: 31, 2002; Canada).
- Colacosiphon** R. Kirschner, R. Bauer & Oberw. (2001), anamorphic *Cryptomycocolacaceae*. 1, Germany. See Kirschner *et al.* (*Mycol.* 93: 643, 2001), Bauer *et al.* (*Mycol.* 95: 756, 2003; ultrastr.).
- Colemaniella** Agnihothr. (1974), anamorphic *Pezizomycotina*, Hso. $\equiv$ eP.?. 1, India. See Agnihothrudu (*Journal of Coffee Research* 4: 3, 1974).
- Colensoniella** Hafellner (1979), ? Dothideales. 1, south temperate. See Hafellner (*Nova Hedwigia Beih.* 62: 160, 1979), Rosato (*Boln Soc. argent. Bot.* 30: 163, 1995; Argentina).
- Coleocarpon** Stubblef., T.N. Taylor, C.E. Mill. & G.T. Cole (1983), Fossil Fungi. 1, USA.
- Coleodictyospora** Charles (1929), anamorphic *Pezizomycotina*, Hso.#eP.1. 1, West Indies. See Mel'nik (*Mikol. Fitopatol.* 32: 32, 1998).
- Coleodictys** Clem. & Shear (1931) $\equiv$ *Coleodictyospora*.
- Coleoma** Clem. (1909) $\equiv$ *Coleopuccinia*.
- Coleomyces** Moreau & M. Moreau (1937) = *Cylindrocarpon* fide Booth (*Mycol. Pap.* 104, 1966).
- Coleonaema** Höhn. (1924), *Pezizomycotina*. See Duan *et al.* (*Fungal Diversity* 26: 187, 2007; revision).
- Coleophoma** Höhn. (1907), anamorphic *Pezizomycotina*, Cpd.0eH.15. 14, widespread. See Sutton (*The Coelomycetes*, 1980), Masilamani & Muthumary (*Acta Bot. Indica* 22: 286, 1994; ultrastr.), Masilamani & Muthumary (*MR* 99: 693, 1995; ontogeny), Wu *et al.* (*MR* 100: 943, 1996; revision), Bianchinotti & Rajchenberg (*Sydowia* 56: 217, 2004; on *Proteaceae*), Duan *et al.* (*Fungal Diversity* 26: 187, 2007; revision).
- Coleopteromyces** Ferrington, Lichtw. & López-Lastra (1999), *Legeriomycetaceae*. 1 (*in* *Scirtidae*), Brazil. See Lichtwardt *et al.* (*Mycol.* 91: 1064, 1999).
- Coleopuccinia** Pat. (1889), *Pucciniales*. 4 (*on* *Rosaceae* (III)), Japan; China. See Thirumalachar & Whitehead (*Am. J. Bot.* 41: 120, 1954), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983; syn. of *Gymnosporangium*).
- Coleopucciniella** Hara ex Hirats. (1937), *Pucciniaceae*. 2, E. Asia (esp. Japan). See Laundon (*Mycotaxon* 3: 134, 1975).
- Coleoseptoria** Petr. (1940), anamorphic *Pezizomycotina*, St.0fH.?. 1, Germany.
- Coleosperma** Ingold (1954), *Dermateaceae*. 1 (aquatic), British Isles. See Ingold (*TBMS* 37: 9, 1954), Nauta & Spooner (*Mycologist* 13: 65, 1999).
- Coleospora** Cribb (1959) nom. dub., ? Fungi.
- Coleosporiaceae** Dietel (1900), *Pucciniales*. 6 gen. (+ 5 syn.), 131 spp.
- Lit.*: Berndt (*CJB* 77: 1469, 1999), Crane (*CJB* 79: 957, 2001), Ono (*Mycoscience* 43: 421, 2002), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003), Hernández & Hennen (*Mycol.* 95: 728, 2003), Maier *et al.* (*CJB* 81: 12, 2003), Wingfield *et al.* (*Australas. Pl. Path.* 33: 327, 2004), Aime (*Mycoscience* 47: 112, 2006).
- Coleosporium** Lév. (1847), *Coleosporiaceae*. *c.* 100 (*on* *Pinus* (0, I) (*Pinaceae*); *on* dicots (asp. asterids) and some monocots (*Orchidaceae*) (II *Caeoma*-like, III)), widespread. *C. campanulae* (*on* *Campanula*), *C. senecionis* (*on* *Senecio*), *C. solidaginis* (*on* *Solidago* and *Aster*), 5 microcyclic spp. *on* *Pinus*. See Kern (*Mycol.* 20: 60, 1928; key spp. *on* *Pinus*), Laundon (*Mycotaxon* 3: 154, 1975; typification), Kaneko (*Rep. Tottori mycol. Inst.* 19: 1, 1981; keys 28 Jap. spp.), Berndt (*Sydowia* 48: 263, 1996), Mims &

Richardson (*CJB* 83: 451, 2005; ultrastr.), Aime (*Mycoscience* 47: 112, 2006).

Coleroa Rabenh. (1850), Venturiaceae. 8, widespread. See Barr (*Sydowia* 41: 25, 1989; key 3 N. Am. spp.).

Colispora Marvanová (1988), anamorphic *Pezizomycotina*, Hso.≡ eH.21. 2 (aquatic), widespread. See Marvanová (*TBMS* 90: 614, 1988), Nawawi & Kuthubutheen (*Mycotaxon* 34: 497, 1989; Malaysia), Gönczöl & Révay (*Mycotaxon* 59: 237, 1996), Descals (*MR* 109: 545, 2005; diagnostics).

collabent, falling in; collapsing.

Collacystis Kunze (1827) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).

collarette, a cup-shaped structure at the apex of a conidiogenous cell.

collariate, having a collar; see collarette.

Collarium Link (1809) nom. dub., anamorphic *Pezizomycotina*.

collarium, the ring of tissue to which the proximal ends of remote lamellae are attached as in *Marasmius* spp., etc.

collateral host, see *Pucciniales*.

Collecephalus J.A. Spencer (1972), anamorphic *Pezizomycotina*, Hso.0eH.6. 1, USA. See Spencer (*Hemerocallis J.* 26: 15, 1972).

Collection and preservation. Carefully dried specimens of many fungi retain at least their microscopic structure for many years. Their preservation in dried reference collections as research and voucher material is therefore recommended. For most taxa, it is only practicable to retain fruit-bodies in dried collections, though mycelia can be preserved as living cultures. Most fungi with fleshy fruit bodies shrink considerably on drying, and such features as colour are frequently lost. Good field notes on size, shape, colour, texture etc. are thus important, and colour photographs are valuable. Freeze-drying (lyophilization) of fleshy fungi often gives satisfactory results (Kendrick, *Mycol.* 61: 392, 1969), although the resulting specimens are fragile.

The experienced worker when making a collection gives attention to (1) conservation: ensuring that the gathering is unlikely to affect the continuing presence of the fungus in that location; (2) quality: representative material must be gathered in a range of developmental stages (including those with full-sized spores in or on the cells producing them and appearing ready for release, but also including when possible earlier and later stages); (3) amount: where possible, enough material should be collected for investigation not only by the collector but also later by others; and (4) field notes, ensuring that features which will deteriorate on drying are adequately described, and that as much information as possible is given about the location and timing of the collection (including, where possible, latitude, longitude, altitude in m above sea level and, where appropriate, aspect), abundance (not what is being counted - ascoma, basidioma etc. - the number seen - a logarithmic scale may be appropriate - the time taken to see that quantity, and whether the find was serendipitous or the result of a search - in the case of an unsuccessful search, an abundance of zero may be recorded), associated organisms (e.g. the species of plant on which the fungus occurs), the part of the organism (e.g. leaf) or other substratum, and details of the nature of any association (necrotrophic parasite etc.). Many lichens are very slow-growing, so particular care should be

taken to ensure that populations are not unduly denuded by collectors. Field observations may suffice, and necessary chemical tests can sometimes be carried out in situ. It is possible to assess the condition of immersed and stromatic microfungi in the field by cutting transversely across the fruit bodies and examining their contents preferably with a hand-lens; where spores are present the inner surface of the fruit-body is usually shiny, and the contents will swell if a drop of water is added. Collections should be placed in packets or baskets as appropriate, ensuring that fragile specimens are protected from crushing, and that there is an unambiguous link between field notes and specimen. Plastic bags are not recommended due to the uncontrollable build-up of humidity levels. Where feasible, specimens should be collected along with their substratum, to minimize disturbance of their structures. Knives, folding saws or secateurs may be appropriate, and for rock-inhabiting lichens a geological hammer and masonry chisel may be needed. After as short a time as possible, and if necessary after microscopical examination, the material must be dried. Many leaf-fungi are best pressed between drying papers, although delicate hyphomycetes etc. may be damaged by such a process and should be air-dried. Specimens of microfungi on wood and bark, and most macrofungi, such as polypores and some gasteromycetes, should be dried in a current of warm dry air, ideally in a specially constructed dryer. Spore prints (on black paper if the spores are pale) of hymenomycetes are valuable, and can sometimes later be used for culturing.

Once dry, specimens are usually kept loose, to facilitate later observations. Microfungi should be protected by glassine inner bags in folded paper outer packets, which may be fixed onto herbarium sheets or kept in filing cabinets. Fragile specimens, especially myxomycetes and macrofungi, are normally pinned or glued onto small pieces of card and kept in small cardboard boxes. Nowadays, most collection data are stored in computerized databases, but packets must still be labelled with at least basic information in order to facilitate curation. Illustrations, photographs etc. must also be cross-referenced with the specimen. Semi-permanent slide preparations (see Mounting media) should always be kept if possible, either in protective cardboard boxes within the specimen packet or in a separate collection. This minimizes the need for future workers to deplete the specimen further, and is particularly important for type or authentic collections.

See also Genetic Resource Collections, Inventories, Reference collections.

Collema C.A. Browne (1756), ? *Pezizomycotina* (L.). 1, Europe.

Collema Weber ex F.H. Wigg. (1780) nom. cons., Collemataceae (L.). 78, widespread. See Degelius (*Symb. bot. upsal.* 13 no. 2: 1, 1954; Europe, keys), Degelius (*Symb. bot. upsal.* 20 no. 2: 1, 1974; extra-Europe, keys), Akhtar & Awasthi (*Biol. Mem.* 5: 13, 1980; India), Degelius (*Nordic Jl Bot.* 6: 345, 1986), Swinscow & Krog (*Lichenologist* 18: 63, 1986; E Africa), Upreti & Singh (*J. Bombay nat. Hist. Soc.* 85: 234, 1988; India), Degelius (*Nordic Jl Bot.* 9: 101, 1989; New Zealand), Degelius (*Nordic Jl Bot.* 14: 229, 1994), Liu & Wei (*Mycotaxon* 86: 349, 2003; China), Liu & Wei (*Mycosystema* 22: 531, 2003; China), Miadlikowska & Lutzoni (*Am. J. Bot.* 91:

- 449, 2004; phylogeny), Wedin & Wiklund (*Symb. bot. upsal.* 34 no. 1: 469, 2004; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Collemataceae** Zenker (1827), Peltigerales (L.). 8 gen. (+ 35 syn.), 293 spp.
- Lit.*: Henssen (*Lichenologist* 3: 29, 1965; simple-spored gen.), Upreti & Singh (*J. Bombay nat. Hist. Soc.* 85: 234, 1988), Jørgensen & Henssen (*Graphis Scripta* 5: 12, 1993), Degelius (*Nordic Jl Bot.* 14: 229, 1994), Verdon & Elix (*Acta Bot. Fenn.* 150: 209, 1994), Galloway & Jørgensen (*Flechten Follmann Contributions to Lichenology in Honour of Gerhard Follmann*: 227, 1995), Galloway (*Nova Hedwigia* 69: 317, 1999), Galloway & Knight (*Lichenologist* 31: 642, 1999), Jørgensen & Tønsberg (*Bryologist* 102: 412, 1999), Guttová (*Lichenologist* 32: 291, 2000), Wiklund & Wedin (*Cladistics* 19: 419, 2003), Miadlikowska & Lutzoni (*Am. J. Bot.* 91: 449, 2004), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny), Jørgensen (*Nordic Lichen Flora* 3: Cyanolichens: 14, 2007).
- Collematomyces** E.A. Thomas ex Cif. & Tomas. (1953) = *Collema* F.H. Wigg.
- Collematospora** Jeng & Cain (1976), Sordariomycetes. 1 (coprophilous), Venezuela. Position very uncertain. See Jeng & Krug (*CJB* 54: 2429, 1976), Huhndorf *et al.* (*Sydowia* 51: 176, 1999).
- Collembolispora** Marvanová & Pascoal (2003), anamorphic *Pezizomycotina*. 1, Portugal. See Marvanová & Cássio (*Cryptog. Mycol.* 24: 341, 2003).
- Collemis** Clem. (1931) = *Collema* F.H. Wigg.
- Collemodes** Fink (1918) = *Collema* F.H. Wigg. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Collemodiopsis** (Vain.) B. de Lesd. (1910) = *Collema* F.H. Wigg. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Collemodium** Nyl. (1878) = *Leptogium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Collemopsidiomyces** Cif. & Tomas. (1953) = *Collemopsidium*.
- Collemopsidium** Nyl. (1881), Xanthopyreniaceae (L.). 20, Europe; N. Africa. See Henssen (*SA* 5: 126, 1986), Nordin (*Graphis Scripta* 13: 39, 2002), Kohlmeyer *et al.* (*Mycol. Progr.* 3: 51, 2004), Mohr *et al.* (*MR* 108: 515, 2004; evolution), Paz-Bermúdez *et al.* (*Nova Hedwigia* 80: 73, 2005; Spain).
- Collemopsis** Nyl. ex Cromb. (1874) = *Psorotichia* fide Ellis (*Lichenologist* 13: 123, 1981).
- Collemopsis** Trevis. (1880) = *Psorotichia* fide Moreno & Egea (*Acta Bot. Barcinon.* 41: 1, 1992).
- Colleptogium** M. Choisy (1962) = *Leptogium*.
- Colletocanis** de Hoog & Aa (1978), anamorphic *Pezizomycotina*, Cac.0eH/1eP.15. 1 (on aecia of *Uredinales*), Argentina. See de Hoog & Aa (*Persoonia* 10: 48, 1978).
- Colletogloeopsis** Crous & M.J. Wingf. (1997) = *Readeriella* fide Crous & Wingfield (*CJB* 75: 668, 1997), Cortinas *et al.* (*Stud. Mycol.* 55: 133, 2006), Crous *et al.* (*Stud. Mycol.* 55: 99, 2006), Hunter *et al.* (*Stud. Mycol.* 55: 147, 2006), Andjic *et al.* (*MR* 111: 1184, 2007; phylogeny), Crous *et al.* (*Stud. Mycol.* 58: 1, 2007; morphology).
- Colletogloeum** Petr. (1953) = *Pseudocercospora* fide Sutton (*The Coelomycetes*, 1980), Sutton & Swart (*TBMS* 87: 93, 1986), Crous *et al.* (*Stud. Mycol.* 45: 107, 2000), Crous (*in litt.*, 2008).
- Colletomanginia** Har. & Pat. (1906) ? = *Engleromyces* fide Lloyd (*Mycol. Writ.*, 1917), Rogers (*Mycol.* 73: 28, 1981), Læssøe (*SA* 13: 43, 1994).
- Colletosporium** Link (1824), anamorphic *Pezizomycotina*. 2, Europe. See Hughes (*CJB* 36: 727, 1958).
- Colletostroma** Petr. (1953) = *Colletotrichum* fide von Arx (*Verh. K. ned. Akad. Wet. Amst.* C 51: 1, 1957).
- Colletotrichella** Höhn. (1916) = *Kabatia* fide Sutton (*Mycol. Pap.* 141, 1977).
- Colletotrichopsis** Bubák (1904) ? = *Colletotrichum* fide von Arx (*Verh. K. ned. Akad. Wet. Amst.* C 51: 1, 1957).
- Colletotrichum** Corda (1831), anamorphic *Glomerella*, Cac.0eH.15. 60, widespread. *C. gloeosporioides* (600 syn.; teleomorph *Glomerella cingulata*) (anthracnose of citrus, banana, and many other plants), *C. kahawae* (coffee berry disease; *Phaseolus* (*C. lindemuthianum*; cucumber (*C. orbiculare*, syn. *C. lagenarium*); *C. coccodes* (syn. *C. atramentarium*) (potato black dot and tomato root rot); *C. dematium* f. *circinans* (onion (*Allium*) smudge); *C. lini* (flax (*Linum*) seedling blight). See Sutton (*Mycol. Pap.* 141, 1977; generic synonymy), Baxter *et al.* (*S. Afr. J. Sci.* 2: 259, 1983; 11 S. Afr. spp.), Baxter *et al.* (*Phytophylactica* 17: 15, 1985; lit. review), Park *et al.* (*Korean Jl Pl. Path.* 3: 85, 1987; spp. separation by electrophoresis), Wang & Li (*Acta Mycol. Sin.* 6: 211, 1987; key 14 spp. China), Ali *et al.* (*Phytopathology* 79: 1148, 1989; electrophoresis differentiates *C. graminicola*), Boland & Brochu (*Can. J. Pl. Path.* 11: 303, 1989; cv. response to races of *C. destructivum*), Koch *et al.* (*Phytophylactica* 21: 69, 1989; spp. on *Medicago* in S. Afr.), Panaccione *et al.* (*Mycol.* 81: 876, 1989; conidial dimorphism in *C. graminicola*), Bailey *et al.* (*MR* 94: 810, 1990; species on *Vigna*), Braithwaite *et al.* (*Aust. Syst. Bot.* 3: 733, 1990; ribosomal DNA as a taxonomic marker), Braithwaite *et al.* (*MR* 94: 1129, 1990; RFLPs in *C. gloeosporioides*), Jeffries *et al.* (*Pl. Path.* 39: 343, 1990; biology and control of tropical fruit crop spp.), Smith (*Pl. Dis.* 74: 69, 1990; spp. from *Fragaria*), Bonde *et al.* (*Phytopathology* 81: 1523, 1991; isozyme patterns in spp. on *Fragaria*), Brooker *et al.* (*Phytopathology* 81: 672, 1991; nitrate non-utilizing mutants and vegetative compatibility), Walker *et al.* (*MR* 95: 1175, 1991; spp. on *Xanthium*), Yang & Chuang (*Plant Prot. Bull.* 33: 262, 1991; variation in *C. musae*), Bailey & Jeger (Eds) (*Colletotrichum: biology, pathology and control*, 1992), Gunnell & Gubler (*Mycol.* 84: 157, 1992; spp. on strawberry), Pain *et al.* (*Physiol. Mol. Plant Pathol.* 41: 111, 1992; monoclonal antibodies in), Sutton in Bailey & Jeger (Eds) (*Colletotrichum: biology, pathology and control*, 1992), Correll *et al.* (*Phytopathology* 83: 1199, 1993; RAPD analysis of *C. orbiculare*), Freeman *et al.* (*Exp. Mycol.* 17: 309, 1993; molecular genotyping), Lyanage *et al.* (*Phytopathology* 83: 113, 1993; curinase in *C. gloeosporioides*), Sherriff *et al.* (*Exp. Mycol.* 18: 121, 1994; ribosomal DNA analysis and species groups), Sreenivasaprasad *et al.* (*MR* 98: 186, 1994; nucleotides and identification of *C. acutatum*), Fabre *et al.* (*MR* 99: 429, 1995; molecular markers and bean isolates), Freeman & Rodriguez (*MR* 99: 501, 1995; spp. differentiation of strawberry isolates by PCR), Sherriff *et al.* (*MR* 99: 475, 1995; rDNA sequence differentiates *C. graminicola* and *C. sublineolum*), Bailey in Dehne *et al.* (Eds) (*Diagnosis and Identification of Plant Pathogens Proceed-*

- ings of the 4th International Symposium of the European Foundation for Plant Pathology: 47, 1997), Poplawski *et al.* (*Aust. J. Bot.* **46**: 143, 1998; DNA markers in a biotype of *C. gloeosporioides*), Brown-ing *et al.* (*Pl. Dis.* **83**: 286, 1999; on *Gramineae*), Buddie *et al.* (*MR* **103**: 385, 1999; on *Fragaria*), Kelemu *et al.* (*Eur. J. Pl. Path.* **105**: 261, 1999; *S. America, Stylosanthes*), Lardner *et al.* (*MR* **103**: 275, 1999; *C. acutatum* s.l.), Martín & García-Figueres (*Eur. J. Pl. Path.* **105**: 733, 1999; on *Olea*), Cannon *et al.* (*Colletotrichum* Host Specificity, Pathology, and Host-Pathogen Interaction: 1, 2000; review, species concepts), Correll *et al.* (*Colletotrichum* Host Specificity, Pathology, and Host-Pathogen Interaction: 145, 2000; population structure), Freeman *et al.* (*Phytopathology* **90**: 608, 2000; on *Prunus* etc.), Freeman *et al.* (*Appl. Environm. Microbiol.* **66**: 5267, 2000; on *Anemone*), García Muñoz *et al.* (*Mycol.* **92**: 488, 2000; physiology, biochemistry, on *Fragaria*), Johnston (*Colletotrichum* Host Specificity, Pathology, and Host-Pathogen Interaction: 21, 2000; phylogeny), Gehlot & Purohit (*Indian Phytopath.* **54**: 215, 2001; ultrastr.), Guerber & Correll (*Mycol.* **93**: 216, 2001; teleomorph), Hsiang & Goodwin (*Eur. J. Pl. Path.* **107**: 593, 2001; on *Gramineae*), Shen *et al.* (*MR* **105**: 1340, 2001; on *Nicotiana*), Abang *et al.* (*Pl. Path.* **51**: 63, 2002; on *Dioscorea*), Cullen *et al.* (*Pl. Path.* **51**: 281, 2002; molecular detection), Lim *et al.* (*Pl. Path. J.* **18**: 161, 2002; on *Musa*), Moriwaki *et al.* (*J. Gen. Pl. Path.* **68**: 307, 2002; Japan), Munaut *et al.* (*MR* **106**: 579, 2002; on *Stylosanthes*), Nirenberg *et al.* (*Mycol.* **94**: 307, 2002; on *Lupinus*), Nitzan *et al.* (*Phytopathology* **92**: 827, 2002; on *Solanum*), Varzea *et al.* (*Pl. Path.* **51**: 202, 2002; on *Coffea*), Abang (*Bibliotheca Mycol.* **197**, 2003; on *Dioscorea*), Guerber *et al.* (*Mycol.* **95**: 872, 2003; *C. acutatum* complex), Mackie *et al.* (*Aust. J. agric. Res.* **54**: 829, 2003; Australia), Moriwaki *et al.* (*Mycoscience* **44**: 47, 2003; Japan), Rodríguez-Guerra *et al.* (*Pl. Path.* **52**: 228, 2003; Mexico), Souza-Paccola *et al.* (*J. Phytopath.* **151**: 329, 2003; genetics), Cano *et al.* (*J. Clin. Microbiol.* **42**: 2450, 2004; clinical strains), Ford *et al.* (*Australas. Pl. Path.* **33**: 559, 2004; on *Lens*), Lu *et al.* (*MR* **108**: 53, 2004; endophytes), Lubbe *et al.* (*Mycol.* **96**: 1268, 2004; on *Proteaceae*), Photita *et al.* (*Fungal Diversity* **18**: 117, 2005; Thailand), Sharma *et al.* (*J. Phytopath.* **153**: 232, 2005; *C. capsici* aggregate), Talhinhos *et al.* (*Appl. Environm. Microbiol.* **71**: 2987, 2005; *C. acutatum* aggregate), Weber *et al.* (*J. Phytopath.* **153**: 318, 2005; mating type genes), Armstrong-Cho & Banniza (*MR* **110**: 951, 2006; teleomorph), Farr *et al.* (*MR* **110**: 1395, 2006; on *Agavaceae*), Liu *et al.* (*Phytopathology* **97**: 1305, 2007; *C. orbiculare* group), Bridge *et al.* (*J. Phytopath.* **156**: 274, 2008; *C. kahawae*), Peres *et al.* (*Phytopathology* **98**: 345, 2008; on *Citrus*).
- colliculose (colliculous)**, with rounded swellings; blistered.
- Colligerites** K.P. Jain & R.K. Kar (1979), Fossil Fungi. 2 (Palaeocene), India.
- Collodendrum** Clem. (1909) = Tremellodendron.
- Collodiscula** I. Hino & Katum. (1955), Xylariaceae. Anamorph *Acanthodochium*. 1 (on dead bamboo culms), Japan; Taiwan. See Samuels (*SA* **6**: 121, 1987; status), Samuels *et al.* (*Mycotaxon* **28**: 453, 1987), Ju & Rogers (*Mycol.* **82**: 342, 1990; posn), Læssøe (*SA* **13**: 43, 1994), Læssøe & Spooner (*Kew Bull.* **49**: 1, 1994), Ju & Rogers (*Mycotaxon* **73**: 343, 1999), Kang *et al.* (*Fungal Diversity* **2**: 135, 1999; uncertain posn).
- Collodochium** Höhn. (1902), anamorphic *Pezizomycotina*, Hsp.0eH.?. 1, Europe.
- Collolechia** A. Massal. (1854) = Placynthium fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Collonaemella** Höhn. (1915) = Cornularia fide Clements & Shear (*Gen. Fung.*, 1931), Sutton (*Mycol. Pap.* **141**, 1977).
- Collonema** Grove (1886) nom. dub., *Pezizomycotina*. Based on an effete ascoma. See Sutton (*Mycol. Pap.* **141**: 45, 1977).
- Collopezis** Clem. (1909) = Tjibodasia.
- Collopus** Earle (1909) = *Mycena* fide Singer (*Agaric. mod. Tax.*, 1951).
- Collostroma** Petr. (1947), anamorphic *Pezizomycotina*, St.0eH.?. 1, Austria.
- collulum**, the neck of a conidiogenous cell (Zaleski, 1927).
- Collybia** (Fr.) Staude (1857) nom. cons., *Tricholomataceae*. 3, widespread (north temperate). The majority of taxa formerly classified in *Collybia* have now been transferred to *Gymnopus* and *Rhodocollybia*. See Antonín & Noordeloos (*Libri Botanici* **17**, 1997; European spp.), Antonín *et al.* (*Mycotaxon* **63**: 359, 1997; taxonomy), Moncalvo *et al.* (*Syst. Biol.* **49**: 278, 2000; phylogeny), Hughes *et al.* (*MR* **105**: 164, 2001; phylogeny), Mata & Petersen (*Mycotaxon* **86**: 303, 2003; type studies neotropical species (s.lat.)).
- Collybidium** Earle (1909) = Flammulina.
- Collybiopsis** (J. Schröt.) Earle (1909) = *Marasmius* fide Kuyper (*in litt.*).
- Collyria** Fr. (1849) nom. dub., *Agaricales*. See Singer (*Agaric. mod. Tax.* edn 3, 1975).
- colon** (:) (in author citations), see Nomenclature.
- Colonnaria** Raf. (1808) = *Clathrus* fide Dring (*Kew Bull.* **35**: 1, 1980).
- Colonomyces** R.K. Benj. (1955), *Euceratomycetaceae*. 1, USA; Europe. See Benjamin (*Aliso* **3**: 186, 1955).
- colony** (of bacteria and yeasts), a mass of individuals, generally of one species, living together; (of mycelial fungi), a group of hyphae (frequently with spores) which, if from one spore or cell, may be one individual.
- Colour**. Many fungi can be characterized partly by the colour of their fruitbodies or other organs, or by the colour of pigments exuded into pure culture media. Describing those colours has often been attempted without reference to standards, with unsatisfactory results. Names of colours should therefore be given precision by reference to a colour standard, preferably the Munsell Color System as exemplified in the *Munsell book of color* (various editions available through the internet). This work is expensive and the 'Mycologists' Color Kit' designed for individual ownership and produced by the Munsell Color Co. seems to be no longer available. The *Methuen handbook of colour* by Kornerup, edn 3, 1984 (an English translation of the Danish *Farver i Farver* by Kornerup & Wanscher, edn 2, 1967) is an inexpensive colour chart for which the equivalent Munsell notation is given for each colour; Rayner's *A mycological colour chart*, 1970 (now unavailable), illustrated Dade's nomenclature (see below).
- Since its publication in 1912 Ridgway's *Color*

standards and color nomenclature, which covers 1,115 colours, has been much used by biologists but copies of this work must now be referred to with caution due to variations having occurred in some colours depending on the amount of use a copy has received and the care which has been given to its preservation. Tables for Ridgway/Munsell conversions accompany Rayner's chart. The Pantone company produces specialist colour charts which may also be applicable.

Other general colour standards include Oberthur & Dauthenay, *Repertoire de couleurs*, 2 vols., 1905 (for Ridgway equivalents see Snell & Dick, *Glossary of mycology*, rev. edn. 1971); Klinksieck & Vallette, *Code de couleurs*, 1908; Maerz & Paul, *A Dictionary of color*, edn 2, 1950; and Wilson, *Horticultural colour chart*, 2 vols., 1939-42. Kelly & Judd (*The ISCC-NBS method of designating colors and a dictionary of color names*, 1955 [reprint 1963], National Bureau of Standards, Washington Circular 553) list the Inter-Society Color Council-NBS equivalents of 7,500 colour names including those of Ridgway and Maerz & Paul; a supplement provides standard colour patches (ISCC-NRSS, *Centroid color charts*, *Standard sample* No. 2106). Locquin, *Guide des couleurs naturelles* (*Obs. Disp. mycol.* 1 (2), 1975) has about 1,536 colour patches, Pfaff (*Z. Mykol.* 49: 237, 1983; comparison colour atlases), *RHS Colour Chart*, 2000 (Royal Horticultural Society, UK) inc. 800 samples).

Saccardo (*Chromotaxia*, 1891; edn 3, 1912) gave the Latin, Italian, French, English and German names and synonyms of 50 colours of mycological interest, and Dade (*Mycol. Pap.* 6 (edn 2), 1949) related Saccardo's colours to the Ridgway standard, suggested additional Latin colour terms for mycological use, and gave an extended list of colour names. The colour terminology used by Fries for agarics was discussed by Wharton (*Grevillea* 13: 25, 1884) whose paper has been reprinted in part by Stearn (*Botanical Latin*, edn 4, 1992) who also reprints Dade's chart and gives additional interesting historical information on colour terminology. Locquin, *Chromotaxis: Code mycologique et pédologique des couleurs*, 1958 (see *Mycol.* 50: 447, 1958) related a number of colours to a series of colour transparencies. See Tocker *et al.* (*Taxon* 40: 201, 1991; survey colour charts).

Colour names are omitted from this *Dictionary* although a few general colour terms such as dematiaceous, hyaline, inquinant, etc., and those given below have been compiled.

Corner (*Clavaria*, 1950) proposed the following series of terms for the more precise description of pigmentation of basidiomata and hyphae: **achroic**, without true pigmentation; **euchroic**, having true pigmentation as opposed to **epichroic**, discoloration due to injury; **hysterochroic**, slowly discoloured from base to apex in old age; **euchroism** may be **acrochroic**, coloured specially in the hyphal tips at the growing point, **metachroic**, changing colour through the appearance of a new pigment in maturer tissue, **ectochroic**, pigment on the outside of the hypha, **mesochroic**, pigment in the hyphal wall, or **endochroic**, pigment inside the cell. The last may be subdivided according to whether the pigment is diffused in the cytoplasm (**cytochroic**), in the cell vacuoles (**cystochroic**) or in oil drops (**lipochroic**). Cf. Pigments.

colour of the reverse, the colour of the underside of a

fungus culture in a tube or Petri dish.

Colpoma Wallr. (1833), Rhytismataceae. Anamorph *Conostroma*. 14, widespread. See Twyman (*TBMS* 29: 234, 1946), Johnston (*N.Z. Jl Bot.* 29: 405, 1991; NZ), Medardi (*Riv. Micol.* 45: 239, 2002; Italy), Buchanan & May (*N.Z. Jl Bot.* 41: 407, 2003; conservation), Hou & Piepenbring (*Forest Pathology* 35: 359, 2005; China).

Colpomella Höhn. (1926) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).

Coltricia Gray (1821), Hymenochaetaceae. 20, widespread. See Pegler (*The polypores* [*Bull. BMS Suppl.*], 1973), Legon (*Mycologist* 17: 42, 2003; UK).

Coltriciaceae Jülich (1982) = Hymenochaetaceae.

Coltriciella Murrill (1904), Hymenochaetaceae. 7, widespread. See Murrill (*Bull. Torrey bot. Club* 31: 348, 1904), Wagner & Fischer (*Mycol.* 94: 998, 2002).

Coltriciopsis Teixeira (1991) = *Coltricia* fide Ryvarden (*Svensk Bot. Tidskr.* 68: 276, 1974).

columella, a sterile central axis within a mature fruit-body which may be uni- or multicellular, unbranched or branched, of fungal or host origin; (of gasteromycetes, after Cunningham) **axile** -, when an axis in the gleba; **dendroid** -, having lateral branches, as in *Gymnoglossum*; **percurrent** -, joining the peridium at the apex of gleba; **pseudo** -, embryonic tissue in the mature peridium of *Geastrum*; **simple** -, not branched, as in *Secotium*.

Columnocystis Pouzar (1959) = *Veluticeps* fide Hjortstam & Tellería (*Mycotaxon* 37: 53, 1990).

Columnodorus Petr. (1941), anamorphic *Pezizomycotina*, St.0eH.?. 1, Europe.

Columnodontia Jülich (1979), Meruliaceae. 1, S.E. Asia; Australasia. See Jülich (*Persoonia* 10: 326, 1979).

Columnomyces R.K. Benj. (1955), Laboulbeniaceae. 1, USA. See Benjamin (*Aliso* 3: 185, 1955), Tavares (*Mycol. Mem.* 9: 627 pp., 1985), Santamaría (*Mycol.* 96: 761, 2004).

Columnophora Bubák & Vleugel (1916), anamorphic *Pezizomycotina*, Hso.0eP.1. 1, Europe.

Columnosphaeria Munk (1953), Dothioraceae. Anamorph *Aureobasidium*. 1, widespread. See von Arx & Müller (*Stud. Mycol.* 9, 1975), Barr (*Harvard Pap. Bot.* 6: 25, 2001), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).

Columnothyrium Bubák (1916), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, Europe.

Colus Cavalier & Séchier (1835), Phallaceae. 4, widespread.

Coma Nag Raj & W.B. Kendr. (1972), anamorphic *Ascocoma*, Cac.0bP.19. 1, Australasia. See Sutton (*Nova Hedwigia* 25: 161, 1974), Swart (*TBMS* 87: 603, 1987; teleomorph), Beilharz & Pascoe (*Mycotaxon* 91: 273, 2005).

comate, having hairs; shaggy.

Comatospora Piroz. & Shoemaker (1971), anamorphic *Pezizomycotina*, St.1eH.19. 1, Canada. See Pirozynski & Shoemaker (*CJB* 49: 539, 1971).

Combea De Not. (1846), Roccellaceae (L). 1, S. Africa; USA. See Tehler (*CJB* 68: 2458, 1990; cladistics), Myllys *et al.* (*Bryologist* 101: 70, 1998), Myllys *et al.* (*Lichenologist* 31: 461, 1999; DNA), Lücking *et al.* (*Mycol.* 96: 283, 2004; phylogeny), Tehler & Irestedt (*Cladistics* 23: 432, 2007).

Combodia Fr. (1849) ? = *Lasiodiplodia* fide Sutton

(*Mycol. Pap.* 141, 1977).

Comesella Speg. (1923), ? Dothideales. 1 (on *Pteridophyta*), Cuba.

Comesia Sacc. (1884), ? Helotiales. 2 or 3, Europe; N. Africa.

Cometella Schwein. (1835) = *Clasterosporium* fide Ellis (*Mycol. Pap.* 70, 1958).

commensalism, a form of symbiosis (q.v.).

Comminutispora A.W. Ramaley (1996), Capnodiales. Anamorph *Hyphospora*. 1, USA. See Ramaley (*Mycol.* 88: 132, 1996), Hambleton *et al.* (*Mycol.* 95: 959, 2003; phylogeny).

commissure, a closing join; a seam.

commixt, mixed with; intermingled.

Common names (also vernacular names). For fungi, these should be printed in Roman (not italic) type and decapitalized. They can be divided into two general categories: those derived from the scientific Latin name of a genus or higher taxonomic rank (common in scientific writing), and those of the language of the user, rather than the scientific Latin binomial or trinomial (generally used by field mycologists). Common names used in scientific writing may be either singular or plural, e.g. *aspergillus* (*aspergilli*), *ascomycete(s)*, *fusarium* (*fusaria*), etc. Such use seems unobjectionable as it enables taxa to be distinguished from the individuals of which they are composed, e.g. *phytophthoras* = species of *Phytophthora*; see Seifert *et al.*, *Stud. Mycol.* 45, 2000).

In English, in marked contrast to flowering plants, few fungi (incl. lichen-forming species) have common names which are genuinely ancient; only twenty-five or so fungi (e.g. fly agaric, blewits, morel, puff ball) have achieved recognition by the *Shorter Oxford Dictionary* and *Webster's Dictionary*. Basidiomycetes and other conspicuous fungi have, however, been recognized by common names from earliest times, and many ancient names may be supposed lost along with so much of Britain's folk heritage. There have been numerous attempts with varying success to generate modern common names for larger fungi (and occasionally for microfungi; see Cooke, *Handbook of British fungi*, 1871), frequently by more or less literal English versions of the scientific names, most recently by the British Mycological Society (see Internet). Lichens used by man for dyeing, or other purposes, or eaten by reindeer were also often given common names, e.g. crottle, heather rags, lungwort, manna, old man's beard, orchil, rock tripe. Common names for diseases of plants, man, and animals caused by fungi are also widely used in both technical and popular writing, and a many plant disease names are also applied to the pathogens themselves, e.g. rust, smut, powdery mildew (see British Society for Plant Pathology. Names of British Plant Diseases and their Causes *Phytopathological Papers* 28, 1984).

Common names for fungi in other languages are often more abundant and diverse than for English, but may not be so well documented. Many examples can be found with Internet search engines (see Internet). See also Lundqvist & Persson (*Svenska Svampnamn*, 1987; 2584) [Swedish names]; Ulvinen *et al.* (*Karstenia* 29 (Suppl.), 1989) [Finnish larger fungi]. See also Classification, Dyeing, Nomenclature.

community, any phytosociological taxon.

Comocephalum Syd. (1939), anamorphic *Pezizomycotina*, Cpd.#eP.?. 1, Ecuador.

Comocheila A. Massal. (1860) = *Phlyctis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Comoclathris Clem. (1909), Diademaceae. Anamorph *Alternaria*-like. 21, America; Europe. See Shoemaker & Babcock (*CJB* 70: 1617, 1992; key), Barr (*SA* 12: 27, 1993; synonym of *Graphyllum*).

comose, having hairs in groups or tufts.

compaginate, joined tightly together.

companion cell, contiguous donor gametangium of *Olpidiopsidales*.

compatible (of mating types, strains, etc.), able to be cross-mated; cross-fertile; **hemi-**, a homokaryon compatible with 1 of the 2 components of the dikaryon. See Sex.

complanate, flat; smooth.

complement-fixation test, a sensitive test by which antigen-antibody reaction may be detected and quantified. The test depends on the ability of antigens after reacting with their specific antibodies to 'fix' **complement** (a group of proteins normally present in freshly isolated serum) the presence of which is necessary for the lysis of red blood cells by haemolysin (red-cell-immune serum).

Completozia Lohde (1874), Completoriaceae. 1 (on prothalli of *Pteridophyta*), widespread (north temperate). See Atkinson (*Cornell Univ. Agric. Exp. Stn Bull.* 94: 252, 1895), Tucker (*Mycotaxon* 13: 481, 1981), Humber (*Mycotaxon* 34: 441, 1989).

Completoriaceae Humber (1989), Entomophthorales. 1 gen., 1 spp.
Lit.: Atkinson (*Bot. Gaz.* 19: 467, 1894), Humber (*Mycotaxon* 34: 441, 1989).

complex, sometimes used to designate a group of closely related species.

Complexipes C. Walker (1979), anamorphic *Tricharina*, Hso.0eP.1. 2, widespread. See Yang & Korf (*Mycotaxon* 23: 457, 1985), Lee & Ka (*Korean J. Mycol.* 18: 127, 1990; Korea), Pacioni *et al.* (*Micologia e Vegetazione Mediterranea* 13: 3, 1998).

complicate, bent upon itself.

compound, made up of a number of parts.

compressed (of a stipe), flattened transversely.

Compsocladium I.M. Lamb (1956), Ramalinaceae (L). 1, New Guinea. See Lamb (*Lloydia* 19: 157, 1956), Ekman (*Op. bot.* 127: 148 pp., 1996), Frisch (*Biblthca Lichenol.* 96: 73, 2007; Ecuador).

Compsomyces Thaxt. (1894), Laboulbeniaceae. 7, widespread. See Santamaría (*Fl. Mycol. Iberica* 5, 2003; Iberian peninsula).

Compsosporiella Sankaran & B. Sutton (1991) = *Anisomeridium* fide Sankaran & Sutton (*MR* 95: 1289, 1991), Harris (*More Florida Lichens*, 1995).

Computing, has numerous applications in mycology, and pertinent papers are cited under appropriate topics. For coding of characters for use in microbial databases see Gams *et al.* (*J. gen. microbiol.* 134: 1667, 1988) and Rogosa *et al.* (*Coding microbiological data for computers*, 1986). See also Authors, Genetic Resource Collections, Internet, Inventorying, Literature, Neural networks, Numerical taxonomy.

Concamerella W.L. Culb. & C.F. Culb. (1981) = *Parmotrema* fide Culberson & Culberson (*Bryologist* 84: 307, 1981), Adler (*Mycotaxon* 38: 331, 1990; key), Thell *et al.* (*Mycol. Progr.* 3: 297, 2004; phylogeny), Blanco *et al.* (*Mycol.* 97: 150, 2005; phylogeny), Blanco *et al.* (*Mol. Phylogen. Evol.* 39: 52, 2006; phylogeny).

concatenate, in chains; catenulate.

concave (esp. of a pileus), hollowed out; basin-like.

concentric bodies, ultrastructures found in many lichenized fungi and also in some other fungi such as *Rhopoglyphus*, *Sphaerotheca*, *Cercospora*, *Pseudopeziza*, *Sphaceloma*; 'elliptical bodies'. See Griffiths & Greenwood (*Arch. Microbiol.* **87**: 285, 1972), Pons *et al.* (*TBMS* **83**: 181, 1984), Beilharz (*TBMS* **84**: 79, 1985), Meyer (*Mycol.* **79**: 44, 1987; in granules in *Allomyces*).

conceptacle, any hollow structure producing spores or spermatia.

conchate (conchiform), like a bivalve shell.

Conchatium Velen. (1934) = *Cyathicula* fide Baral (*SA* **13**: 113, 1994).

Conchites Paulet (1791) = *Auricularia* fide Donk (*Taxon* **7**: 174, 1958).

Conchomyces Overeem (1927), *Tricholomataceae*. 2, Indonesia. See Thorn *et al.* (*Mycol.* **92**: 241, 2000; phylogeny).

Conchyliastrum Zebrowski (1936), Fossil Fungi ? *Chytridiomycetes*. 2 (Cambrian to ? Recent), Australia.

concolorous, of one colour.

concrecent, becoming joined.

concrete, joined by growth.

conditioning, the process by which fungi enzymically soften up substrata such as dead leaves before detritivorous animals can eat them.

conducting hypha, see hypha.

Condylospora Nawawi (1976), anamorphic *Pezizomycotina*, Hso.0fH.10. 3 (aquatic), pantropical. See Nawawi & Kuthubutheen (*Mycotaxon* **33**: 329, 1988), Santos-Flores *et al.* (*Caribb. J. Sci.* **32**: 116, 1996; Puerto Rico), Chan *et al.* (*Fungal Diversity* **5**: 89, 2000; Hong Kong).

conferted, near together; crowded.

Conferticium Hallenb. (1980), *Stereaceae*. 4, widespread (north temperate). See Ginns & Freeman (*Bibliotheca Mycol.* **157**, 1994), Larsson & Larsson (*Mycol.* **95**: 1037, 2003; phylogeny).

Confertobasidium Jülich (1972) = *Scytinostromella* fide Ginns & Freeman (*Bibliotheca Mycol.* **157**, 1994).

Confertopeltis Tehon (1933) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* **141**, 1977).

Conferva L. (1753), *Algae*. *Algae*.

confervoid, composed of loose filaments or cells.

Confistulina Stalpers (1983) = *Fistulina*.

confluent (1) (of sori, etc.), coming together; running into one another; (2) (of the flesh of a stipe), continuous with the trama of the pileus.

congeneric, one of two or more taxa considered to belong to one genus; cf. synonym.

congested, very near together.

conglobate (1) massed into a ball; (2) (of the bases of stipes), together making a fleshy mass.

conglutinate, glued together; esp. of paraphyses in *Lecanorales*.

Conia Vent. (1799) nom. rej. = *Lepraria* fide Sutton (*in litt.*).

Coniambigua Etayo & Diederich (1995), anamorphic *Pezizomycotina*. 1, Spain. See Etayo & Diederich (*Flechten Follmann Contributions to Lichenology in Honour of Gerhard Follmann*: 207, 1995), Diederich (*Herzogia* **16**: 41, 2003).

Coniangium Fr. (1821) = *Arthonia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Grube *et al.* (*Mycol.* **96**: 1159, 2004).

Coniarthonia Grube (2001), *Arthoniaceae* (L.). 6,

widespread. See Grube (*Lichenologist* **33**: 492, 2001).

Conicomycetes R.C. Sinclair, Eicker & Morgan-Jones (1983), anamorphic *Pezizomycotina*, Hsy.0fH.15. 2, widespread. See Illman & White (*CJB* **63**: 419, 1985; addit. spp.), Seifert (*Mycotaxon* **71**: 301, 1999; Canada).

Conicosolen F. Schill. (1927) = *Psorotheciopsis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Conida A. Massal. (1856) = *Arthonia* fide Santesson (*Symb. bot. upsal.* **12** no. 1: 1, 1952), Calatayud *et al.* (*Bibliotheca Lichenol.* **88**: 67, 2004).

conidange, a small pycnidium (in a lichen thallus) having no stout wall (des Abbayes, 1951) (obsol.).

Conidella Elenkin (1901) ? = *Arthonia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Calatayud *et al.* (*Bibliotheca Lichenol.* **88**: 67, 2004).

Conidial nomenclature. The traditional approach to nomenclature of spores of anamorphic fungi is that of Saccardo who differentiated 7 morphological types based on shape and septation (amero- [with no septum], dictyo- [with longitudinal and transverse septa], didymo- [with 1 transverse septum], helico- [with a helix shape, with or without septa], phragmo- [with more than 1 transverse septum], scoleco- [long and thin, with or without septa], and staurospores [with radiating 'arms' or star-shaped, with or without septa]). These terms were further qualified according to whether the spores were pigmented (phaeo-amero-spores, etc.) or not (hyalo-amero-spores, etc.); see Anamorphic fungi. Kendrick & Nag Raj (*in Kendrick* (Ed.), *The whole fungus* **1**: 43, 1979) discussed Saccardo's categories and offered precise definitions.

Since Hughes (*CJB* **31**: 577, 1953) drew attention to the systematic importance of conidiogenous events (q.v.), a nomenclature for conidia has evolved based on the methods by which the conidia develop, giving rise to terms such as annelloconidia, phialoconidia, tretroconidia etc. (cf.). These attempt to summarize in a single word a complex series of developmental events any of which can vary independently of the others; as a result, they are imprecise, and not universally accepted: a better procedure is to use the word 'conidium' with qualifying adjectives or descriptors. Main contributions to conidial terminology have been by the first Kananaskis Workshop-Conference in 1969 (see Kendrick (Ed.), *Taxonomy of fungi imperfecti*, 1971). Ellis (*Dematiaceous hyphomycetes*, 1971) offered a series of definitions as did Kendrick & Carmichael (*in Ainsworth et al.* (Eds), *The Fungi* **4A**: 323, 1973), Cole (*CJB* **53**: 2983, 1975), and Cole & Samson (*Patterns of development in conidial fungi*, 1979). The descriptive terminology in both conidial morphology and conidiogenous events was initiated by Minter *et al.* (*TBMS* **79**: 75, 1982; **80**: 39, 1983; **81**: 109, 1983), developed by Sutton (*in Reynolds & Taylor* (Eds), *The fungal holomorph*: 28, 1993) and Hennebert & Sutton, and Sutton & Hennebert (*in Hawksworth* (Ed.), *Ascomycete systematics*: 65, 77, 1994), and is used in this edn of the *Dictionary*. See Anamorphic fungi.

conidiangium, pycnidium (obsol.).

Conidiascus Holterm. (1898), ? *Saccharomycetes*. 1, Java.

Conidiobolus Bref. (1884), *Ancylistaceae*. 38, widespread. See King (*CJB* **54**: 45, 1976), King (*CJB* **54**: 1285, 1976; key), King (*CJB* **55**: 718, 1977), Re-

- maudière & Keller (*Mycotaxon* 11: 323, 1980), Ben-Ze'ev & Kenneth (*Mycotaxon* 14: 393, 1982; subgen. *Delacrouxia*), Latgé *et al.* (*CJB* 60: 413, 1982; ultrastr.), Latgé *et al.* (*Exp. Mycol.* 10: 99, 1986; ultrastr.), Keller (*Sydowia* 40: 122, 1987), Humber (*Mycotaxon* 34: 441, 1989), Callaghan *et al.* (*MR* 104: 1270, 2000; repetitive conidia), Tosi *et al.* (*Mycotaxon* 90: 343, 2004; n.sp. Antarctica), Tanabe *et al.* (*J. gen. appl. Microbiol.* Tokyo 51: 267, 2005), Keller (*Sydowia* 58: 38, 2006), Huang *et al.* (*Mycotaxon* 100: 227, 2007; USA), Waingankar *et al.* (*Mycopathol.* 165: 173, 2008; n.sp.).
- Conidiocarpus** Woron. (1926), anamorphic *Pezizomycotina*, Cpd.0eH.15. 2, widespread. See Hughes (*Mycol.* 68: 693, 1976), Matsushima (*Matsush. Mycol. Mem.* 10, 2001; Japan), Reynolds & Gilbert (*Aust. Syst. Bot.* 18: 265, 2005; Australia), Reynolds & Gilbert (*Cryptog. Mycol.* 27: 249, 2006; Panamá).
- Conidiogenesis.** The process of conidium formation. Concepts of conidiogenesis have increasingly been used in anamorphic fungal systematics since Hughes (*CJB* 31: 577, 1953) classified some hyphomycetes according to the different methods by which conidia develop from conidiophores and the ways in which conidiophores (and conidiogenous cells) grow before, during and after conidia are produced. The historical development of this approach has been covered by Kendrick (Ed.) (*Taxonomy of fungi imperfecti*, 1971), for hyphomycetes, by Sutton (*in* Ainsworth *et al.* (Eds), *The Fungi* 4A: 513, 1973) for coelomycetes, and by Vobis (*Bibl. Lich.* 14, 1980) for lichenized pycnidia. Cole & Samson (*Patterns of development in conidial fungi*, 1979) emphasized the contribution of ultrastructural data to developmental concepts. Minter *et al.* (*TBMS* 79: 75, 1982; 80: 39, 1983; 81: 109, 1983) reassessed optical and electron microscopy observations and demonstrated a continuum of developmental processes. See Anamorphic fungi, wall-building.
- conidiogenous**, producing conidia; - **cell**, any cell from or within which a conidium is directly produced; - **locus**, the place on a conidiogenous cell at which a conidium arises; Kendrick (1971: 258).
- conidiole**, a small conidium, esp. one on another; a secondary conidium, as in *Empusa*.
- conidioma** (pl. -**ata**), a specialized multi-hyphal, conidia-bearing structure (Kendrick & Nag Raj *in* Kendrick (Ed.), *The whole fungus* 1: 51, 1979). See acervulus, pycnidium, sporodochium, synnema (all obsol. nouns, but used adjectivally, e.g. acervular conidioma). See Fig. 10. Cf. conidiophore.
- conidiophore**, a simple or branched hypha (a **fertile hypha**) bearing or consisting of conidiogenous cells from which conidia are produced; sometimes used when describing reduced structures for the conidiogenous cell.
- Conidiosporomyces** Vánky (1992), Tilletiaceae. 3 (on *Poaceae*), pantropical. See Vánky & Vánky (*Lidia* 5: 157, 2002; southern Africa).
- Conidiotheca** Réblová & L. Mostert (2007), ? Calosphaeriales. 1, USA. See Réblová & Mostert (*MR* 111: 299, 2007; phylogeny).
- Conidioxyphium** Bat. & Cif. (1963) = *Conidiocarpus* fide Hughes (*Mycol.* 68: 693, 1976).
- conidium**, a specialized, non-motile (cf. zoospore), asexual spore, usually caducous, not developed by cytoplasmic cleavage (cf. sporangiospore) or free-cell formation (cf. ascospore); in certain *Oomycota* produced through the incomplete development of zoosporangia which fall off and germinate to produce a germination tube. See Sutton (*TBMS* 86: 1, 1986; derivation etc.); - **initial**, a cell, or part of a cell from which a conidium develops; - **ontogeny**, conidiogenesis (q.v.).
- Coniella** Höhn. (1918), anamorphic *Schizoparmaceae*, Cpd.0eP.15. 13, widespread. See Sutton (*The Coelomycetes*, 1980; key), Castlebury *et al.* (*Mycol.* 94: 1017, 2002; phylogeny), Van Niekerk *et al.* (*MR* 108: 283, 2004; phylogeny), Rossman *et al.* (*Mycoscience* 48: 135, 2007; review).
- Coniobotrys** Pouzar (1958) ? = *Jaapia* Bres. fide Donk (*Persoonia* 3: 199, 1964).
- Coniobrevicolla** Réblová (1999), Trichosphaeriaceae. 1 (from wood), Denmark. See Réblová (*Mycotaxon* 70: 421, 1999).
- Coniocarpaceae** Rchb. (1841) = Arthoniaceae.
- Coniocarpon** DC. (1805) nom. rej. = *Arthonia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Coniocessia** D. García, Stchigel, D. Hawksw. & Guarro (2006), Xylariales. Anamorph *Nodulisporium*-like. 1 (from soil), Jordan. See García *et al.* (*MR* 110: 1284, 2006).
- Coniochaeta** (Sacc.) Cooke (1887), Coniochaetaeae. Anamorph *Lecythophora*. 65 (coprophilous or on rotting wood), widespread. Species with *Nodulisporium*-like anamorphs belong to *Coniolaria* (Xylariales). See Hawksworth & Yip (*Aust. J. Bot.* 29: 377, 1981; key 11 spp. in cult.), Mahoney & LaFavre (*Mycol.* 73: 931, 1981; synopsis), Checa *et al.* (*Cryptog. Mycol.* 9: 1, 1988; key 15 spp. Spain), Hawksworth *in* Hawksworth (Ed.) (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. 269 269: 377, 1994; polyphyly), Kamiya *et al.* (*Mycoscience* 36: 377, 1995), Lee & Hanlin (*Mycol.* 91: 434, 1999; DNA), Romero *et al.* (*MR* 103: 689, 1999; Argentina), Weber (*Nova Hedwigia* 74: 159, 2002; anam.), Weber *et al.* (*Nova Hedwigia* 74: 187, 2002; phylogeny), Huhndorf *et al.* (*Mycol.* 96: 368, 2004; phylogeny), Asgari & Zare (*Nova Hedwigia* 82: 227, 2006; Iran), García *et al.* (*MR* 110: 1271, 2006; phylogeny).
- Coniochaetaeae** Malloch & Cain (1971), Coniochaetales. 5 gen. (+ 8 syn.), 72 spp.
Lit.: Checa *et al.* (*Cryptog. Mycol.* 9: 1, 1988), Crane & Shearer (*Mycotaxon* 54: 107, 1995), Kamiya *et al.* (*Mycoscience* 36: 377, 1995), Guarro *et al.* (*Mycoscience* 38: 123, 1997), Ramaley (*Mycol.* 89: 962, 1997), Huhndorf *et al.* (*Sydowia* 51: 176, 1999), Lee & Hanlin (*Mycol.* 91: 434, 1999; DNA), Romero *et al.* (*MR* 103: 689, 1999), Weber *et al.* (*Nova Hedwigia* 74: 187, 2002), Huhndorf *et al.* (*Mycol.* 96: 368, 2004), García *et al.* (*MR* 110: 1271, 2006).
- Coniochaetales** Huhndorf, A.N. Mill. & F.A. Fernández (2004). Sordariomycetidae. 1 fam., 9 gen., 76 spp. Fam.:
- Coniochaetaeae**
For *Lit.* see under fam.
- Coniochaetidium** Malloch & Cain (1971) = *Coniochaeta* fide von Arx (*Stud. Mycol.* 8: 25, 1975; key), Udagawa & Tsubouchi (*Mycotaxon* 27: 63, 1986), Guarro *et al.* (*Mycoscience* 38: 123, 1997), García *et al.* (*MR* 110: 1271, 2006; phylogeny), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).

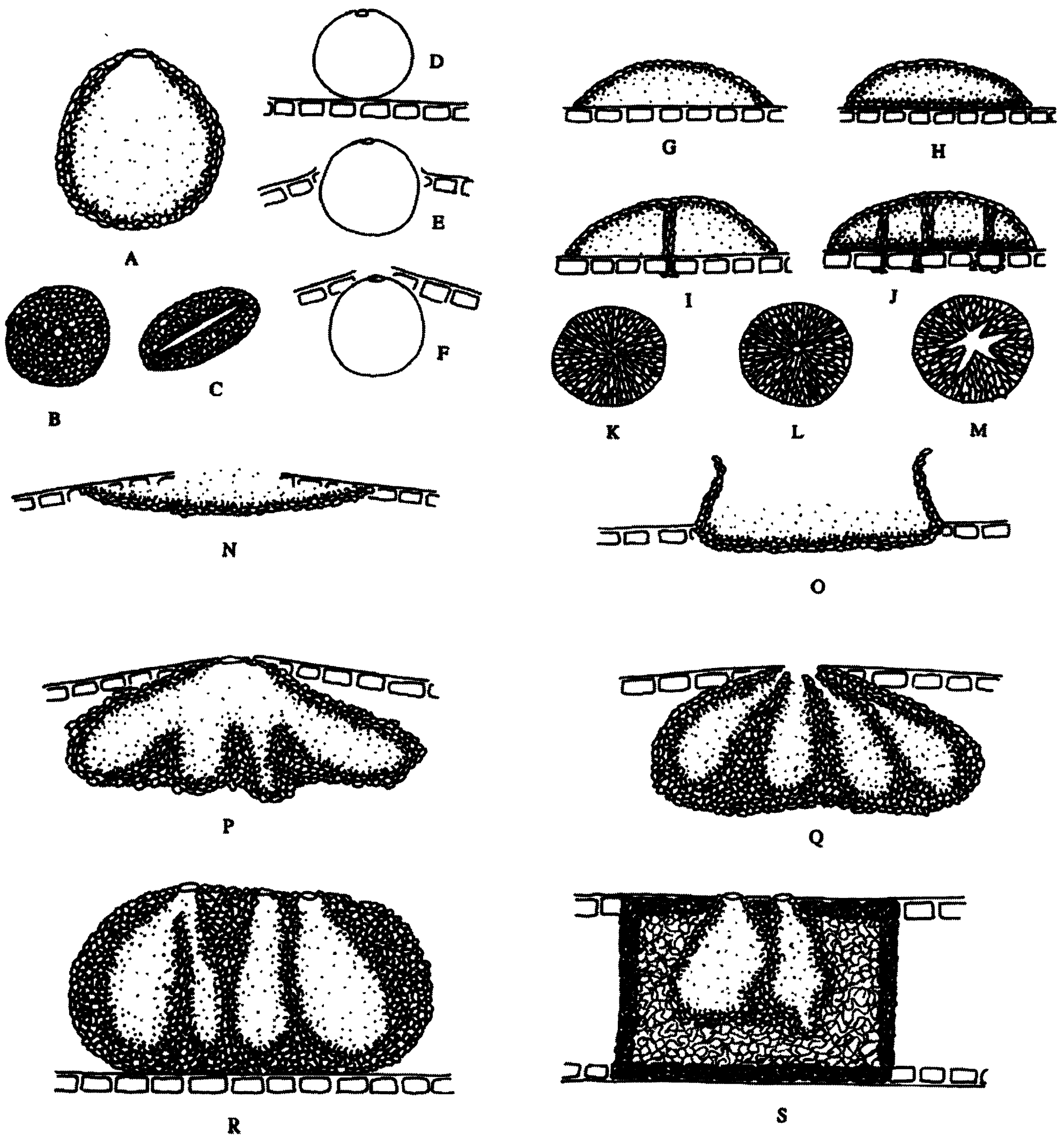


Fig. 12. Conidiomatal types. A-F, pycnidial; B, dehiscence by a central circular ostiole; C, dehiscence by a longitudinal ostiole (raphe); D, superficial; E, semi-immersed; F, immersed; G-M, pycnothyrial; G, with upper wall only; H, with upper and lower walls; I, with a central supporting column; J, multilocular with several supporting columns; K, dehiscence from the margin; L, dehiscence by a central ostiole; M, dehiscence by irregular fissures; N, acervular; O, cupulate; P-R, eustromatic; P, convoluted, immersed; Q, multilocular, immersed; R, multilocular, superficial; S, pseudostromatic.

Coniochila A. Massal. (1860) ? = *Ocellularia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Coniocybaceae Rchb. (1837), *Lecanoromycetes* (inc. sed.) (L). 4 gen. (+ 12 syn.), 56 spp.

Lit.: Honegger (*Lichenologist* 17: 273, 1985), Honegger (*Sydowia* 38: 146, 1985), Tibell (*Symb. bot. upsal.* 27 no. 1: 279 pp., 1987), Tibell (*Fl. Neotrop. Monogr.* 69: 78 pp., 1996), Tibell (*Symb.*

bot. upsal. 32 no. 1: 291, 1997), Wedin & Tibell (*CJB* 75: 1236, 1997), Rikkinen (*Bryologist* 101: 558, 1998), Tibell (*Bibliotheca Lichenol.* 71: 107 pp., 1998), Selva & Tibell (*Bryologist* 102: 377, 1999), Tibell (*Nordic Lichen Flora* 1. Introductory Parts; Calicioid Lichens and Fungi: 20, 1999), Tibell (*Bryologist* 104: 191, 2001), Tibell (*Lichenologist* 33: 519, 2001), Tibell & Koffman (*Bryologist* 105: 353, 2002).

- Coniocybe** Ach. (1816), Coniocybaceae ($\pm$ L). 24, widespread (esp. temperate). See Tibell (*Symb. bot. upsal.* 21 no. 2: 1, 1975), Tibell (*Svensk bot. Tidskr.* 72: 171, 1978), Honegger (*Lichenologist* 17: 273, 1985; anamorph), Redhead (*CJB* 62: 2514, 1984), Tibell (*Symb. bot. upsal.* 27 no. 1: 279 pp., 1987; Australasia), Selva (*Symb. bot. upsal.* 34 no. 1: 19, 2004).
- Coniocybomyces** Cif. & Tomas. (1953) $\equiv$ Coniocybe.
- Coniocybopsis** Vain. (1927) = Microcalicium fide Tibell (*Bot. Notiser* 131: 229, 1978), Tibell (*Recollecting Edvard August Vainio*: 95, 1998).
- Coniodictyum** Har. & Pat. (1909), Cryptobasidiaceae. 1, Africa. See Malençon (*BSMF* 69: 77, 1953), Maier *et al.* (*Stud. Mycol.* 55: 279, 2006; epidemic on *Zizyphus mucronata* in South Africa).
- Coniolaria** Seigle-Mur., Guiraud, Steiman & Sage (1995) nom. inval. = Coniolarrella fide Seigle-Murandi *et al.* (*Cryptog. Bot.* 5: 346, 1995), García *et al.* (*MR* 110: 1271, 2006).
- Coniolarrella** D. García, Stchigel & Guarro (2006), ? Xylariaceae. Anamorph *Rhinocladiella*-like. 1 (from wood), Colorado. See García *et al.* (*MR* 110: 1285, 2006), García *et al.* (*MR* 110: 1271, 2006; phylogeny).
- Conioloma** Flörke (1815) = Arthonia fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Coniomela** (Sacc.) Kirschst. (1934) = Coniochaeta fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Coniomycetes** (obsol.). Class for fungi with spores borne in a naked mass, including certain anamorphic fungi, *Pucciniales* and *Ustilaginales* (Fries, *Syst. mycol.* 1, 1821).
- Coniophora** DC. (1815), Coniophoraceae. 20, widespread. *C. puteana* (cellar fungus) is a cause of rot in wood. See Lentz (*Mycol.* 49: 534, 1957; basidial development), Ginns (*CJB* 51: 249, 1973; type studies), Ginns (*Op. bot.* 61, 1982; world monogr.), Adaskaveg *et al.* (*Harvard Pap. Bot.* 6: 15, 2001; isolates from citrus), Huckfeldt & Schmidt (*Mycologist* 20: 42, 2006; key to strand-forming house-rot fungi).
- Coniophoraceae** Ulbr. (1928), Boletales. 6 gen. (+ 2 syn.), 29 spp.
Lit.: Cooke (*Mycol.* 49: 197, 1957; key), Donk (*Taxon*: 254, 1951-63), Hallenberg (*Lachnocladiaceae and Coniophoraceae of North Europe*, 1985), Besl *et al.* (*Z. Mykol.* 52: 277, 1986; chemosyst.), Hjortstam (*Windahlia* 17: 55, 1987), Pegler (*Serpula lacrymans. Fundamental Biology and Control Strategies*: 1, 1991), Singh *et al.* (*Mycologist* 7: 124, 1993), Gilbertson & Hemmes (*Mycotaxon* 65: 427, 1997), Bigelow *et al.* (*MR* 102: 257, 1998), Ginns (*Mycol.* 90: 19, 1998), Thorn *et al.* (*CJB* 76: 686, 1998), Schmidt & Moreth (*MR* 104: 69, 2000), Palfreyman *et al.* (*FEMS Microbiol. Lett.* 228: 281, 2003), Kauserud (*Mycol.* 96: 232, 2004), Kauserud *et al.* (*MR* 108: 1264, 2004), Kauserud *et al.* (*Mol. Ecol.* 13: 3137, 2004), Binder *et al.* (*Systematics and Biodiversity* 3: 113, 2005), Moreth & Schmidt (*Holzfor-schung* 59: 90, 2005), Kauserud *et al.* (*Mol. Ecol.* 15: 421, 2006).
- Coniophorafomes** Rick (1934), Stereaceae. 1, S. America.
- Coniophorella** P. Karst. (1889) = Coniophora fide Ginns (*Op. Bot.* 61, 1982).
- Coniophoropsis** Hjortstam & Ryvarden (1986), Boletales. 1, Argentina. See Hjortstam & Ryvarden (*My-cotaxon* 25: 540, 1986).
- Coniophyllum** Müll. Arg. (1892) = Calycidium fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Conioscypha** Höhn. (1904), anamorphic *Conioscyphascus*, Hso.0eP.20. 7, widespread. See Shearer (*Mycol.* 65: 128, 1973), Kirk (*TBMS* 82: 177, 1984; n.sp.), Matsushima (*Matsush. Mycol. Mem.* 7: 47, 1993), Matsushima (*Matsush. Mycol. Mem.* 9: 7, 1996), Chen & Tzean (*Bot. Bull. Acad. sin. Taipei* 41: 315, 2000; Taiwan), Réblová & Seifert (*Stud. Mycol.* 50: 95, 2004; phylogeny).
- Conioscyphascus** Réblová & Seifert (2004), ? Sordari-ales. Anamorph *Conioscypha*. 2, Europe. See Réblová & Seifert (*Stud. Mycol.* 50: 100, 2004).
- Conioscyphopsis** Goh & K.D. Hyde (1998), anamor-phic *Pezizomycotina*, Hso.???. 1, Australia. See Goh & Hyde (*MR* 102: 308, 1998).
- Coniosporiella** Bat. (1966) = Schiffnerula fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Coniosporiopsis** Speg. (1918) nom. conf., anamorphic *Pezizomycotina*. See Hughes (*CJB* 36: 754, 1958).
- Coniosporium** Link (1809), anamorphic *Chaetothyria-les*, Hsp.#eP.23. 7, Europe. See Sterflinger *et al.* (*Antonie van Leeuwenhoek* 72: 349, 1997), De Leo *et al.* (*Stud. Mycol.* 43: 70, 1999), Sterflinger *et al.* (*Stud. Mycol.* 43: 5, 1999; ecology), Sterflinger & Prillinger (*Antonie van Leeuwenhoek* 80: 275, 2001; phylog-eny), Selbmann *et al.* (*Stud. Mycol.* 51: 1, 2005).
- Coniotheciella** Speg. (1918) ? = Coniothecium fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Coniothecium** Corda (1833) nom. dub., anamorphic *Pezizomycotina*. See Hughes (*CJB* 36: 727, 1958), Hawksworth (*TBMS* 65: 219, 1975; redisp. licheni-colous spp.).
- Coniothele** Norman (1868) = Verrucaria Schrad. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Coniothyriaceae** W.B. Cooke (1983) = Leptosphaeri-aceae.
- Coniothyriella** Speg. (1889) nom. conf., *Pezizomy-cotina*. See Petrak & Sydow (*Beih. Rep. spec. nov. regn. veg.* 42: 322, 1927).
- Coniothyriella** Speg. (1910) $\equiv$ Coniothyria.
- Coniothyriites** Babajan & Tasl. (1970), Fossil Fungi. 1 (Tertiary), former USSR.
- Coniothyria** Syd. (1912), anamorphic *Pezizomy-cotina*, Cpd.0eP.15. 1 (on *Agave*), widespread (sub-tropical).
- Coniothyria** Petr. (1923) = Coniothyrium fide Clements & Shear (*Gen. Fung.*, 1931).
- Coniothyriopsiella** Bender (1932) ? = Cyclothyrium fide Sutton (*Mycol. Pap.* 141, 1977).
- Coniothyriopsis** Petr. (1923) = Cyclothyrium fide Sutton (*Mycol. Pap.* 141, 1977).
- Coniothyriopsis** Speg. (1910) ? = Microsphaeropsis Höhn. fide Sutton (*Mycol. Pap.* 141, 1977).
- Coniothyris** Clem. (1909) $\equiv$ Coniothyriella Speg. (1910).
- Coniothyrium** Corda (1840) nom. cons., anamorphic *Leptosphaeria*, Cpd.0-1eP.19. 44, widespread. See Westcott (*Mem. Cornell agric. Exp. Stn* 153, 1934; *C. minitans* (mycoparasite of sclerotia), Biga *et al.* (*Sydowia* 12: 258, 1959), Sutton (*Mycol. Pap.* 123, 1971; relationship to *Microsphaeropsis*), Sesan & Crisan (*Stud. Cercet. Biol. Acad. romana* 40: 71, 1988), Sesan (*Probl. Prot. Plant.* 17: 29, 1989),

- Sandys-Winsch *et al.* (*MR* 97: 1175, 1993; world distrib.), Wingfield *et al.* (*Mycopathologia* 136: 139, 1996; on *Eucalyptus*), Swart *et al.* (*S. Afr. J. Bot.* 64: 137, 1998; on *Proteaceae*), Guarro *et al.* (*Medical Mycology* 37: 133, 1999; clinical strain), Câmara *et al.* (*MR* 105: 41, 2001; teleomorphs in *Paraphaeosphaeria*), Muthumeenakshi *et al.* (*MR* 105: 1065, 2001; phylogeny, population structure), Sterflinger & Prillinger (*Antonie van Leeuwenhoek* 80: 275, 2001; rock-inhabiting spp.), Taylor & Crous (*Mycoscience* 42: 265, 2001; on *Proteaceae*), Grendene *et al.* (*MR* 106: 796, 2002; mycoparasitism), van Zyl *et al.* (*Mycopathologia* 155: 149, 2002; S Africa), Zyl *et al.* (*MR* 106: 51, 2002; S Africa, Thailand), Verkley *et al.* (*Stud. Mycol.* 50: 323, 2004; exclusion of mycoparasitic spp.), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Conisphaeria** Cooke (1879) nom. dub., Fungi. Based on various pyrenomycetes.
- conjugate**, joined; in twos; - **nuclei**, two nuclei in one cell which undergo division (- **division**) at the same time, as in basidiomycetes.
- conjugation**, copulation (q.v.), esp. isogamic copulation; - **tube**, a tube between two copulating cells.
- Conjunctospora** Udagawa & Uchiy. (1999), anamorphic *Pezizomycotina*, Hso.?.?. 1, Japan. See Udagawa & Uchiyama (*CJB* 76: 1638, 1998).
- conk**, the fruit-body (basidioma) of a wood-attacking fungus, esp. of a polypore.
- connate**, joined by growth.
- connective**, see disjunctor.
- connective hyphae**, hyphae of the connective tissue of the context (Fayod, 1889).
- Connersia** Malloch (1974), Pseudeurotiaceae. 1 (from soil, wood etc.), British Isles; Canada. See Suh & Blackwell (*Mycol.* 91: 836, 1999; phylogeny), Sogonov *et al.* (*Mycol.* 97: 695, 2005).
- connivent** (1) touching but not organically joined; (2) (of a pileus margin), touching the stipe.
- Conocybe** Fayod (1889) nom. cons., Bolbitiaceae. *c.* 200, widespread. See van Waveren (*Persoonia* 6: 119, 1970), Watling (*Fl. Illustr. Champ. Afr. centr.* 3: 57, 1974; key 13 Afr. spp.), Watling (*Revue Mycol. Paris* 40: 31, 1976), Watling (*British fungus flora* 3, 1982; key 58 Br. spp.), Arnolds & Hausknecht (*Persoonia* 18: 239, 2003; Netherlands), Hausknecht (*Öst. Z. Pilzk.* 12: 41, 2003; sect. *Mixtae*), Hausknecht *et al.* (*Öst. Z. Pilzk.* 13: 153, 2004; type stud. North American spp.), Hausknecht (*Beitr. Kenntn. Pilze Mitteleur.* 14: 93, 2005; stirps *Pilosella* in Europe), Hausknecht *et al.* (*Karstenia* 45: 1, 2005; Finland), Walther & Weiss (*Mycol.* 98: 792, 2006; Anamorphs).
- Conohypha** Jülich (1975), Meruliaceae. 2, Europe; USA. See Jülich (*Persoonia* 8: 303, 1975), Wojewoda (*Acta Mycologica Warszawa* 38: 3, 2003; Poland).
- Conoplea** Pers. (1801), anamorphic *Sarcosomataceae*, Hso.0eP.10. 8, widespread. See Hughes (*CJB* 38: 659, 1960; key), Vittal & Dorai (*Mycotaxon* 51: 27, 1994; India), Urban *et al.* (*MR* 108: 749, 2004).
- Conopleaceae** Chevall. (1826) = *Sarcosomataceae*.
- Conostoma** Bat. & J.L. Bezerra (1965), anamorphic *Pezizomycotina*, Hso.0eH.?. 1, Brazil. See Batista & Bezerra (*Riv. Patol. veg., Pavia Sér.* 4 1: 42, 1965).
- Conostroma** Moesz (1921), anamorphic *Colpoma*, St.0eH.10. 2, Europe; India. See Muthumary (*Curr. Sci.* 55: 1081, 1986; India spp.).
- Conotrema** Tuck. (1848) = *Stictis* fide Gilenstam (*Ark. Bot. ser. 2* 7: 149, 1969), Sherwood (*Mycotaxon* 5: 1, 1977), Aptroot *et al.* (*Biblthca Lichenol.* 64, 1997), Winka *et al.* (*Lichenologist* 30: 455, 1998), Wedin *et al.* (*New Phytol.* 164: 459, 2004; ecology, phylogeny), Wedin *et al.* (*Lichenologist* 37: 67, 2005; phylogeny), Wedin *et al.* (*MR* 110: 773, 2006; Scandinavia).
- Conotrematomyces** Cif. & Tomas. (1953) ≡ *Conotrema*.
- Conotremopsis** Vězda (1977), Stictidaceae (L). 1, Tasmania. See Vězda (*Folia geobot. phytotax.* 12: [313], 1977).
- Conservation** (of fungi). In view of the destruction of many habitats on a global scale and the threats of climate change, there is an increasingly urgent need to attend to conservation of rare and endangered fungi. Many groups of fungi are sensitive to environmental pollution, the most abundant evidence being for lichen-forming species. *In situ* conservation of fungi therefore prioritizes conservation of habitats and regulation of pollution (for *ex situ* fungal conservation, see Genetic resource collections). Fungal conservation is however still in its infancy. Public awareness is very low. Consequently, in many countries there is no explicit legal protection for fungi. Many national biodiversity action plans produced as a result of the Rio Convention (see Biodiversity) fail to consider fungi. The IUCN (The World Conservation Union) currently includes only two committees for fungal conservation in its Species Survival Commission (both listed under plants), one for fungi in general, the other for lichens (there are, in comparison, twenty committees for birds). There are serious practical problems in applying IUCN red-listing criteria to the fungi, and very few fungi have yet been formally evaluated using this system. The broader conservation movement is largely unaware of the need to conserve fungi (frequently only one or two token larger fungi are listed as endangered, and then usually as 'lower' plants), and fungi (for example host-specific species known only on rare endemic plants) may be treated as part of the problem (a threat to the plant) rather than recognized as being themselves in need of protection. Furthermore, the broader conservation movement usually identifies priority habitats on the basis of bird, mammal and flowering plant diversity, with fungi rarely taken into account. This can mean that habitats rich in fungal diversity are being missed by such categorization; host-specific fungi are frequently not found in all places where associated organisms occur; furthermore, like other groups of organisms, fungi are being affected by climate change with, for example, refugee species appearing in areas beyond their traditional geographical limits.
- The challenges for fungal conservation are therefore daunting. Efforts to date have emphasized gathering scientific evidence for threats and decline (there have also been successful efforts in the UK to identify 'important fungal areas'), but the political activity necessary to turn that evidence into results remains very small; there is little awareness of the need to maintain a distinction between those responsible for scientific evidence and those involved in the political promotion of conservation, and there is little dialogue between those interested in *in situ* and *ex situ* conservation. Evidence gathering has been di-

rected mainly towards the visually more striking larger fungi, including species forming conspicuous lichens. Basic activities include compilation of distribution and ecological data into regional and national databases from which **Red Lists** are prepared, comprising condensed information on threatened species. National lists have been prepared for most European countries for basidiomycetes and some larger ascomycetes (see Internet) but coverage is patchy. For lichens, there is a preliminary *Red List of Macrolichens in the European Community* (Sérusiaux, 1989) but, although efforts continue, there is still no European level red-list for any other group of fungi. For other parts of the world, red list coverage is usually poor to non-existent, although some impressive fungal conservation work has occurred in the north-west USA as an adjunct to projects conserving the northern spotted owl (e.g. Molina, *MR* 112: 613, 2008).

On the basis of the Red Lists, it appears that some ecological groups of basidiomycetes are more vulnerable than others: of special concern are (1) wood-inhabiting fungi (esp. bracket spp.) on large logs in virgin and old-growth forests, endangered by intensive forestry (Høiland & Bendiksen, in Arnolds & Kreisel, *Conservation of fungi in Europe*: 51, 1993; Kotiranta & Niemelä, *Threatened polypores in Finland*, 1993); (2) fungi of peat bogs, marshland and boggy forests, due to reclamation and drainage (Winterhoff & Krieglsteiner, *Beig. Veroff. Natur. Landschaftspflege Bad. Württ.* 40, 1984); (3) fungi of sand dunes, due to recreation, digging of sand and afforestation (Winterhoff & Krieglsteiner, 1984); (4) fungi of old, permanent pastures on soils poor in nutrients, due to increased fertilizer application, afforestation or lack of appropriate management (Arnolds, *Opera Bot.* 100: 7, 1989; Nitare, *Svensk bot. Tidskr.* 82: 341, 1988); (5) ectomycorrhizal fungi in forests on soils poor in nutrients, due to acidification and/or nitrogen accumulation from air pollution (Arnolds, *Agric. Ecosyst. Environm.* 35: 209, 1991; Dighton & Jansen, *Environm. Pollut.* 73: 179, 1991).

There is a wealth of evidence to show that lichens are also greatly affected by many of the above factors, but more particularly deforestation, agricultural practices and a wide variety of atmospheric pollutants (see Air pollution); a review of the principles and priorities of lichen conservation is provided by Seaward (*J. Hattori Bot. lab.* 52: 401, 1982). Experiments and circumstantial evidence have not demonstrated a strong correlation between collection of mushrooms and their decline (Egli *et al.*, *Mycol. Helv.* 3: 417, 1990), but rare lichens have disappeared as a result of over-zealous collecting for economic reasons (e.g. as a component of curries, wreaths, decorations) or for reference collections and exsiccata. Maintenance of threatened species and species diversity of fungi in general is often dependent on management practices (Keizer, in Pegler *et al.* (Eds), 1993: 251), but in deciding these, fungi are rarely taken into account.

There are very few non-governmental organizations specifically dedicated to fungal conservation. Mycologists in Europe co-operate through the European Council for Conservation of Fungi (ECCF), established by the 9th Congress of European Mycologists in Oslo (1985) and now the conservation wing of the European Mycological Association (see Socie-

ties and organizations). The ECCF is composed of national representatives of each country [other persons active in fungal conservation can be placed on the mailing list by request]. The ECCF organizes specialist meetings on fungal conservation between European Congresses, and short business meetings during those Congresses. The Bern Convention's Standing Order Committee failed in 2006 to adopt an ECCF submission presenting the scientific case for including 33 endangered larger fungi in its lists of strictly protected organisms, but in 2007, the Council for Europe adopted guidelines for conservation of macrofungi in Europe prepared by the ECCF. Some other mycological societies also have conservation groups: lichen conservation is catered for by a sub-committee of the International Association for Lichenology (and via its *Newsletter*). There is a Conservation Special Interest Group in the Australasian Mycological Society, and in November 2007, a specialist group for fungal conservation was established in Brazil. Three prototype Specialist Committees have been established for ascomycete conservation, rust & smut conservation, and for conservation of chromistans, chytrids, myxomycetes and zygomycetes (see Internet).

General introductions to fungal conservation are provided by Arnolds and Richardson (in Hawksworth (Ed.), *Frontiers in mycology*: 187, 243, 1991); Palm & Chapela (*Mycology in Sustainable Development*, 1997); Moore *et al.* (*Fungal Conservation. Issues and Solutions*, 2001). See also Biodiversity, Climate change.

Consetiella Hol.-Jech. & Mercado (1982), anamorphic *Pezizomycotina*, Hsy.-. 1, Cuba. See Holubová-Jechová & Mercado (*Mycotaxon* 14: 310, 1982), Mercado-Sierra *et al.* (*Mycotaxon* 67: 417, 1998).

consortium, a form of symbiosis (q.v.) in which two or more organisms live together in an interdependent way (obsol.).

conspecific, of two or more taxa considered to be one species; cf. synonym.

constipate, crowded together.

Constricta R. Heim & Mel.-Howell (1965) nom. inval., Agaricaceae. 1, Ivory Coast. See Heim & Meléndez-Howell (*Revue Mycol. Paris* 30: 324, 1965).

containment levels, see Safety, Laboratory.

contaminated (1) bearing, or intermixed with, a pathogen, as spores on seeds, fungi in soil (c.f. infection and infested); (2) (of cultures), not pure.

context (of hymenomycetes), the hyphal mass between the superior surface and the subhymenium or the trama of basidiocarps.

contiguous, touching; joining.

contingent, touching.

continuous (1) (of spores, hyphae, etc.), having no septa; (2) (of a stipe), one with the tissue of the pileus or peridium; (3) (of cultures), see culture.

control, to prevent or retard the development of a disease (Anon., *TBMS* 33: 154, 1950).

Contumyces Redhead, Moncalvo, Vilgalys & Lutzoni (2002), Agaricomycetes. 3, Europe. *Hymenochaetales* or *Agaricales* (*Rickenella* clade). See Redhead *et al.* (*Mycotaxon* 82: 161, 2002).

convergence, describes two organisms with many characters in common but which are descended from widely separate origins. Difficult to distinguish from parallelism due to intermediate conditions.

convex (of a pileus), equally rounded; broadly obtuse;

- convexo-expanded**, having the edge bent over; **convexo-plane**, convex when young, flat after expansion.
- Cooke** (Mordecai Cubitt; 1825-1914, England). Schoolmaster, Lambeth (1851-1860); cataloguer, India Museum, London (1862-1880); cryptogamic botanist, Royal Botanic Gardens, Kew (1880-1892). Like his countryman Berkeley (q.v.), he had wide interests in natural history from which his mycological work was the chief development. He was responsible for a very great number of books, papers, and other writings, producing *Science Gossip* for some years and starting (in 1872) the cryptogamic journal *Grevillea*, most of which was written by him during the twenty years the journal was under his control. He described a great number of new species, and new groupings, esp. of polypores and pyrenomycetes (*Grevillea* 1884-1890). His collection of some 46,000 specimens and 25,000 sheets of drawings, are now in the fungal reference collection of the Royal Botanic Gardens, Kew (K). *Publs. Handbook of British Fungi* (1871) [supplemented by 1,300 numbers of *Fungi Britannici Exsiccati*]; *Mycographia* (1875-1878) [pictures and accounts of discomycetes]; *Illustrations of British fungi (Hymenomycetes)* (1881-1891) [with 1,200 coloured plates, see *TBMS* 20: 33, 1935, for index]; *Handbook of Australian Fungi* (1892); *Fungoid Pests of Cultivated Plants* (1906). *Biogs, obits etc.* Ramsbottom (*TBMS* 5: 169, 1915); English (Mordecai Cubitt Cooke, 1987); Stafleu & Cowan (*TL-2* 1: 536, 1976).
- Cookeina** Kuntze (1891), Sarcoscyphaceae. 12, widespread (esp. tropical). See Pfister & Kaushal (*Mycotaxon* 20: 117, 1984; key), Landvik *et al.* (*Nordic J Bot.* 17: 403, 1997; DNA), Wang (*Mycotaxon* 62: 289, 1997; China), Harrington *et al.* (*Mycol.* 91: 41, 1999; phylogeny), Maldonado González (*Revta Jardín bot. Nac. Univ. Habana* 21: 305, 2000; Cuba), Weinstein *et al.* (*Mycol.* 94: 673, 2002; phylogeny), Meléndez-Howell *et al.* (*Mycotaxon* 87: 53, 2003; ultrastr.), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Iturriaga & Pfister (*Mycotaxon* 95: 137, 2006; monogr.).
- Cookella** Sacc. (1878), Cookellaceae. 1 (on *Articularia* and *Microstroma*), widespread. See Tehler (*CJB* 68: 2458, 1990; relationships, use as outgroup).
- Cookellaceae** Höhn. ex Sacc. & Trotter (1913), ? Myriangiales. 3 gen. (+ 11 syn.), 13 spp.
Lit.: Eriksson (*Op. Bot.* 60, 1981), Eriksson & Yue (*Mycotaxon* 38: 201, 1990), Tehler (*CJB* 68: 2458, 1990; rels, use as outgroup).
- Cooksonomyces** H.J. Swart & D.A. Griffiths (1974), anamorphic *Pezizomycotina*, Cac/St.≡ eP.19. 1, Australia. See Swart & Griffiths (*TBMS* 63: 152, 1974).
- Coolia** Huijsman (1943) nom. nud. = *Squamanita* fide Bas (*Persoonia* 3, 1965).
- coolplate**, a temperature-controlled plate on which cultures under a light source may be maintained without an undesirable rise in temperature. See Cooke (*FBPP News* 6: 37, 1981).
- Coonemeria** Mouch. (1997), Trichocomaceae. Anamorph *Paecilomyces*-like. 3, widespread. See Mouchacca (*Cryptog. Mycol.* 18: 1, 1997).
- Copelandia** Bres. (1912) = *Panaeolus* fide Kuyper (*in litt.*).
- Coppinsia** Lumbsch & Heibel (1998), ? Trapeliaceae (L). 1, Europe. See Lumbsch & Heibel (*Lichenologist* 30: 96, 1998), Heibel & Lumbsch (*Lichenologist* 31: 203, 1999; Germany), Lumbsch *et al.* (*MR* 111: 1133, 2007).
- Copranophilus** Speg. (1909) = *Pyxidiophora* fide Lundqvist (*Bot. Notiser* 133: 121, 1980), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Coprinaceae** Overeem & Weese (1924) = Agaricaceae.
- Coprinarius** (Fr.) P. Kumm. (1871) nom. rej. = *Panaeolus* fide Kuyper (*in litt.*).
- coprine**, a disulfuran-like metabolite of the edible *Coprinus atramentarius* which gives a reaction in humans similar to that of antabuse (q.v.).
- Coprinellus** P. Karst. (1879), Psathyrellaceae. Anamorph *Hormographiella*. c. 100, widespread. See Jørgensen & Stalpers (*Taxon* 50: 909, 2001; nomencl.), Ko *et al.* (*MR* 105: 1519, 2001; phylogeography), Redhead *et al.* (*Taxon* 50: 203, 2001; nomencl.), Gams (*Taxon* 54: 520, 2005; nomencl.), Cáceres *et al.* (*Antonie van Leeuwenhoek* 89: 79, 2006; anamorphs).
- Coprinites** Poinar & Singer (1990), Fossil Fungi. 1, Dominican Republic.
- Coprinopsis** Beeli (1929) ? = *Oudemansiella* fide Singer (*Agaric. mod. Tax.* edn 3, 1975).
- Coprinopsis** P. Karst. (1881), Psathyrellaceae. c. 200, widespread. See Jørgensen & Stalpers (*Taxon* 50: 909, 2001; nomencl.), Redhead *et al.* (*Taxon* 50: 203, 2001; nomencl.), Keirle *et al.* (*Fungal Diversity* 15: 33, 2004; Hawaii), Gams (*Taxon* 54: 520, 2005; nomencl.).
- Coprinus** Pers. (1797), Agaricaceae. Anamorph *Rhacophyllus*. c. 10 (coprophilous, on wood, etc.), widespread. The Ink-Caps. Some are edible; *C. comatus*, the shaggy ink-cap or shaggy-mane, is a common mushroom in waste places. The lamellae and their cystidia 'deliquesce' by autodigestion after spore discharge giving 'ink' that may be used for writing. A phylogenetic reconsideration of *Coprinus* s. lat. has led to a changed generic circumscription. The type species of the genus (and the generitype of the family) belongs to Agaricaceae; the other coprinoid taxa belong to Psathyrellaceae. See Buller (*Researches* 1-7, 1909; to 1950), Seaver (*Mycol.* 27: 83, 1935; lifting power), Lange (*Dansk bot. Ark.* 14 no. 6, 1952; biological species concept), Lange & Smith (*Mycol.* 45: 747, 1953), Orton (*TBMS* 40: 263, 1957), Kits van Waveren (*Persoonia* 5: 131, 1968; 'stercorarius' group), Anderson (*The life history and genetics of Coprinus lagopus*, 1971), Romagnesi (*BSMF* 92: 189, 1976; *C. micaceus*-group), van der Bogart (*Mycotaxon* 4: 233, 1976; Western N. Am. Sect. *Coprinus*), Patrick (*Mycotaxon* 6: 341, 1977; sectional ranks), Orton & Watling (*British Fungus Fl.* 3, 1979; keys 92 spp.), Reijnders (*Persoonia* 10: 384, 1979; development), van der Bogart (*Mycotaxon* 8: 243, 1979; Western N. Am. sect. *Seratulii*), Johnson & Vilgalys (*Mycol.* 90: 971, 1998), Hopple & Vilgalys (*Mol. Phylogen. Evol.* 13: 1, 1999), Redhead *et al.* (*Taxon* 50: 203, 2001; new systematic arrangement).
- Coprinusella** (Peck) Zerov (1979) = *Coprinus* fide Kuyper (*in litt.*).
- Coprobia** Boud. (1885) = *Cheilymenia* fide Moravec (*Mycotaxon* 38: 459, 1990), Moravec (*Libri Botanici* 21, 2005).
- Coprobolus** Cain & Kimbr. (1970), Thelebolaceae. 1 (coprophilous), Canada. Position is uncertain. See van Brummelen (*Persoonia* 16: 425, 1998).
- coprogen**, a growth factor in dung required by *Pilobo-*

- lus* spp. (Hesseltine *et al.*, *Mycol.* **45**: 7, 1953; Piddacks *et al.*, *J. Am. Chem. Soc.* **75**: 6064, 1953).
- Coprolepa** Fuckel (1870) = *Hypocopra* fide Cain (*Univ. Toronto Stud., Biol.* **38**, 1934), Læssøe (*SA* **13**: 43, 1994; ? synonym of *Xylaria*).
- coprome**, a physically and chemically uniform unit (pellet) of faeces used in experimental studies of coprophilous fungi (Wood & Cooke, *TBMS* **83**: 337, 1984).
- Copromyces** N. Lundq. (1967), Sordariaceae. 1 (coprophilous), Sweden; Canada. See Lundqvist (*Symb. bot. upsal.* **20** no. 1, 1972), Huhndorf *et al.* (*Mycol.* **96**: 368, 2004; phylogeny), Miller & Huhndorf (*Mol. Phylogen. Evol.* **35**: 60, 2005; phylogeny).
- Coprophilous fungi**. Fungi living on dung; fimicolous fungi. Fungi on dung include aerial contaminants, non-specialized species which have been eaten and survived passage through the gastro-intestinal tract, symbionts living in the gastro-intestinal tract excreted with the dung, and species specially adapted for living on dung. The last category are the coprophilous fungi, and they comprise many species from a wide range of taxonomic groups, e.g. most *Acrasiales*, some other *Mycetozoa*, *Mucorales*, *Pezizales*, *Sordariales*, *Coprinaceae*, and certain other *Basidiomycota*. Many produce violently discharged spores with sticky sheaths which, particularly for species on herbivorous dung, aid colonization of adjacent vegetation. Some coprophilous fungi are specific to particular types of animal, others seem to be generalists. There is often a distinct succession observable on decaying dung: some later colonizers may produce antibiotics to aid colonization, and among these are species (such as *Poronia punctata*) now endangered possibly partly as a result of antibiotic supplements to domesticated animal feeds.
- Lit.*: Bell (*Dung fungi: an illustrated guide to the coprophilous fungi in New Zealand*, 1983), Bell (*An illustrated guide to the coprophilous ascomycetes of Australia*, 2005), Cain (*Univ. Toronto Studies, biol. ser.* **38**, 1934 [reprinted 1968]; *Can. J. Res.* **C28**: 566; *CJB* **34**: 675; **35**: 255; **39**: 1633; **40**: 447, 1950-62; coprophilous ascomycetes I-VIII), Eliasson & Lundqvist (*Bot. Notiser* **132**: 551, 1979; coprophilous myxomycetes), Prokhorov (*Mikol. Fitopat.* **28**: 20; key 20 discom. gen.), Richardson (*MR* **105**: 387, 2001; diversity), Richardson & Watling (*Bull. BMS* **2**: 18, 1968; asco., basidio.; **3**: 86, 1969, phyco., keys; edn 2, 1975; edn 3, 1997), Webster (*TBMS* **54**: 161, 1970; review), Dix & Webster (*Fungal ecology*, 1995; review), Wicklow (*in* Carroll & Wicklow, *The fungal community*, edn 2 : 715, 1992). See also amonia fungi.
- Coprotiella** Jeng & J.C. Krug (1976), *Pezizomycetes*. 1, S. America. See van Brummelen (*Persoonia* **16**: 425, 1998; posn).
- Coprotinia** Whetzel (1944), *Sclerotiniaceae*. 1 (on dung), widespread (north temperate). See Holst-Jensen *et al.* (*Mycol.* **89**: 885, 1997; relationships), Holst-Jensen *et al.* (*Mycol.* **96**: 135, 2004; phylogeny).
- Coprotrichum** Bonord. (1851) = *Sporendonema* fide Mason & Hughes *in* Wood (Ed.) (*Nature* **179**: 328, 1957).
- Coprotus** Korf & Kimbr. (1967), *Thelebolaceae*. 23, widespread. See Pfister (*in litt.*), Häffner (*Rheinl.-Pfälz. Pilzj.* **5-6**: 134, 1995), Brummelen (*Persoonia* **16**: 425, 1998; posn), Prokhorov (*Mikol. Fitopatol.* **32**: 40, 1998), Suárez *et al.* (*Mycotaxon* **97**: 257, 2006; isozymes).
- copulants**, Kniep's name for copulating structures of like form.
- copulation**, the fusion of sexual elements; conjugation; **gametangial** -, the fusion of two sexual organs; **heterogamic** -, the fusion of gametes morphologically unlike; **isogamic** -, the fusion of gametes morphologically like; conjugation in the narrower sense; **planogamic** -, the fusion of motile gametes to give a motile zygote (a planozygote). Cf. merogamy.
- Cora** Fr. (1825) = *Dictyonema* C. Agardh ex Kunth fide Parmasto (*Nova Hedwigia* **29**: 99, 1978).
- Coraceae** Tomas. ex Tomas. (1950) = *Atheliaceae*.
- Coraemyces** Cif. & Tomas. (1954) = *Cora*.
- coral fungi**, basidiomata of *Clavariaceae*.
- coral spot**, a branch disease of shrubs and trees (*Nectria cinnabarina*).
- Corallicola** Volkm.-Kohlm. & Kohlm. (1992), *Halosphaeriaceae*. 1 (on coral), Belize. See Kohlmeyer & Volkmann-Kohlmeyer (*Mycotaxon* **44**: 417, 1992).
- Corallinopsis** Lagarde (1917), anamorphic *Pezizomycotina*, Hsy.0eP.?. 1 (on *Insecta*), France.
- Coralliochytrium** Domján (1937), *Chytridiales*. 1, Hungary. See Domján (*Folia Cryptog.* **2**: 22, 1937).
- Corallium** G. Hahn (1883) = *Ramaria* Fr. ex Bonord. fide Donk (*Reinwardtia* **2**: 435, 1954).
- Corallochytrium** Raghuk. (1987), ? *Choanozoa*. 1, Arabian Sea. See Cavalier-Smith & Allsopp (*Eur. J. Protist.* **32**: 1, 1996), Cavalier-Smith *in* Coombs *et al.* (Eds) (*Evolutionary Relationships Among Protozoa*: 375, 1998).
- Corallocytostroma** Y.N. Yu & Z.Y. Zhang (1980), anamorphic *Clavicipitaceae*, St. = eH.?. 2, China; Australia. See Yu & Zhang (*Acta Microbiol. Sin.* **20**: 232, 1980), Shivas *et al.* (*MR* **101**: 849, 1997), Pažoutová *et al.* (*MR* **108**: 126, 2004; ontogeny, phylogeny).
- Corallodendron** Jungh. (1838) [non *Corallodendron* Mill. 1754, *Papilionaceae*] = *Corallomyces* Fr. fide Samson & Seifert *in* Samson & Pitt (Eds) (*Advances in Penicillium and Aspergillus systematics* **102**: 397, 1985; represents a diatom).
- Coralloderma** D.A. Reid (1965), *Meruliaceae*. 2, Asia; Australia. See Reid (*Nova Hedwigia Beih.* **18**: 332, 1965).
- Corallofungus** Kobayasi (1983), *Hydnaceae*. 1, Japan. See Kobayasi (*J. Jap. Bot.* **56**: 174, 1983).
- coralloid**, much branched; like coral in form; esp. basidiomata of *Clavaria*. Cf. forate.
- Coralloidea** Roussel (1806) = *Ramaria* Fr. ex Bonord.
- Coralloides** Hoffm. (1789) nom. rej. prop. ? = *Stereocaulon* Hoffm. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Coralloides** Tourn. ex Maratti (1822) nom. rej. prop. = *Ramaria* Fr. ex Bonord. fide Donk (*Persoonia* **8**: 281, 1975).
- Coralloides** Wulfen (1776) nom. dub., *Fungi* (L).
- Corallomorpha** Opiz (1856) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* **141**, 1977).
- Corallomyces** Berk. & M.A. Curtis (1853) = *Corallomycetella* fide Rogerson (*Mycol.* **62**: 865, 1970), Rossman *et al.* (*Stud. Mycol.* **42**: 248 pp., 1999).
- Corallomyces** Fr. (1849), anamorphic *Pezizomycotina*, Hsy.0eH.?. 2, Africa; Java.
- Corallomycetella** Henn. (1904), *Nectriaceae*. Anamorphs *Fusarium*-like, *Rhizostilbella*. 2 (woody tis-

- sues), widespread (pantropical). See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- corbiculae**, protective structures forming a stroma around the telia of certain rusts (Kuhnoltz-Lordat, *Bull. mens. Acad. Sci. Lett. Montpellier* 71: 91, 1942; see *RAM* 26: 468, 1947); paraphyses; pseudoparaphyses.
- Corbulopsora** Cummins (1940), Pucciniaceae. 3 (on *Compositae*), Papua New Guinea; India. See Cummins (*Mycol.* 32: 364, 1940) Cf. *Miyagia*.
- Cordea** (August Karl Josef; 1809-1849, Czech). A medic; employed in the National Museum, Prague; lost at sea in the West Indies. His collections, previously thought lost with him, were rediscovered and are in the National Museum, Prague (PRM), see Pilát, *Acta Musei Naturalis Pragae* 1B: 139, 1938). *Publs. Pilze. Sturm's Deutschlands Flora* (1829-1841); *Icones Fungorum hucusque Cognitorum* 6 parts (1837-1854) [the last part by Zobel]; *Anleitung zum Studium der Mycologie* (1842). *Biogs, obits etc.* Šebek (*Česká Mykologie* 38: 129, 1984); Šebek (*Mykologický Sborník* 61: 113, 1984); Stafleu & Cowan (*TL-2* 1: 546, 1976).
- Cordalia** Gobi (1885) = *Tuberculina* fide Saccardo (*Syll. fung.* 4: 653, 1886).
- Cordana** Preuss (1851), anamorphic *Pezizomycotina*, Hso.1eP.6. 13, Europe; tropical. *C. musae* (banana leaf spot). See Hughes (*CJB* 33: 259, 1955), de Hoog *et al.* (*Proc. K. Ned. Akad. Wet. Ser. C, Biol. Med. Sci.* 86: 197, 1983), Priest (*MR* 94: 861, 1990; spp. on *Musa*, Australia), Castañeda Ruiz *et al.* (*Mycotaxon* 73: 1, 1999; Venezuela), Markovskaja (*Mycotaxon* 87: 179, 2003; Lithuania), Cai *et al.* (*Sydowia* 56: 222, 2004; China), Soares *et al.* (*Fungal Diversity* 18: 147, 2005; Brazil).
- Cordella** Speg. (1886), anamorphic *Apiospora*, Hso.0eP.37. 4, pantropical. See Subramanian (*Proc. Indian natn Sci. Acad. Part B. Biol. Sci.* 55: 38, 1962), Reynolds & Gilbert (*Aust. Syst. Bot.* 18: 265, 2005; Australia), Reynolds & Gilbert (*Cryptog. Mycol.* 27: 249, 2006; Panamá).
- Cordierites** Mont. (1840), ? Helotiales. 3, widespread. See Samuels & Kohn (*Sydowia* 39: 202, 1986; NZ), Zhuang (*Mycotaxon* 31: 261, 1988; key), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006; phylogeny).
- Corditubera** Henn. (1897), Boletales. 5, Africa (tropical). See Demoulin & Dring (*Bull. Jard. bot. nat. Belg.* 45: 345, 1975), Malençon (*Cryptog. Mycol.* 4: 1, 1983), Verbeken & Walley (Boll. Gruppo Micol. 'G. Bresadola' 46: 87, 2003).
- Cordycepioideus** Stifler (1941) = *Ophiocordyceps* fide Blackwell & Gilbertson (*Mycol.* 76: 763, 1984), Blackwell & Rossi (*Mycotaxon* 25: 581, 1986; ecology), Samson *et al.* (*Atlas of Entomopathogenic Fungi*, 1988), Ochiel *et al.* (*Mycologist* 11: 7, 1997), Suh *et al.* (*Mycol.* 90: 611, 1998; phylogeny), Sung *et al.* (*Stud. Mycol.* 57: 1, 2007).
- Cordyceps** Fr. (1824) nom. cons., Cordycipitaceae. Anamorphs *Beauveria*, *Isaria*, *Lecanicillium*, *Akanthomyces*, *Mariannaea*. 90 (mostly on insects; caterpillar fungi, vegetable caterpillars), widespread. Recently split into a number of segregates, including *Ophiocordyceps*, *Metacordyceps* and *Elaphocordyceps*; see also these genera. See Kobayasi (*Bull. Biogeogr. Soc. Japan* 9: 271, 1939; Japan), Mains (*Mycol.* 50: 169, 1957; N. Am., key), Willis (*Muelleria* 1: 2, 1959; Australia, key), Kobayasi & Shimizu (*Bull. natn. Sci. Mus. Tokyo*, B 5: 69, 1960), Kobayasi & Shimizu (*Bull. natn. Sci. Mus. Tokyo*, B 2: 133, 1976; New Guinea), Evans & Samson (*TBMS* 79: 431, 1982), Evans & Samson (*TBMS* 82: 127, 1984; on ants), Hameed *et al.* (*Revue roum. Biol. Sér. Biol. Végét.* 29: 147, 1984; *Ophiocordyceps*), Samson *et al.* (*Atlas of Entomopathogenic Fungi*, 1988), Ito & Hirano (*Lett. Appl. Microbiol.* 25: 239, 1997; DNA), Tzean *et al.* (*Atlas of Entomopathogenic Fungi from Taiwan*, 1997), Chen *et al.* (*Biochemical Genetics* 37: 201, 1999; DNA), Artjariyasriping *et al.* (*Mycoscience* 42: 503, 2001; phylogeny), Guzmán *et al.* (*Mycotaxon* 78: 115, 2001; Mexico), Kinjo & Zang (*Mycoscience* 42: 567, 2001; *Ophiocordyceps*, China), Liu *et al.* (*J. Invert. Path.* 78: 178, 2001), Liu *et al.* (*MR* 105: 827, 2001; *Ophiocordyceps*, anamorph), Nikoh & Fukatsu (*Mol. Biol. Evol.* 18: 1631, 2001; phylogeny, introns), Park *et al.* (*Mycobiology* 29: 121, 2001; phylogeny), Huang *et al.* (*Mycotaxon* 81: 229, 2002; *Beauveria* anamorph), Hywel-Jones (*MR* 106: 2, 2002; ascospores), Liu *et al.* (*MR* 106: 1100, 2002; phylogeny, anamorphs), Evans (*Mycology Series* 19: 517, 2003; biocontrol), Fukatsu & Nikoh (*Mycology Series* 19: 311, 2003; host relations), Stensrud *et al.* (*MR* 109: 41, 2005; phylogeny), Yokoyama *et al.* (*FEMS Microbiol. Lett.* 250: 145, 2005; heterothallism), Torres *et al.* (*Mycotaxon* 94: 253, 2005), Stensrud *et al.* (*MR* 111: 409, 2007; evolution in *C. sinensis*), Sung *et al.* (*Stud. Mycol.* 57: 1, 2007; phylogeny, monogr.).
- Cordycipitaceae** Kreisel ex G.H. Sung, J.M. Sung, Hywel-Jones & Spatafora (2007), Hypocreales. 15 gen. (+ 18 syn.), 250 spp. See Sung *et al.* (*Stud. Mycol.* 57: 1, 2007; phylogeny, monogr.), Sung *et al.* (*Mol. Phylogen. Evol.* 44: 1204, 2007; phylogeny).
- Cordylia** Fr. (1818) [non *Cordylia* Pers. 1807, *Leguminosae*] = *Cordyceps*.
- Cordyliceps** Fr. (1832) = *Cordyceps*.
- Corella** Vain. (1890) = *Dictyonema* C. Agardh ex Kunth fide Parmasto (*Nova Hedwigia* 29: 99, 1978).
- Coremiaceae** Nann. (1934) = *Trichocomaceae*.
- Coremiales**, see *Hyphomycetes*.
- Coremiella** Bubák & K. Krieg. (1912), anamorphic *Pezizomycotina*, Hsy.0eP.40. 1, widespread. See Ellis (*Dematiaceous Hyphomycetes*, 1971), Comerio *et al.* (*Revta Iberoamer. Micol.* 22: 50, 2005).
- Coremiopsis** Sizova & Suprun (1957) ? = *Isaria* fide Samson (*Stud. Mycol.* 6, 1974).
- Coremium** Link (1809) = *Penicillium* Link fide Thom (*Bull. Bur. Anim. Ind. USDA* 118, 1910), Seifert & Samson (*Advances in Penicillium and Aspergillus Systematics* 102: 143, 1985).
- coremium**, see *synnema*.
- Corenohydnium** Lloyd (1936) nom. dub., Fungi.
- Coreomyces** Thaxt. (1903), Laboulbeniaceae. 20, widespread. See Majewski (*Acta Mycologica Warszawa* 9: 217, 1973; Polish spp.), Tavares (*Mycol. Mem.* 9: 627 pp., 1985), Majewski (*TMSJ* 29: 151, 1988; Japan), Santamaría (*Fl. Mycol. Iberica* 5, 2003; Iberian peninsula).
- Coreomycetopsis** Thaxt. (1920), ? Laboulbeniaceae. 1 (on termites), West Indies; USA. See Blackwell & Kimbrough (*Mycol.* 68: 541, 1976; structure and development), Henk *et al.* (*Mycol.* 95: 561, 2003).
- Corethromyces** Thaxt. (1892), Laboulbeniaceae. 82 (on beetles), widespread. See Tavares (*Mycol. Mem.* 9, 1985), Santamaría (*Mycol.* 89: 325, 1997; on rove beetles), Weir & Rossi (*Mycol.* 93: 171, 2001; Bolivia), Weir & Hughes (*Mycol.* 94: 483, 2002; New

- Zealand), Rossi & Máca (*Sydowia* 58: 110, 2006; Czech Republic), Santamaria (*Nova Hedwigia* 82: 349, 2006; Spain), Rossi & Weir (*Mycol.* 99: 131, 2007; S America).
- Corethrospis** Corda (1839), anamorphic *Pezizomycotina*, Hsy.0eH.?. 3, Europe; America.
- Corethrostroma** Kleb. (1933), anamorphic *Pezizomycotina*, St.0eH.?. 1, Europe.
- coriacellate**, somewhat coriaceous.
- coriaceous**, like leather in texture.
- Corinophoros** A. Massal. (1856) nom. rej. = *Peccania* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Coriolaceae** Singer (1961) = Polyporaceae.
- Coriolellus** Murrill (1905) = *Antrodia* fide Donk (*Verh. K. ned. Akad. Wet.* tweede sect. 62: 1, 1974).
- Coriolopsis** Murrill (1905), Polyporaceae. 17, widespread. See Pegler (*The polypores* [Bull. BMS Suppl.], 1973), Ryvarden & Johansen (*Prelim. Polyp. Fl. E. Afr.*: 315, 1980; key 10 Afr. spp.).
- Coriolus** Quél. (1886) = *Trametes* fide Singer (*Publicações Inst. Micol. Recife* 304, 1961), Domanski *et al.* (*Polyporaceae* edn 2, 1973) See also.
- Coriscium** Vain. (1890) nom. utique rej. = *Lichenomphalia* fide Stalpers (*in litt.*). The name has been used for the anamorph (lichenized squamules) of certain lichenized species of *Omphalina* and is now listed as nom. utique rej. See Redhead & Kuyper (*Arctic Alpine Mycology* 2: 319, 1987).
- corium**, see Spore wall and Fig. 5.
- corkir**, see cudbear.
- Cormothecium** A. Massal. (1854) = *Rhizocarpon* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Corneohydnum** Lloyd (1924) nom. nud., ? Agaricomycetes. ? Basidiomycetes.
- corneous** (1) horn-like in texture; (2) (of a substance), like horn.
- Corner** (Edred John Henry; 1906-1996; England, later Singapore). Assistant Director, Singapore Botanic Garden (1929-1939, remaining in Singapore until 1945); Principal Field Scientific Officer, UNESCO (1946); Lecturer in Botany (1949), then Reader in Plant Taxonomy (1959), then Professor of Tropical Botany (1966), Cambridge University; Fellow of the Royal Society of London (1955); developed the concept of hyphal systems, using analysis of hyphal development to elucidate phylogeny in basidiomycetes; his taxonomic monographs demonstrated the huge diversity of basidiomycetes in southeast Asia. *Publs. Ad Polyporaceas I-VII Beihefte zur Nova Hedwigia* (1983-1989). *Biogs, obits etc.* Watling & Ginns (*Mycol.* 90: 732, 1998) [portrait]; Watling (*MR* 105: 1533, 2001) [portrait].
- Corneromyces** Ginns (1976), Boletales. 1, Sabah. See Ginns (*Mycol.* 68: 970, 1976).
- Corneromycetaceae** Jülich (1979) = Coniophoraceae.
- Corneroporus** Hattori (2001), Bankeraceae. 1, Malaysia. See Hattori (*Mycoscience* 42: 426, 2001).
- Cornicularia** (Schreb.) Hoffm. (1792), Parmeliaceae (L.). 1, widespread (north temperate). See Kärnefelt (*Op. Bot.* 86: 1, 1986), Kärnefelt *et al.* (*Pl. Syst. Evol.* 183: 113, 1992), Thell *et al.* (*Mycol. Progr.* 1: 335, 2002; phylogeny), Peršoh *et al.* (*Mycol. Progr.* 3: 103, 2004; asci, photobionts), Thell *et al.* (*Symb. bot. upsal.* 34 no. 1: 429, 2004; biogeography), Randlane & Saag (*Central European Lichens*: 75, 2006; key).
- Cornicularia** Bonord. (1851) = *Clavulinopsis* fide Corner (*Ann. Bot. Mem.* [A monograph of *Clavaria* and allied genera] 1, 1950).
- Cornicularia** Schaer. (1850) = *Alectoria* Ach.
- Corniculariaceae** Schaer. (1850) = Parmeliaceae.
- Corniculariella** P. Karst. (1884), anamorphic *Durandiella*, St.0fH.15. 7, widespread. See DiCosmo (*CJB* 56: 1665, 1978), Illman (*Taxon* 34: 512, 1985; typification), Verkley (*Nova Hedwigia* 75: 433, 2002).
- corniform**, shaped like a horn (Fig. 23.36).
- Corniola** Gray (1821) [non *Corniola* Adans. 1763, *Leguminosae*] = *Arrhenia* fide Redhead (*CJB* 62: 865, 1984).
- Cornipulvina** Huhndorf, A.N. Mill., F.A. Fernández & Lodge (2005), Boliniaceae. 1, neotropics. See Huhndorf *et al.* (*Fungal Diversity* 20: 61, 2005).
- Cornucopiella** Höhn. (1915), anamorphic *Pezizomycotina*, Cpd.0eH.15. 2, Europe. See Seifert (*TBMS* 85: 123, 1985), Okada & Tubaki (*Sydowia* 39: 148, 1986).
- Cornuella** Setch. (1891) [non *Cornuella* Pierre 1891, *Sapotaceae*] = *Tracya*.
- Cornularia** Sacc. (1884) = *Corniculariella* fide DiCosmo (*CJB* 56: 1665, 1978).
- Cornuntum** Velen. (1947), ? Helotiales. 1, Europe.
- cornute** (1) horned; horn-like in form; (2) (of aecia), see roestelia.
- Cornutispora** Piroz. (1973), anamorphic *Pezizomycotina*, Cpd.1bH.10. 4 (on lichens and *Rhytismatales*), widespread. See Hawksworth (*TBMS* 67: 151, 1976), Martínez & Hafellner (*Mycotaxon* 69: 271, 1998), Punithalingam (*MR* 107: 917, 2003; cytology), Knoph (*Biblthca Lichenol.* 88: 345, 2004; Japan).
- Cornutostilbe** Seifert (1990), anamorphic *Pezizomycotina*, Hsy.0eH.1. 1, Indonesia. See Seifert (*Mem. N. Y. bot. Gdn* 59: 120, 1990).
- Cornuvesica** C.D. Viljoen, M.J. Wingf. & K. Jacobs (2000), Microascales. Anamorph *Chalara*-like. 1, Europe; N. America. See Viljoen *et al.* (*MR* 104: 365, 2000), Hausner *et al.* (*CJB* 81: 40, 2003), Hausner & Reid (*CJB* 82: 752, 2004; phylogeny).
- Corollium** Sopp (1912) = *Paecilomyces* fide Raper & Thom (*Manual of the Penicillia*, 1949).
- Corollospora** Werderm. (1922), Halosphaeriaceae. Anamorphs *Clavariopsis*-like, *Sigmoidea*, *Varicosporina*. 19 (on wood or sand, marine), widespread. See Nakagiri (*TMSJ* 27: 197, 1986; anamorphs), Kohlmeyer & Volkmann-Kohlmeyer (*TBMS* 88: 181, 1987; key 6 spp.), Nakagiri & Tokura (*TMSJ* 28: 413, 1987; key 13 spp.), Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 34: 1, 1991; key), Read *et al.* (*Bot. Mar.* 35: 553, 1992; asci), Spatafora *et al.* (*Am. J. Bot.* 85: 1569, 1998; phylogenetic analysis), Chen *et al.* (*Mycol.* 91: 84, 1999; DNA), Kong *et al.* (*MR* 104: 35, 2000; DNA), Campbell *et al.* (*Fungal Diversity Res. Ser.* 7: 15, 2002; phylogeny, revision), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny), Hsieh *et al.* (*Bot. Mar.* 50: 302, 2007; ontogeny).
- Coronasclerotes** Stach & Pickh. (1957), Fossil Fungi. 5 (Carboniferous), Germany.
- coronate**, crowned.
- Coronatomyces** Dania García, Stchigel & Guarro (2004), ? Sordariaceae. 1, Cuba. Perhaps synonymous with *Boothiella*. See García *et al.* (*Stud. Mycol.* 50: 144, 2004).
- Coronella** P. Crouan & H. Crouan (1867) = *Kickxella* fide Linder (*Farlowia* 1: 49, 1943).
- Coronellaria** P. Karst. (1870), Dermateaceae. 4,

- Europe. See Scheuer (*Bibliotheca Mycol.* 123, 1988), Magnes & Hafellner (*Bibliotheca Mycol.* 139, 1991), Raitviir & Leenurm (*Folia cryptog. Estonica* 38: 63, 2001; Estonia).
- Coronicium** J. Erikss. & Ryvar den (1975), Pterulaceae. 5, widespread (north temperate); Hawaii. See Eriksson & Ryvar den (*Cortic. N. Europ.* 4, 1976), Gilbertson & Hemmes (*Mem. N. Y. bot. Gdn* 89: 81, 2004; Hawaii).
- Coronium** Bonord. (1864) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Coronopapilla** Kohlm. & Volkm.-Kohlm. (1990), ? Zopfiaceae. 1 (marine), Belize. See Kohlmeyer & Volkmann-Kohlmeyer (*MR* 94: 685, 1990), Eriksson & Hawksworth (*SA* 8: 7, 1991).
- Coronophora** Fuckel (1864), Nitschkiaceae. 5 (from wood), Europe. See Subramanian & Sekar (*Kavaka* 18: 19, 1993), Huhndorf *et al.* (*MR* 108: 1384, 2004).
- Coronophoraceae** Höhn. (1907) = Nitschkiaceae.
Lit.: Nannfeldt (*Svensk bot. Tidskr.* 69: 49, 1975), Subramanian & Sekar (*Kavaka* 18: 19, 1993) but the rank originally intended by Höhnelt is uncertain. See.
- Coronophorales** Nannf. (1932). Hypocreomycetidae. 4 fam., 26 gen., 87 spp. Fams:
- (1) **Bertiaceae**
 - (2) **Chaetosphaerellaceae**
 - (3) **Nitschkiaceae**
 - (4) **Scortechiniaceae**
- For *Lit.* see under fam.
- Coronophorella** Höhn. (1909) = Nitschkia fide Müller & von Arx in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 87, 1973).
- Coronoplectrum** Brusse (1987), Parmeliaceae (L). 1, Namibia. See Brusse (*Mycotaxon* 28: 131, 1987).
- Coronospora** M.B. Ellis (1971), anamorphic *Ascoronospora*, Hso.≡ eP.10. 4, S.E. & E. Asia. See Ellis (*Mycol. Pap.* 125: 16, 1971), Matsushima (*Matsush. Mycol. Mem.* 10, 2001; connection), Zhang & Zhang (*Mycosystema* 23: 331, 2004).
- Coronotelium** Syd. (1921) = Puccinia fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- correct** (of names), see Nomenclature.
- correlated species** (of *Pucciniales*), a species derived by reduction (of life cycle or morphology) from a parent heteroecious macrocyclic species/or the parent species itself.
- Corrugaria** Métrod (1949) = *Mycena* fide Singer (*Agaric. mod. Tax.*, 1951).
- corrugate**, wrinkled.
- cortex**, a more or less thick outer covering; **epi-** (q.v.); **corticate**, having a cortex.
- corticate**, see cortex.
- Corticiaceae** Herter (1910) nom. cons., Corticiales. 29 gen. (+ 8 syn.), 136 spp. Traditionally this family contained the resupinate homobasidiomycetes, which are now divided over more than 10 orders.
Lit.: Larsson (*MR* 111: 1040, 2007).
- Corticiales** K.H. Larss. (2007). Agaricomycetes. 1 fam., 29 gen., 136 spp. Fam.:
Corticiaceae
For *Lit.* see under fam.
- Corticifraga** D. Hawksw. & R. Sant. (1990), ? Lecanorales. 2 (on lichens, *Peltigerales*), widespread (esp. temperate). See Hawksworth & Santesson (*Bibliotheca Lichenol.* 38: 123, 1990), Martínez & Hafellner (*Mycotaxon* 69: 271, 1998; Sapin, Portugal), Zhurbenko (*Mikol. Fitopatol.* 35: 34, 2001; Russia), Hafellner *et al.* (*Mycotaxon* 84: 293, 2002; N America), Hawksworth (*Lichenologist* 35: 191, 2003; UK, Ireland), Zhurbenko (*Lichenologist* 39: 221, 2007; review).
- corticoid**, of a form resembling *Corticium*; specifically, with a smooth hymenium.
- Corticoides** Lloyd (1908) = *Tremella* Pers. fide Lloyd (*Mycol. Writ. (Myc. Notes No. 57)* 5: 816, 1919).
- Corticirama** Pilát (1957), Corticiaceae. 2, Europe. See Pilát (*Beih. Sydowia* 1: 128, 1957).
- Corticiruptor** Wedin & Hafellner (1998), Lecanorales (L). 1, Norway. See Wedin & Hafellner (*Lichenologist* 30: 86, 1998).
- Corticium** Fr. (1835) = *Phanerochaete* fide Donk (*Per-soonia* 3: 199, 1964).
- Corticium** Pers. (1794), Corticiaceae. 25, widespread. *C. solani* (anamorph *Rhizoctonia solani*), see *Thanatephorus*, and *C. salmonicolor* (pink disease of rubber, tea, and other tropical plants, see *Phanerochaete*. Formerly used for many resupinate basidiomycetes; now restricted to the species previously known as *Laeticorticium*. See Eriksson & Ryvar den (*Cortic. N. Europ.* 4: 759, 1976; key 5 Eur. spp.), Larsen & Gilbertson (*Norw. JI Bot.* 24: 99, 1977), Greslebin & Rajchenberg (*N.Z. JI Bot.* 41: 437, 2003; Patagonia), Duhem & Michel (*BSMF* 122: 145, 2006; key s.str.).
- corticulous**, living on bark; **corticole**, an organism which does this.
- Corticomyces** A.I. Romero & S.E. López (1989), anamorphic *Agaricomycetes*. 1 (with clamp-connexions), Argentina. See Romero & López (*Mycotaxon* 34: 431, 1989).
- cortina** (of agarics), a partial veil (or part of one), frequently web-like, covering the mature gills.
- Cortinaria**, see *Cortinarius*.
- Cortinariaceae** R. Heim ex Pouzar (1983) nom. cons., Agaricales. 12 gen. (+ 28 syn.), 2104 spp.
Lit.: Ammirati *et al.* (*Poisonous Mushrooms of the Northern United States and Canada*: 396 pp., 1986), Bidaud *et al.* (*Atlas des Cortinaires* 8: 239, 1996), Liu *et al.* (*CJB* 75: 519, 1997), Brandrud (*Edinb. J. Bot.* 55: 65, 1998), Hibbett *et al.* (*Nature* 407: 506, 2000) suggest that *Cortinariaceae* could be the sistergroup to *Hydnangiaceae*, while the inclusion of *Inocybe* is not supported. Several gastroid taxa are also included in the *Cortinariaceae*, Høiland & Holst-Jensen (*Mycol.* 92: 694, 2000), Moncalvo *et al.* (*Syst. Biol.* 49: 278, 2000), Bougher & Lebel (*Aust. Syst. Bot.* 14: 439, 2001), Peintner *et al.* (*Am. J. Bot.* 88: 2168, 2001), Peintner *et al.* (*Mycol.* 94: 620, 2002), Garnica *et al.* (*MR* 107: 1143, 2003), Garnica *et al.* (*Mycol.* 95: 1155, 2003), Peintner *et al.* (*MR* 107: 485, 2003), Peintner *et al.* (*Mycol.* 96: 1042, 2004), Frøslev *et al.* (*Mol. Phylogen. Evol.* 37: 602, 2005), Matheny (*Mol. Phylogen. Evol.* 35: 1, 2005), Vesterholt (*Fungi of Northern Europe* 3: 146 pp., 2005), Garnica *et al.* (*CJB* 83: 1457, 2005), Moreau *et al.* (*Mol. Phylogen. Evol.* 38: 794, 2006).
- Cortinariales** = Agaricales.
- cortinarins**, toxic fluorescent cyclic decapeptides produced by *Cortinarius* spp. (Laatsch & Matthies, *Mycol.* 83: 492, 1991). See also mycetismus (*Mycetism*).
- Cortinarius** (Pers.) Gray (1821) nom. cons., Cortinariaceae. c. 2000, widespread (esp. north temperate). The genus has been subdivided in a number of subgenera, but these usually lack phylogenetic quality or make other groups non-monophyletic. Recognition of *Dermocybe* as a separate genus would make the rest

- of *Cortinarius* paraphyletic. See Moser (*Die Gattung Phlegmacium*, 1960; key European subgen. *Phlegmacium*), Horak & Moser (*Nova Hedwigia* 10: 211, 1965; key), Moser (*Z. Pilzk.* 35: 213, 1969; key European subgen. *Leprocybe*), Moser (*Schweiz. Z. Pilzk.* 50: 153, 1972; key), Moser & Horak (*Beih. Nova Hedwigia* 52: 513, 1975; key South American spp.), Brandrud (*Nordic Jl Bot.* 3: 577, 1983; key European subgen. *Cortinarius*), Høiland (*Op. bot.* 71: 1, 1984; key European spp. subgen. *Dermocybe*), Beaton *et al.* (*Kew Bull.* 40: 171, 1985; key Austral.), Gill & Steglich (*Progr. Chem. Nat. Prod.* 51, 1987; pigment chemistry), Brandrud *et al.* (*Cortinarius Flora Photographica*, 1990; European spp.), Horak & Wood (*Sydowia* 42: 88, 1990; key Australasian subgen. *Myxadium* and *Paramyxadium*), Reumaux *et al.* (*Atlas des Cortinaires*, 1990; European spp.), Bendiksen *et al.* (*Sommerfeltia* 19: 1, 1993; key European spp. subgen. *Myxadium*), Gill (*Aust. Jl Chem.* 48: 1, 1995; pigments in Australian spp.), Horak (*Beih. Sydowia* 10: 101, 1995; key Australasian subgen. *Phlegmacium*), Liu *et al.* (*CJB* 75: 519, 1997; phylogeny), Høiland & Holst-Jensen (*Mycol.* 92: 694, 2000; phylogeny), Seidl (*Mycol.* 92: 1091, 2000; phylogeny subgen. *Myxadium*), Soop (*BSMF* 117: 91, 2001; New Zealand sp.), Peintner *et al.* (*Mycotaxon* 81: 177, 2002; syn. of *Cortinarius*), Consiglio *et al.* (*Il Genere Cortinarius in Italia* 1, 2003; Italy), Garnica *et al.* (*MR* 107: 1143, 2003; South American spp.), Consiglio *et al.* (*Il Genere Cortinarius in Italia* 2, 2004; Italy), Francis & Bougher (*Australasian Mycologist* 23: 1, 2004; Western Australian spp.), Soop (*Cortinarius in Sweden*, 2004; Sweden), Antonini *et al.* (*Il Genere Cortinarius in Italia*, 2005; keys to subgen.), Bidaud *et al.* (*Atlas des Cortinaires* 15: 983, 2005), Consiglio *et al.* (*Il Genere Cortinarius in Italia* 3, 2005; Italy), Consiglio *et al.* (*Rivista di Micologia* 49: 29, 2006; sect. *Cystidiosis*) *Cortinarius* poisoning, see Mycetism.
- Cortinellus** Roze (1876) = *Tricholoma* fide Singer (*Agaric. mod. Tax.*, 1951).
- Cortiniopsis** J. Schröt. (1889) = *Lacrymaria*.
- Cortinomyces** Bougher & Castellano (1993) = *Protoglossum*.
- Corylomyces** Stchigel, M. Caldach & Guarro (2006), *Lasiosphaeriaceae*. 1, France. See Stchigel *et al.* (*MR* 110: 1362, 2006).
- Corylophomyces** R.K. Benj. (1994), *Laboulbeniaceae*. 5, widespread. See Benjamin (*Aliso* 14: 42, 1994), Benjamin (*Aliso* 18: 71, 1999), Santamaría (*Fl. Mycol. Iberica* 5, 2003).
- Corymbomyces** Appel & Strunk (1904) = *Gliocladium* fide Kendrick & Carmichae in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 390, 1973).
- corymbose**, arranged in clusters.
- Corynascella** Arx & Hodges (1975), ? *Chaetomiaceae*. 3, widespread. See von Arx (*Beih. Nova Hedwigia* 94, 1988; key), Guarro *et al.* (*Mycol.* 89: 955, 1997), Stchigel *et al.* (*Mycol.* 95: 1218, 2003).
- Corynascus** Arx (1973), *Chaetomiaceae*. Anamorph *Myceliophthora*. 7, widespread. See von Arx (*Stud. Mycol.* 8: 21, 1975), von Arx (*Beih. Nova Hedwigia* 94, 1988; key), Mouchacca (*Cryptog. Mycol.* 18: 19, 1997; thermophilic spp.), Sigler *et al.* (*Mycotaxon* 68: 185, 1998), Stchigel *et al.* (*MR* 104: 879, 2000; key).
- Coryne** Nees (1816), anamorphic *Ascocoryne*, Hsy.0eH.15. 1, widespread (esp. temperate). See Seifert (*Stud. Mycol.* 31: 157, 1989).
- Coryneaceae** Corda (1839) = *Pseudovalsaceae*.
- Corynecystis** Brusse (1985), *Lichinaceae* (L). 1, S. Africa. See Brusse (*Bothalia* 15: 552, 1985).
- Corynelia** Ach. (1823), *Coryneliaceae*. 7 (on *Podocarpaceae*), widespread (esp. tropical and south temperate). See Benny *et al.* (*Bot. Gaz.* 146: 238, 1985), Johnston & Minter (*MR* 92: 422, 1989), Hawksworth (*SA* 14: 48, 1995; nomencl.), Winka & Eriksson (*Phylogenetic Relationships Within the Ascomycota Based on 18S rDNA Sequences Akademisk Avhandling* [Thesis (PhD), Department of Ecology and Environmental Science, Umeå University]: [17] pp., 2000; phylogeny), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny).
- Coryneliaceae** Sacc. ex Berl. & Voglino (1886), *Coryneliales*. 8 gen. (+ 7 syn.), 46 spp.
Lit.: Benny *et al.* (*Bot. Gaz.* 146: 232, 1985), Benny *et al.* (*Bot. Gaz.* 146: 437, 1985), Benny *et al.* (*Bot. Gaz.* 146: 238, 1985), Benny *et al.* (*Bot. Gaz.* 146: 431, 1985), Johnston & Minter (*MR* 92: 422, 1989), Marmolejo (*Mycotaxon* 72: 195, 1999), Rikinen (*Karstenia* 40: 147, 2000), Winka & Eriksson (*Phylogenetic Relationships Within the Ascomycota Based on 18S rDNA Sequences Akademisk Avhandling* [Thesis (PhD), Department of Ecology and Environmental Science, Umeå University]: [17] pp., 2000), Inderbitzin *et al.* (*MR* 108: 737, 2004).
- Coryneliales** Seaver & Chardón (1926). *Eurotiomycetidae*. 1 fam., 8 gen., 46 spp. Fam.:
- Coryneliaceae**
Lit.: Benny *et al.* (*Bot. Gaz.* 146: 232, 238, 431, 437, 1985), Fitzpatrick (*Mycol.* 12: 206, 1920; 34: 464, 1942; keys, monogr.), Geiser *et al.* (*Mycol.* 98: 1051, 2006), Johnston & Minter (*MR* 92: 422, 1989; asci).
- Coryneliella** Har. & P. Karst. (1890), *Pezizomycotina*. 1, Mauritius. See Fitzpatrick (*Mycol.* 12: 206, 1920).
- Coryneliopsis** Butin (1972), ? *Coryneliaceae*. 2 (with *Cyttaria*), Chile. See Benny *et al.* (*Bot. Gaz.* 146: 437, 1985; key), Johnston & Minter (*MR* 92: 422, 1989; asci).
- Coryneliospora** Fitzp. (1942), *Coryneliaceae*. 2, widespread. See Benny *et al.* (*Bot. Gaz.* 146: 437, 1985; key).
- Corynelites** Babajan & Tasl. (1970), *Fossil Fungi*. 1 (Tertiary), former USSR.
- Corynella** Boud. (1885) [non *Corynella* DC. 1825, *Leguminosae*] = *Claussenomyces* fide Korf & Abawi (*CJB* 49: 1879, 1971).
- Coryneopsis** Grove (1933) = *Seimatosporium* fide Sutton (*Mycol. Pap.* 141, 1977).
- Corynesphaera** Dumort. (1822) nom. rej. prop. = *Cordyceps*.
- Corynespora** Güssow (1906) nom. cons., anamorphic *Corynesporasca*, Hso. = eP.25. 89, widespread. See Wei (*Mycol. Pap.* 34, 1950), Ellis (*Mycol. Pap.* 65, 1957; key), Ellis (*Mycol. Pap.* 76, 1960), Goh *et al.* (*Fungal Diversity* 1: 85, 1998; rDNA analysis), Gams & Seifert (*Taxon* 48: 379, 1999; nomencl.), Pereira *et al.* (*Biological Control* 26: 21, 2003; biocontrol), Silva *et al.* (*MR* 107: 567, 2003; genetic variation).
- Corynesporasca** Sivan. (1996), *Corynesporascaceae*. Anamorph *Corynespora*. 1, Sri Lanka. See Sivanesan (*MR* 100: 783, 1996).
- Corynesporascaceae** Sivan. (1996), *Pleosporales*. 2 gen., 90 spp.
Lit.: Carris (*Mycol. Soc. Amer. Newsl.* 38: 19,

- 1987), Morgan-Jones (*Mycotaxon* 31: 511, 1988), Sivanesan (*MR* 100: 783, 1996), Goh *et al.* (*Fungal Diversity* 1: 85, 1998).
- Corynesporella** Munjal & H.S. Gill (1961), anamorphic *Pezizomycotina*, Hso.≡ eP.?. 4, India. See Munjal & Gill (*Indian Phytopath.* 14: 7, 1961).
- Corynesporina** Subram. (1994) nom. inval., anamorphic *Pezizomycotina*, Hso.?.?. 1, Singapore. See Subramanian (*Nova Hedwigia* 59: 266, 1994), Shoemaker & Hambleton (*CJB* 79: 592, 2001).
- Corynesporopsis** P.M. Kirk (1981), anamorphic *Pezizomycotina*, Hso.1≡ eP.29. 9, widespread. See Sutton (*Sydowia* 41: 330, 1989), Mercado Sierra *et al.* (*Mycotaxon* 64: 7, 1997).
- Corynetes** Hazsl. (1881) = *Geoglossum* fide Nitare (*Windahlia* 14: 37, 1984), Spooner (*Biblthca Mycol.* 116, 1987).
- Coryneum** Nees (1816), anamorphic *Pseudovalsa*, Cac.≡ eP.19. 21, widespread (esp. temperate). See Sutton (*Mycol. Pap.* 138, 1975; key), Sutton & Rizwi (*Nova Hedwigia* 32: 341, 1980), Orsenigo *et al.* (*Mycotaxon* 67: 257, 1998).
- Corynitaceae** Kalchbr. (1880) = Phallaceae.
- Corynites** Berk. & M.A. Curtis (1853) = *Mutinus* fide Stalpers (*in litt.*).
- Corynocladus** Leidy (1850) nom. dub., ? Microthyriaceae.
- Corynodesmium** Wallr. (1828) nom. nud., anamorphic *Pezizomycotina*. See Hughes (*CJB* 36: 727, 1958).
- Corynoides** Gray (1821) = *Calocera* fide McNabb (*N.Z. Jl Bot.* 3: 31, 1965).
- Corynophoron** Nyl. ex Müll. Arg. (1894) = *Stereocaulon* Hoffm. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Corynophorus**, see *Corinophoros*.
- Coscinarina** Ellis & Everh. (1886) = *Oomyces* fide Rogerson (*Mycol.* 62: 865, 1970).
- Coscinedia** A. Massal. (1860) = *Myriotrema* fide Hale (*Bull. Br. Mus. nat. hist. Bot.* 8: 227, 1981).
- Coscinocladium** Kunze (1846), Physciaceae (L.). 1, Europe. See Crespo *et al.* (*Taxon* 53: 405, 2004; phylogeny).
- coscinocystidium**, a cystidium projecting as a pseudocystidium.
- coscinoid**, a pitted conducting element in *Linderomyces*.
- Coscinopeltella** Chardón (1930) = *Vestergrenia* Rehm fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Coscinopeltis** Speg. (1909) = *Munkiella* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Coscinospora** Mirza (1963) nom. inval. ≡ *Jugulospora*.
- Cosmariospora** Sacc. (1880), anamorphic *Pezizomycotina*, Hsp.1eP.?. 1, Italy.
- Cosmospora** Rabenh. (1862), Nectriaceae. Anamorphs *Acremonium*-like, *Fusarium*-like, *Chaetopsina*, *Cylindrocladiella*, *Stilbella*, *Volutella*. 47, widespread. Anamorphs varied, the genus may not be monophyletic. See Samuels *et al.* (*Mycol. Pap.* 164, 1991; keys 40 spp. as *Nectria* subgen. *Dialonectria*), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Nirenberg & Samuels (*CJB* 78: 1482, 2000), Samuels *et al.* (*Fusarium* Paul E. Nelson Memorial Symposium: 1, 2001; *Fusarium*-like anamorphs), Samuels *et al.* (*Tropical Mycology* 2: 13, 2002; key), Summerbell & Schroers (*J. Clin. Microbiol.* 40: 2866, 2002; phylogeny), Hosoya & Tubaki (*Mycoscience* 45: 261, 2004), Samuels *et al.* (*CBS Diversity Ser.* 4, 2006; USA), Zhang & Zhuang (*Mycosystema* 25: 15, 2006; phylogeny).
- Costanetia** Bat. & J.L. Bezerra (1963), anamorphic *Pezizomycotina*, Cpd.1bH.?. 1, Brazil. See Batista & Bezerra (*Quad. Lab. crittogam., Pavia* 31: 75, 1963).
- Costantin** (Julien Noël; 1857-1936, France). Maître de Conférences de Botanique, École Normale Supérieure, Paris (1887-1901); Professor of Culture (1901-1919) then Professor of Organographics (1919 onwards) at the Natural History Museum, Paris. Carried out early work in pure culture with hyphomycetes, particularly species parasitic on other fungi; was an early exponent of the view, later adopted by Vuillemin (q.v.) and Mason (q.v.) that hyphomycetes should be classified by the development of their conidia. *Publs. Les Mucédinées Simples. Histoire, Classification, Culture et Rôle des Champignons Inférieurs dans les Maladies des Végétaux et des Animaux* (1888); *Atlas des Champignons Comestibles et Vénéneux* (1895); (with Durour) *Nouvelle Flore des Champignons de France* (1891) [many later edns and reprints]. *Biogs, obits etc.* Magrou (*BSMF* 53: 245, 1937); Stafleu & Cowan (*TL-2* 1: 555, 1976).
- Costantinella** Matr. (1892), anamorphic *Morchellaceae*, Hso.0eP.10. 4, Europe; N. America. See Paden (*Persoonia* 6: 405, 1972), Wong *et al.* (*Fungal Diversity* 8: 173, 2001; Hong Kong).
- Costapeda** Falck (1923) ≡ *Helvella*.
- costate**, veined or ribbed.
- costiferous**, see hypha.
- cot death** (Sudden Infant Death Syndrome; SIDS), hypothesis for involvement of *Scopulariopsis brevicaulis* through biodeteriogenic action on mattresses with subsequent release of toxic gases was proposed by Richardson (*Lancet* 335: 670, 1990) but not supported by later experiments (Kelley *et al.*, *Human Exp. Toxicol.* 11: 347, 1992).
- Cotylidia** P. Karst. (1881), Agaricomycetes. 9, widespread (esp. tropical). *Hymenochaetales* or *Agaricales* (*Rickenella* clade). See Reid (*Beih. Nova Hedwigia* 18: 56, 1965; key), Boidin *et al.* (*BSMF* 66: 445, 1998; sub *Phanerochaetaceae*).
- cotyliform**, plate-like or wheel-like with an upturned edge.
- Cougourdella** E. Hesse (1935), Microsporidia. 2.
- Coulterella** Zebrowski (1936), Fossil Fungi ? Chytridiomycetes. 1 (Cambrian to ? Recent), Australia.
- Courtoisia** L. Marchand (1830) nom. rej. prop. = *Rinodina* fide Hafellner (*Beih. Nova Hedwigia* 79: 241, 1984).
- Coutinia** J.V. Almeida & Sousa da Câmara (1903) = *Botryosphaeria* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Coutourea** Castagne (1845) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Cowlesia** Nieuwl. (1916) ≡ *Macropodia*.
- cramp balls**, the ascomata of *Daldinia concentrica*.
- Crandallia** Ellis & Sacc. (1897), anamorphic *Duplicaria*, Cpt.0eH.15. 1, USA. See Powell (*Mycol.* 65: 1362, 1973), Kohlmeyer & Volkmann-Kohlmeyer (*MR* 105: 500, 2001).
- Craneomyces** Morgan-Jones, R.C. Sinclair & Eicker (1987), anamorphic *Pezizomycotina*, Hso.0eP.3. 1, S. Africa. See Morgan-Jones *et al.* (*Mycotaxon* 30: 345, 1987).
- Craspedodidymum** Hol.-Jech. (1972), anamorphic *Chaetosphaeriaceae*, Hso.0eP.15. 10, widespread. See Holubová-Jechová (*Česká Mykol.* 26: 70, 1972),

- Pinruan *et al.* (*Mycoscience* 45: 177, 2004; Thailand, on palms), Huhndorf & Fernández (*Fungal Diversity* 19: 23, 2005; teleomorph).
- Craspedon** Fée (1825) = *Strigula* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Crassoascus** Checa, Barrasa & A.T. Martínez (1993), Annulatascaceae. 1 (from wood etc.), Spain. See Kang *et al.* (*Mycoscience* 40: 151, 1999).
- Crassochaeta** Réblová (1999), Chaetosphaerellaceae. 2 (from wood), widespread. See Réblová (*Mycotaxon* 71: 45, 1999), Réblová & Winka (*Mycol.* 93: 478, 2001; phylogeny), Huhndorf *et al.* (*MR* 108: 1384, 2004; phylogeny).
- Cratarellus**, see *Craterellus*.
- Craterella** Pers. (1794) nom. rej. = *Cotylidia* fide Donk (*Taxon* 6: 26, 1959).
- Craterellaceae** Herter (1910) = *Cantharellaceae*.
- Craterellus** Pers. (1825), *Cantharellaceae*. 20, widespread. *C. cornucopioides* ('Horn of Plenty') is edible. See Corner (*Beih. Sydowia* 1, 1957), Feibelman *et al.* (*MR* 101: 1423, 1997), Dahlman *et al.* (*MR* 104: 388, 2000; molecular systematics).
- Crateridium** Trevis. (1862) = *Cyphelium* Ach. fide Tibell (*Beih. Nova Hedwigia* 79: 597, 1984).
- crateriform**, cup-like or crater-like in form.
- Craterocola** Bref. (1888), *Sebacinaceae*. Anamorph *Ditangium*. 1, Europe. See Donk (*Persoonia* 4: 164, 1966), Weiss & Oberwinkler (*MR* 105: 403, 2001; phylogeny).
- Craterolechia** A. Massal. (1860) ? = *Arthonia* fide Zahlbruckner (*Catalogus Lichenum Universalis* 2, 1922).
- Crateromyces** Corda (1831) nom. dub., *Fungi*. ? Based on insect eggs.
- Cratiria** Marbach (2000), *Caliciaceae* (L.). 14, widespread (esp. tropical). See Marbach (*Biblthca Lichenol.* 74: 160, 2000).
- Crauatamyces** Viégas (1944), *Dothideomycetes*. 1, Brazil.
- Creangium** Petr. (1950) = *Saccardia* fide von Arx (*Persoonia* 2: 421, 1963).
- Crebrothecium** Routien (1949) = *Eremothecium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Cremasteria** Meyers & R.T. Moore (1960), anamorphic *Pezizomycotina*, Hso.0eP.4. 1 (marine), USA; Mediterranean. See Meyers & Moore (*Am. J. Bot.* 47: 348, 1960), Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 34: 1, 1991).
- Creomegaster** Mattir. (1924) = *Leucophleps* fide Fogel (*CJB* 57: 1718, 1979).
- Crenasclerotes** Stach & Pickh. (1957), *Fossil Fungi*. 3 (Carboniferous), Germany.
- crenate**, having the edge toothed with rounded teeth (Fig. 23.43).
- crenulate**, delicately crenate (Fig. 23.44).
- Creodiplodina** Petr. (1957), anamorphic *Pezizomycotina*, Hso.1eH.?. 1, Australia. See Petrak (*Sydowia* 10: 316, 1956).
- Creographa** A. Massal. (1860) nom. rej. prop. = *Phaeographis* fide Lücking *et al.* (*Taxon* 56: 1296, 2007; nomencl.).
- Creolophus** P. Karst. (1879) = *Hericium* Pers. fide Larsson & Larsson (*in litt.*).
- Creomelanops** Höhn. (1920) = *Botryosphaeria* fide Samuels & Singh (*TBMS* 86: 295, 1986), Eriksson & Yue (*SA* 6: 241, 1987).
- Creonecte** Petr. (1949), anamorphic *Pezizomycotina*, Cpd.0fH.?. 1 (on *Uredo*), S. America.
- Creonectria** Seaver (1909) = *Nectria* fide Rogerson (*Mycol.* 62: 865, 1970), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Creopus** Link (1833) = *Hypocrea* fide Rogerson (*Mycol.* 62: 865, 1970), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Chaverri & Samuels (*Stud. Mycol.* 48, 2003).
- Creoseptoria** Petr. (1937), anamorphic *Pezizomycotina*, St.0fH.?. 1, Caucasus.
- creosote fungus**, see kerosene fungus.
- Creosphaeria** Theiss. (1910), ? *Xylariaceae*. Anamorph *Selenosporopsis*. 3, N. & S. America. See Ju *et al.* (*Mycotaxon* 48: 219, 1993), Læssøe (*SA* 13: 43, 1994), Bills & Peláez (*Mycotaxon* 57: 471, 1996; endophytes), Ju & Rogers (*Mycotaxon* 73: 343, 1999; Taiwan), Sánchez-Ballesteros *et al.* (*Mycol.* 92: 964, 2000; phylogeny), Acero *et al.* (*Mycol.* 96: 249, 2004; phylogeny), Triebel *et al.* (*Nova Hedwigia* 80: 25, 2005; phylogeny).
- Creothyriella** Bat. & C.A.A. Costa (1957), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, India. See Batista & Costa (*Revta Biol. Lisb.* 1: 97, 1957).
- Creothyrium** Petr. (1925) = *Cylindrocolla* fide Sutton (*Mycol. Pap.* 141, 1977).
- Crepidopus** (Nees) Gray (1821) nom. rej. = *Pleurotus* fide Kuyper (*in litt.*).
- Crepidotaceae** Singer (1951) = *Inocybaceae*.
- Crepidotus** (Fr.) Staude (1857), *Inocybaceae*. c. 200, widespread. See Hesler & Smith (*North American species of Crepidotus*, 1965; key N. Am. spp.), Singer (*Beih. Nova Hedwigia* 44: 341, 1973; key), Senn-Irlet (*Mycotaxon* 52: 59, 1994; culture), Senn-Irlet (*Persoonia* 16: 1, 1995; key Eur. spp.), Senn-Irlet & de Meijer (*Mycotaxon* 66: 165, 1998; key Brazilian spp.), Aime *et al.* (*Am. J. Bot.* 92: 74, 2005; phylogeny and taxonomy).
- Crepidula** Simakova, Pankova & I.V. Issi (2003), *Microsporidia*. 1. See Simakova *et al.* (*Parazitologiya* 37: 145, 2003).
- Crepidulospora** Simakova, Pankova & I.V. Issi (2004), *Microsporidia*. 1. See Simakova *et al.* (*Parazitologiya* 38: 477, 2004).
- Crepinula** Kuntze (1891) = *Cephalotheca*.
- crescentic**, see *lunate*.
- Cresponea** Egea & Torrente (1993), *Roccellaceae* (L.). 12, widespread (esp. tropical). See Egea & Torrente (*Mycotaxon* 48: 302, 1993), Letrouit-Galinou *et al.* (*Bull. Soc. linn. Provence* 45: 389, 1994; ultrastr.), Grube (*Bryologist* 101: 377, 1998; phylogeny), Kantvilas (*Symb. bot. ups. 34* no. 1: 183, 2004), Kantvilas (*Australasian Lichenology* 58: 32, 2006; Australia).
- Cresporhaphis** M.B. Aguirre (1991), ? *Trichosphaeriaceae* ($\pm$ L.). 7, widespread (temperate; mediterranean). See Barr (*Mycotaxon* 46: 64, 1993), Calatayud & Aguirre-Hudson (*MR* 105: 122, 2001).
- Cribbea** A.H. Sm. & D.A. Reid (1962), *Cortinariaceae*. 4, widespread (southern temperate). Basidioma gasteroid. See Smith & Reid (*Mycol.* 54: 98, 1962), Francis & Bougher (*Australasian Mycologist* 21: 81, 2002; Australia).
- Cribbeaceae** Singer, J.E. Wright & E. Horak (1963) = *Cortinariaceae*. The name *Cribbeaceae* has not yet been proposed for rejection against *Cortinariaceae*.
- cribose (cribriform)**, having a network like a sieve.
- Cribritaceae** Locq., D. Pons & Sal.-Cheb. (1981) = *Microthyriaceae*.

- Cribrites** R.T. Lange (1978), Fossil Fungi, Microthyriaceae. 1 (? Eocene), Australia.
- Cribrpeltis** Tehon (1933), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, USA.
- Cribrrospora** Pacioni & P. Fantini (2000), Agaricales. 1, Europe. See Pacioni & Fantini (*Micologia e Vegetazione Mediterranea* 14: 171, 1999).
- Cricunopus** P. Karst. (1881) = *Suillus* Gray fide Smith & Thiers (*The Boletes of Michigan*, 1971).
- Criella** (Sacc.) Henn. (1900), Rhytismataceae. 1, widespread (tropical).
- Crinigera** I. Schmidt (1969), *Pezizomycotina*. 1 (on *Fucus*, marine), Baltic Sea. See Koch & Jones (*CJB* 67: 1183, 1989).
- Crinipellis** Pat. (1889), Marasmiaceae. c. 65, widespread. The pathogens of cacao are now placed in *Moniliophthora* (q.v.). See Singer (*Lilloa* 8: 441, 1942; monogr.), Singer (*Fl. Neotrop. Monogr.* 17: 9, 1976; key 14 neotrop. spp.), Arruda *et al.* (*Mycol.* 97: 1348, 2005; new sp.).
- Crinitospora** B. Sutton & Alcorn (1985), anamorphic *Pezizomycotina*, Cac.1eH.15/19. 1, Australia. See Sutton & Alcorn (*TBMS* 84: 437, 1985).
- Crinium** Fr. (1819) = *Crinula* Fr.
- Crinofera** Nieuwl. (1916) = *Pilophora*.
- Crinula** Fr. (1821), anamorphic *Holwaya*, Hsy.0eP.?. 2, Europe; N. America. See Seifert (*Stud. Mycol.* 27: 1, 1985), Aronsson (*Svensk bot. Tidskr.* 85: 9, 1991; Sweden), Roth (*Schweiz. Z. Pilzk.* 69: 197, 1991; Switzerland).
- Crinula** Sacc. (1889) = *Holwaya*.
- Criserosphaeria** Speg. (1912), ? Helotiales. 1, Argentina. See Petrak & Sydow (*Annls mycol.* 33: 157, 1935).
- crispate**, curled and twisted.
- crista**, tubular, pouch-like or shelf-like inwardly directed fold of the inner membrane of a mitochondrion; site of ATP production during aerobic metabolism.
- Cristaspora** Fort & Guarro (1984), Trichocomaceae. 1, Spain. See Fort & Guarro (*Mycol.* 76: 1115, 1984).
- cristate**, crested.
- Cristella** Pat. (1887) = *Sebacina* fide Rogers (*Mycol.* 36: 70, 1944), Weresub (*Taxon* 16: 402, 1967), Donk (*Taxon* 17: 278, 1968) = *Trechispora* (Hydnodont.) fide, Liberta (*CJB* 51: 1871, 1973).
- Cristelloporia** I. Johans. & Ryvarden (1979) = *Trechispora* fide Larsson (*in litt.*).
- Cristidium** R. Sant. (1952) nom. nud., anamorphic *Pezizomycotina*. 1 (on *Gyalectidium* in the tropics).
- Cristinia** Parmasto (1968), Stephanosporaceae. 7, widespread. See Hjortstam & Grosse-Brauckmann (*Mycotaxon* 47: 405, 1993; key).
- Cristiniaceae** Jülich (1982) = *Atheliaceae*.
- Cristula** Chenant. (1920), anamorphic *Pezizomycotina*, Hso.1bH.1. 1, Europe.
- Cristularia** (Sacc.) Costantin (1888) = *Botrytis* fide Saccardo (*Syll. fung.* 4: 134, 1886).
- Cristulariella** Höhn. (1916), anamorphic *Nervostroma*, Hso.1bH.1. 4 (on *Acer* etc.), widespread (north temperate). See Redhead (*CJB* 53: 700, 1975), Niedbalski *et al.* (*Mycol.* 71: 722, 1979; development in *C. pyramidalis*), Suto & Suyama (*Mycoscience* 46: 227, 2005), Narumi-Saito *et al.* (*Mycoscience* 47: 351, 2007).
- Cristulospora** L.F. Khodzhaeva & I.V. Issi (1989), Microsporidia. 3.
- Crivellia** Shoemaker & Inderb. (2006), Pleosporaceae.
- Anamorph *Brachycladium*. 1, widespread. See Inderbitzin *et al.* (*CJB* 84: 1304, 2006).
- Crocicreas** Fr. (1849), Helotiaceae. 62, widespread (esp. north temperate). See also *Cyathicula*. See Carpenter (*Mem. N. Y. bot. Gdn* 33, 1981), Baral & Krieglsteiner (*Beih. Sydowia* 6, 1985), Galán (*MR* 98: 1137, 1994), Triebel & Baral (*Sendtnera* 3: 199, 1996), Iturriaga *et al.* (*MR* 103: 28, 1999; application).
- Crocicreomyces** Bat. & Peres (1964) = *Calopadia* fide Lücking *et al.* (*Lichenologist* 30: 121, 1998).
- Crocodia** Link (1833) nom. rej. = *Pseudocyphellaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Crocynia** (Ach.) A. Massal. (1860) nom. cons., *Crocyniaceae* (L.). c. 2, widespread (tropical). See Hue (*Bull. Soc. bot. Fr.* 71: 311, 1924; s.l. monogr.), Ekman & Tønsberg (*MR* 106: 1262, 2002; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Crocyniaceae** M. Choisy ex Hafellner (1984), Lecanorales (L.). 1 gen. (+ 1 syn.), c. 2 spp.
Lit.: Hafellner (*Nova Hedwigia* Beih. 79: 241, 1984), Aptroot & Sipman (*Willdenowia* 20: 221, 1991), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny).
- Crocysporium** Corda (1837) = *Aegerita* fide Saccardo (*Syll. fung.* 4: 662, 1886).
- Cronartiaceae** Dietel (1900), Pucciniales. 2 gen., 24 spp.
Lit.: Crane *et al.* (*Proceedings of the Fourth IUFRO Rusts of Pines Working Party Conference* Tsukuba: 101, 1995), Hiratsuka (*Proceedings of the Fourth IUFRO Rusts of Pines Working Party Conference* Tsukuba: 1, 1995), Mims *et al.* (*Mycol.* 88: 47, 1996), Vogler & Bruns (*Mycol.* 90: 244, 1998), Et-touil *et al.* (*Phytopathology* 89: 915, 1999), Vogler (*HortTechnol.* 10: 518, 2000), Hantula *et al.* (*MR* 106: 203, 2002), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003), Maier *et al.* (*CJB* 81: 12, 2003), Kubisiak *et al.* (*Heredity* 92: 41, 2004), Wingfield *et al.* (*Australas. Pl. Path.* 33: 327, 2004), Aime (*Mycoscience* 47: 112, 2006).
- Cronartium** Fr. (1815), *Cronartiaceae*. c. 20 (on *Pinus* (0, I) (*Pinaceae*); on dicots (II, III)), widespread. *C. ribicola* (blister rust of *Pinus strobus* and other 5-needle pines; II and III on *Ribes*), *C. quercuum* (fusiform rust of pine). See Mielke (*Bull. Sch. Forest. Yale* 52, 1943; *C. ribicola*), Peterson (*Rep. Tottori mycol. Inst.* 10: 203, 1973), Hiratsuka & Powell (*Canad. Forest Serv. Tech. Rep.* 4, 1976), Burdsall & Snow (*Mycol.* 69: 503, 1977; *C. quercuum* taxonomy), Vogler & Bruns (*Mycol.* 90: 244, 1998; DNA seq. analysis), Hantula *et al.* (*MR* 106: 203, 2002; genetics), Hamelin *et al.* (*Phytopathology* 95: 793, 2005; Mol. epidemiol. white pine blister rust).
- Crossopora** Syd. & P. Syd. (1919), Phakopsoraceae. c. 17, widespread (tropical). See Peterson (*Rep. Tottori mycol. Inst.* 10: 203, 1973), Gjerum *et al.* (*Lidia* 5: 87, 2000; Uganda), Berndt *et al.* (*Mycotaxon* 83: 265, 2002; Brazil), Engkhaninun *et al.* (*Mycoscience* 46: 137, 2005; Thailand).
- Crotalia** Liro (1938), anamorphic *Anthracoidea*. 1, Europe.
- Crotone** Theiss. & Syd. (1915), Venturiaceae. 1, S. America.
- Crotonocarpia** Fuckel (1870) = *Cucurbitaria* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).

- crottle**, Scottish term for many lichens (obsol.); often used collectively; **black -**, *Parmelia omphalodes*.
- Crouania** Fuckel (1870) [non *Crouania* J. Agardh 1842, *Algae*] = *Lamprospora* fide Eckblad (*Nytt Mag. Bot.* 15: 1, 1968).
- Crouaniella** (Sacc.) Lambotte (1888) = *Ascobolus* fide van Brummelen (*Persoonia* Suppl. 1: 1, 1967).
- crowded** (of gills), very close together; conferted.
- crown rust** (of oats), *Puccinia coronata*.
- Crozalsiella** Maire (1917) = *Ustilago* fide Vánky (*Eur. Smut Fungi*: 348, 1994) fide.
- crozier**, the hook of an ascogenous hypha before ascus-development; ascus crook (Fig. 13).
- Crucella** Marvanová & Suberkr. (1990), anamorphic *Camptobasidium*. 1, USA. See Marvanová & Suberkropp (*Mycol.* 82: 212, 1990).
- Crucellisporiopsis** Nag Raj (1983), anamorphic *Pezizomycotina*, Ccu.1bH.15. 2, Venezuela; New Zealand. See Nag Raj (*CJB* 60: 2601, 1982).
- Crucellisporium** M.L. Farr (1968), anamorphic *Pezizomycotina*, Cac/Ccu.1bH.10. 2, USA; Tanzania. See Nag Raj & Kendrick (*CJB* 56: 713, 1978), Punithalingam (*Nova Hedwigia* 48: 297, 1989; cytology), Punithalingam (*MR* 107: 917, 2003).
- cruciate** (1) in the form of a cross; (2) (of basidial septa), vertical and at right angles.
- Crucibulum** Tul. & C. Tul. (1844), Agaricaceae. 3, widespread (temperate). See Sarasini & Pina (*Rivista di Micologia* 39: 115, 1996), Zhou *et al.* (*Fungal Diversity* 17: 243, 2004; China), Sarasini (*Gasteromyceti Epigei*: 406 pp., 2005).
- cruciform** (of nuclear division in *Plasmodiophora*), having the chromosomes in a ring around a dumb-bell-shaped nucleolus.
- cruciform division**, see promitosis.
- Cruciger** R. Kirschner & Oberw. (1999), anamorphic *Agaricomycetes*. 1, Germany. See Kirschner & Oberwinkler (*Mycoscience* 40: 345, 1999).
- Crucispora** E. Horak (1971), Agaricaceae. 2, New Zealand; Asia. See Horak (*N.Z. J. Bot.* 9: 489, 1971).
- Crumenella** P. Karst. (1890), Helotiaceae. 1 (on *Myrica*), Europe.
- Crumenula** De Not. (1864) = *Godronia* fide Groves (*CJB* 43: 1195, 1965), Petrini *et al.* (*CJB* 67: 2805, 1989).
- Crumenula** Rehm (1889) ≡ *Crumenulopsis*.
- Crumenulopsis** J.W. Groves (1969), Helotiaceae. Anamorph *Digitosporium*. 4, Europe; N. America. See Ennos & Swales (*MR* 95: 521, 1991; populations), Hanlin *et al.* (*Mycol.* 84: 650, 1992).
- crust**, a general term for a hard surface layer, esp. of a sporocarp; crustose.
- Crustoderma** Parmasto (1968), Meruliaceae. 14, widespread. See Nakasone (*Mycol.* 76: 40, 1984), Gilbertson & Nakasone (*Mycol.* 95: 467, 2003; key).
- Crustodiplodina** Punith. (1988), anamorphic *Pezizomycotina*, St.1eH.19. 1, British Isles. See Punithalingam (*Mycol. Pap.* 159: 199, 1988).
- Crustodontia** Hjortstam & Ryvarden (2005), Polyporales. 1, widespread. See Hjortstam & Ryvarden (*Syn. Fung.* 20: 36, 2005).
- Crustomollisia** Svrček (1987), Dermateaceae. 1, Europe. See Svrček (*Sydowia* 39: 219, 1987), Nauta & Spooner (*Mycologist* 13: 65, 1999).
- Crustomyces** Jülich (1978), Cystostereaceae. 3, widespread. See Jülich (*Persoonia* 10: 140, 1978), Legon (*Mycologist* 20: 118, 2006).
- crustose** (crustaceous), crust-like; used for lichens having a thallus stretching over and firmly fixed to the substratum by the whole of their lower surface; such thalli generally lack rhizinae and a lower cortex. (Fig. 21B).
- Crustospathula** Aptroot (1998), Ramalinaceae (L). 1, Papua New Guinea. See Aptroot (*Trop. Bryol.* 14: 27, 1998).
- Crustula** Velen. (1934) = *Mollisia* fide Baral (*SA* 13: 113, 1994).
- Cryocaligula** Minter (1986), anamorphic *Ploioderma*, St.1eH.10. 1, C. America. See Minter (*Recent Research on Conifer Needle Diseases* (USDA Forest Service General Technical Report GTR-WO 50): 78, 1986).
- Cryomyces** Selbmann, de Hoog, Mazzaglia, Friedmann & Onofri (2005), anamorphic *Dothideomycetes*. 2, Antarctica. See Selbmann *et al.* (*Stud. Mycol.* 51: 1, 2005).
- cryopreservation**, see Genetic Resource Collections.
- Cryphonectria** (Sacc.) Sacc. & D. Sacc. (1905), Cryphonectriaceae. Anamorph *Endothiella*. 5, widespread. *C. parasitica* (chestnut (*Castanea*) blight or canker). See also *Endothia*. See Roane in Roane *et al.* (Eds) (*Chestnut blight, other Endothia diseases, and the genus Endothia*: 28, 1986; key 11 spp.), Micales & Stipes (*Phytopathology* 77: 650, 1987), Milgroom & Lipari (*Mol. Ecol.* 4: 633, 1995; DNA), Cortesi *et al.* (*Eur. J. For. Path.* 28: 167, 1998; VCGs), Milgroom & Cortesi (*Proc. natn Acad. Sci. U.S.A.* 96: 10518, 1999; pop. str.), Myburg *et al.* (*Mycol.* 91: 243, 1999; DNA), Castlebury *et al.* (*Mycol.* 94: 1017, 2002; posn), Hoegger *et al.* (*Mycol.* 94: 105, 2002; *C. radicalis*), Myburg *et al.* (*CJB* 80: 590, 2002), Marra *et al.* (*Heredity* 93: 189, 2004; population biology), Myburg *et al.* (*CJB* 82: 1730, 2004; phylogeny), Myburg *et al.* (*Mycol.* 96: 990, 2004; phylogeny), Gryzenhout *et al.* (*Taxon* 54: 539, 2005; nomencl.), Breuillin *et al.* (*MR* 110: 288, 2006; genetic variation), Gryzenhout *et al.* (*FEMS Microbiol. Lett.* 258: 161, 2006; *C. parasitica*, taxonomy review), Gryzenhout *et al.* (*Mycol.* 98: 239, 2006; phylogeny), Liu & Milgroom (*Mycol.* 99: 279, 2007; E Asia, VCGs).
- Cryphonectriaceae** Gryzenh. & M.J. Wingf. (2006), Diaporthales. 12 gen. (+ 2 syn.), 26 spp.
Lit.: Barr (*Mycol. Mem.* 7: 1, 1978), Anagnostakis (*Mycol.* 79: 23, 1987), Redlin & Rossman (*Mycol.* 83: 200, 1991), Castlebury *et al.* (*Mycol.* 94: 1017, 2002), Myburg *et al.* (*Mycoscience* 44: 187, 2003), Gryzenhout *et al.* (*Stud. Mycol.* 50: 130, 2004), Myburg *et al.* (*Mycol.* 96: 990, 2004), Gryzenhout *et al.* (*Mycol.* 98: 239, 2006), Rossman *et al.* (*Mycoscience* 48: 135, 2007; phylogeny), Gryzenhout *et al.* (*Taxonomy, phylogeny, and ecology of bark-infecting and tree killing fungi in the Cryphonectriaceae*: in press, 2008; monograph).
- crypta**, a sleeve-like formation around a tree root (esp. evergreens) in tropics and subtropics developed by certain agarics (Singer, 1962: 20).
- Cryptadelphia** Réblová & Seifert (2004), Trichosphaeriaceae. Anamorph *Brachysporium*. 6, widespread (temperate). See Réblová & Seifert (*Mycol.* 96: 348, 2004), Markovskaja & Treigien (*Nova Hedwigia* 84: 495, 2007; Lithuanian, anamorph).
- Cryptandromyces** Thaxt. (1912), Laboulbeniaceae. 13 or 19, widespread. See Tavares (*Mycol. Mem.* 9, 1985), Santamaría (*Fl. Mycol. Iberica* 5, 2003; Iberian peninsula).

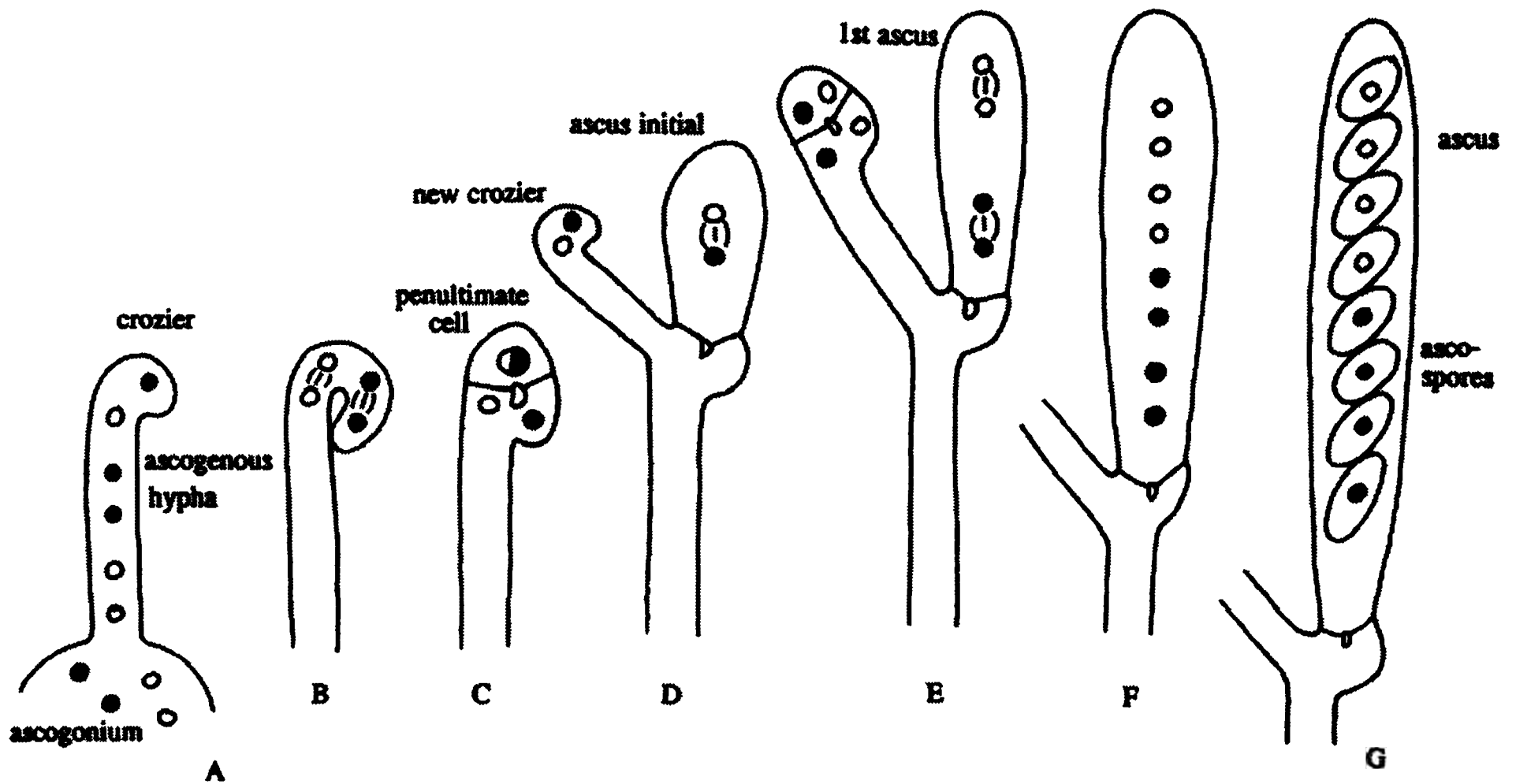


Fig. 13. Ascus and ascospore development (diagrammatic). A, ascogenous hypha with a crozier at the apex developing from an ascogonium; B, conjugate division of the two nuclei in the crozier; C, two septa cut off a binucleate penultimate cell, the nuclei in which fuse to form a diploid fusion nucleus, meanwhile the backwardly directed terminal cell fuses with the ascogenous hypha; D, penultimate cell enlarges to become the ascus within which the fusion nucleus begins to divide meiotically, and a new crozier develops from beneath the ascus and repeats the behaviour of the first; E, second division of meiosis occurs in the young ascus; F, mitotic division of the four haploid nuclei in the ascus; G, ascospores formed.

Cryptascoma Ananthap. (1988), Valsaceae. 1, India.

See Ananthapadmanaban (*TBMS* 90: 479, 1988).

Cryptella Quél. (1875) = *Robergea* fide Saccardo (*Syll. fung.* 2: 806, 1883).

Cryptendoxyla Malloch & Cain (1970), ? Cephalothecaceae. Anamorph *Chalara*-like. 1 (from soil etc.), Canada. See von Arx & van der Walt (*Stud. Mycol.* 9: 167, 1987; posn), Suh & Blackwell (*Mycol.* 91: 836, 1999; phylogeny).

cryptic, inconspicuous or hidden.

Cryptica R. Hesse (1884) = *Pachyphloeus* fide Fischer (*Nat. Pflanzenfam.* 5b: viii, 1938).

Cryptoascus Petri (1909), Pezizomycotina. 2, Europe. *C. oligosporus* on *Olea*, *C. graminis* on wheat.

Cryptobasidiaceae Malençon ex Donk (1956), Exobasidiales. 4 gen. (+ 2 syn.), 9 spp.

Lit.: Ciccarone (*Micol. Ital.* 18: 29, 1989), Bauer *et al.* (*CJB* 75: 1273, 1997), Gómez & Kisimova-Horovitz (*Revta Biol. trop.* 45: 1293, 1998), Begerow *et al.* (*Mycol. Progr.* 1: 187, 2002), Hendrichs *et al.* (*Sydowia* 55: 33, 2003).

Cryptobasidiales Jülich (1981) = Exobasidiales.

Cryptobasidium Lendn. (1921) = *Botryoconis* fide Malençon (*BSMF* 69: 92, 1953).

Cryptoceuthospora Petr. (1921), anamorphic *Pezizomycotina*, St.OeH.?. 2, Europe.

Cryptochaete P. Karst. (1889) = *Peniophora* fide Donk (*Persoonia* 3: 199, 1964).

Cryptocline Petr. (1924), anamorphic *Helotiales*, Cac.OeH.19. 15, widespread (north temperate). See Morgan-Jones (*CJB* 51: 309, 1973), Sutton (*The Coelomycetes*, 1980), Petrini (*Sydowia* 37: 238, 1984), Matsushima (*Matsush. Mycol. Mem.* 10, 2001;

Japan).

Cryptococcaceae Kütz. ex Castell. & Chalm. (1919) = Tremellaceae.

Cryptococcales. Order used for *Blastomycetes* (q.v.) with ascomycetous teleomorphs, but *Cryptococcus* itself is now known to be polyphyletic and partly of basidiomycetous affinity (and assigned here to *Tremellaceae*).

cryptococcosis, a disease in humans and animals caused by *Cryptococcus neoformans* (teleomorph *Filobasidiella neoformans*); 'European blastomycosis'; torulosis. See Casadevall & Perfect (*Cryptococcus neoformans*, 1998), Kovacs *et al.* (*Annl. Intern. Med.* 1103: 533, 1985; clinical), Buchanan & Murphy (*Emerg. Infect. Dis.* 4: 71, 1998; pathogenesis).

Cryptococcus Kütz. (1833) nom. rej. ≡ *Cryptococcus* Vuill.

Cryptococcus Vuill. (1901) nom. cons., anamorphic *Filobasidiella*. c. 75, widespread. In a wide sense, applied to a range of yeast forming species within the *Tremellomycetes*. See Ellis & Pfeiffer (*J. Clin. Microbiol.* 28: 1642, 1990; ecology), James & Cherniak (*Infect. Immun.* 60: 1084, 1992; cell wall biochemistry), Guého *et al.* (*Antonie van Leeuwenhoek* 63: 175, 1993; mol. phylogeny), Perfect *et al.* (*J. Clin. Microbiol.* 31: 3305, 1993; PFGE), Currie *et al.* (*J. Clin. Microbiol.* 32: 1188, 1994; RFLP), Fan *et al.* (*J. med. Vet. Mycol.* 32: 1163, 1994; mol. phylogeny), Fell *et al.* (*Stud. Mycol.* 38: 129, 1995; mol. phylogeny), Filonow *et al.* (*Biol. Control* 7: 212, 1996; biocontrol), Tanaka *et al.* (*J. med. Vet. Mycol.* 34: 299, 1996; ploidy), Boekhout & Scorzetti (*J. Med. Vet. Mycol.* 35: 147, 1997; mycocins), Boekhout *et al.*

- (*Int. J. Syst. Bacteriol.* 47: 432, 1997; PFGE, RAPD), Sorrell & Ellis (*Rev. Iberoam. Micol.* 14: 42, 1997; ecology), Casadevall & Perfect (*Cryptococcus neoformans*, 1998), Krockenberger *et al.* (*Medical Mycology* 39: 523, 2001; immunohistochemical differentiation of *Cryptococcus neoformans* vars), Hazen & Howell (*Manual of Clinical Microbiology* 2: 1693, 2003), Lemmer *et al.* (*Medical Mycology* 42: 135, 2004; PCR fingerprinting compared to serotyping in *Cryptococcus neoformans*), McClelland *et al.* (*Trends in Microbiology* 12: 208, 2004; mating system in *Cryptococcus neoformans*), Lin *et al.* (*Nature London* 434 no. 7036: 1017, 2005; sexual reproduction in partners of the same mating type in *Cryptococcus neoformans*), Loftus *et al.* (*Science Washington* 307 no. 5713: 1321, 2005; genome map), Lin & Heitman (*Annual Review of Microbiology* 60: 69, 2006; biology of *Cryptococcus neoformans* species complex), Playford *et al.* (*J. Clin. Microbiol.* 44: 876, 2006; detection and identification by reverse line blot hybridization).
- Cryptocolax** R.A. Scott (1956), Fossil Fungi, Eurotiales. 1 (Eocene), USA. See Pirozynski (*Ann. Rev. Phytopath.* 14: 237, 1976).
- Cryptocoryneopsis** B. Sutton (1980), anamorphic *Pezizomycotina*, Hso.0bP.1. 1, Australia. See Sutton (*TBMS* 74: 393, 1980), Ho *et al.* (*Mycol.* 92: 582, 2000; key), Alcorn (*Australas. Mycol.* 21: 111, 2002).
- Cryptocoryneum** Fuckel (1870), anamorphic *Pezizomycotina*, St.0bP.1. 4, widespread (temperate). See Ho *et al.* (*Mycol.* 92: 582, 2000; key).
- Cryptocrea** Petr. (1937) = *Eudarluca* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Cryptoderis** Auersw. (1869) = *Pleuroceras*.
- Cryptoderma** Imazeki (1943) = *Phylloporia* fide Wagner & Fischer (*MR* 105: 781, 2001).
- Cryptodesma** Leidy (1850) nom. dub., ? Fungi.
- Cryptodiaporthe** Petr. (1921), *Gnomoniaceae*. Anamorphs *Diplodina*, *Uniseta*. 24, widespread (north & south temperate). See Barr (*Mycotaxon* 41: 287, 1991), Redlin & Rossman (*Mycol.* 83: 200, 1991), Bathgate *et al.* (*MR* 100: 159, 1996), Castlebury *et al.* (*Mycol.* 94: 1017, 2002), Castlebury *et al.* (*Mycoscience* 44: 203, 2003; phylogeny), Sogonov *et al.* (*Sydowia* 57: 102, 2005; phylogeny), Gryzenhout *et al.* (*Mycol.* 98: 239, 2006; placement of *C. corni*), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Cryptodictyon** A. Massal. (1860), *Lecideaceae* (L). 2, Asia.
- Cryptodidymosphaeria** (Rehm) Höhn. (1917) = *Didymosphaeria* fide Aptroot (*Nova Hedwigia* 60, 1995).
- Cryptodidymosphaerites** Currah, Stockey & B.A. LePage (1998), Fossil Fungi, Pleosporales. 1. See Currah *et al.* (*Mycol.* 90: 668, 1998).
- Cryptodiscus** Corda (1838), ? *Stictidaceae*. 6, widespread. See Sherwood (*Mycotaxon* 5: 1, 1977), Sherwood-Pike (*Mycotaxon* 28: 137, 1987), Wedin *et al.* (*Lichenologist* 37: 67, 2005; phylogeny).
- cryptoendolithic** (of organisms, esp. lichens), surviving at low temperatures through modification of the thallus so that it can exist inside rock between rock crystals (Friedmann, *Science, N.Y.* 215: 1045, 1982). Cf. endolithic.
- Cryptogamia** (obsol.). Division of the kingdom *Plantae* for the spore-producing plants, i.e. the *Thallophyta* (which traditionally included fungi), *Bryophyta* (mosses and liverworts), and *Pteridophyta* (ferns, etc.); the *Phanerogamia* (*Spermatophyta*) being the division for the flowering (or seed-producing) plants.
- Cryptogene** Syd. (1939) = *Ascochytopsis* fide Sutton (*Mycol. Pap.* 141, 1977).
- Cryptogenella** Syd. (1939) = *Ascochytopsis* fide Sutton (*Mycol. Pap.* 141, 1977).
- Cryptohymenium** Samuels & L.M. Kohn (1987), *Dermateaceae*. 1, New Zealand. See Samuels & Kohn (*Sydowia* 39: 202, 1987).
- Cryptolechia** A. Massal. (1853), *Gyalectaceae* (L). 8, widespread (esp. tropical). See Vězda (*Folia geobot. phytotax.* 4: 443, 1969), Hawksworth & Dibben (*Lichenologist* 14: 98, 1982; nomencl.), Kauff & Büdel (*Bryologist* 108: 272, 2005; ontogeny, anatomy), Kalb (*Biblthca Lichenol.* 95: 297, 2007; key).
- Cryptoleptosphaeria** Petr. (1923), ? *Diaporthales*. 1 (on *Leptosphaeria*), Europe. Affinities of this genus remain obscure. See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Réblová & Seifert (*Stud. Mycol.* 50: 95, 2004).
- Cryptomela** Sacc. (1884) = *Cryptosporium* fide Höhn. (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt.* 1 125: 76, 1916).
- Cryptomeliola** S. Hughes & Piroz. (1997), *Meliolaceae*. 3, Cuba; Kenya. See Mibey & Hawksworth (*Mycol. Pap.* 174, 1997), Mibey & Cannon (*Cryptog. Mycol.* 20: 249, 1999).
- Cryptomphalina** R. Heim (1966), *Polyporaceae*. 1, Thailand. See Singer (*Agaric. mod. Tax.* 4th ed: 185, 1986; possibly a teratological form of *Lentinus*).
- Cryptomycella** Höhn. (1925), anamorphic *Cryptomycina*, St.0eH.15. 1, Europe. See Gabel (*Mycol.* 85: 861, 1993).
- Cryptomyces** Grev. (1825), *Rhytismataceae*. 1, widespread (north temperate). *C. maximus* (on *Salix*). See Alcock (*TBMS* 11: 161, 1926), Minter & Cannon (*IMI Descr. Fungi Bact.* 148 nos 1471-1480, 2001), Vasil'eva (*Mikol. Fitopatol.* 36: 17, 2002).
- Cryptomycetaceae** Höhn. (1917) = *Rhytismataceae*.
- Cryptomycina** Höhn. (1917), *Pezizomycotina*. Anamorph *Cryptomycella*. 3 or 1, widespread (north temperate). *C. pteridis* (common on bracken, *Pteridium aquilinum*). See Bache-Wiig (*Mycol.* 32: 214, 1940).
- Cryptomycocolacaceae** Oberw. & R. Bauer (1990), *Cryptomycocolacales*. 2 gen., 2 spp.
Lit.: Mattsson & Wedin (*Lichenologist* 30: 463, 1998).
- Cryptomycocolacales** Oberw. & R. Bauer (1990). *Cryptomycocolacomycetes*. 1 fam., 2 gen., 2 spp. Fam.:
Cryptomycocolacaceae
For Lit. see under fam.
- Cryptomycocolacomycetes** R. Bauer, Begerow, J.P. Samp., M. Weiss & Oberw. (2006). *Pucciniomycotina*. 1 ord., 1 fam., 2 gen., 2 spp. Ord.:
Cryptomycocolacales
For Lit. see ord. and fam.
- Cryptomycocolax** Oberw. & R. Bauer (1990), *Cryptomycocolacaceae*. 1 (parasitic on an ascomycete), Costa Rica. See Oberwinkler & Bauer (*Mycol.* 82: 672, 1990), Bauer *et al.* (*Mycol. Progr.* 5: 41, 2006).
- Cryptonectriella** (Höhn.) Weese (1919) = *Nectriella* Nitschke ex Fuckel fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Cryptonectriopsis** (Höhn.) Weese (1919) = *Phomatospora* fide Barr (*Mycol. Mem.* 7: 232 pp., 1978).

- Cryptoniesslia** Scheuer (1993), Niessliaceae. 1 (from dead leaves), British Isles. See Scheuer (*MR* 97: 543, 1993), Samuels & Barr (*CJB* 75: 2165, 1997).
- Cryptoparodia** Petr. (1950) = *Antennularia* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Cryptopeltis** Rehm (1906) = *Porina* Müll. Arg. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Cryptopeltosphaeria**, see *Cryptoleptosphaeria*.
- Cryptopezia** Höhn. (1919), Helotiales. 1, Samoa.
- Cryptophaeella** Höhn. (1917) ? = *Microsphaeropsis* Höhn. fide Sutton (*Mycol. Pap.* 141, 1977).
- Cryptophallus** Peck (1897) = *Phallus* fide Lloyd (*Mycol. Notes* 26: 329, 1907).
- Cryptophiale** Piroz. (1968), anamorphic *Pezizomycotina*, Hso.1eH.15. 21, widespread (tropical). See Sutton *et al.* (*MR* 92: 354, 1989; key), McKenzie (*Mycotaxon* 49: 307, 1993; NZ, New Caledonia spp.), Goh & Hyde (*MR* 100: 999, 1996; key), Umali *et al.* (*Mycoscience* 40: 189, 1999).
- Cryptophialoidea** Kuthub. & Nawawi (1987), anamorphic *Pezizomycotina*, Hso.0fH.15. 2, Malaysia. See Kuthubutheen & Nawawi (*TBMS* 89: 581, 1987), Kuthubutheen & Nawawi (*MR* 98: 686, 1994), Delgado *et al.* (*Fungal Diversity* 20: 31, 2005; Cuba).
- Cryptoporaceae** Jülich (1982) = *Polyporaceae*.
- Cryptoporus** (Peck) Shear (1902), *Polyporaceae*. 2, N. America; S.E. Asia. See Gilbertson & Ryvarden (*N. Amer. Polyp.* 1: 220, 1986), Wu & Zang (*Mycotaxon* 74: 415, 2000; China), Giaon *et al.* (*Bollettino dell'Associazione Micologica ed Ecologica Romana* 18-19: 56, 2002).
- Cryptopus** Theiss. (1914) [non *Cryptopus* Lindl. 1824, *Orchidaceae*] = *Adelopus*.
- Cryptorhynchella** Höhn. (1915) ? = *Sphaerographium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Verkley (*Nova Hedwigia* 75: 433, 2002).
- Cryptosordaria** De Not. ex Sacc. (1891) nom. inval. = *Anthostomella* See Læssøe (*SA* 13: 43, 1994; ? synonym of *Xylaria*), Lu & Hyde (*Fungal Diversity Res. Ser.* 4, 2000).
- Cryptosphaerella** Sacc. (1882) ? = *Coronophora* fide Subramanian & Sekar (*Kavaka* 18: 19, 1993).
- Cryptosphaeria** Ces. & De Not. (1863) nom. cons., *Diatrypaceae*. Anamorph *Cytosporina*. 8, widespread (esp. temperate). See Glawe & Rogers (*CJB* 64: 1493, 1986; anamorph), Glawe & Jacobs (*Mycol.* 79: 135, 1987), Rappaz (*Mycol. Helv.* 2: 285, 1987; key), Glawe (*Sydowia* 41: 122, 1989; anamorph), Rappaz (*Taxon* 38: 664, 1989; nomencl.), Romero & Carmarán (*Fungal Diversity* 12: 161, 2003; Argentina), Acero *et al.* (*Mycol.* 96: 249, 2004; phylogeny, polyphyly).
- Cryptosphaeria** Grev. (1822) nom. rej. = *Diplodia* fide Bisby & Mason (*TBMS* 24: 138, 1940).
- Cryptosphaerina** Lambotte & Fautrey ex Sacc. & P. Syd. (1902) = *Cryptosphaeria* Ces. & De Not. fide Pirozynski (*in litt.*).
- Cryptospora** Tul. & C. Tul. (1863) [non *Cryptospora* Kar. & Kir. 1842, *Cruciferae*] = *Cryptosporella* fide Holm (*SA* 11: 29, 1992), Mejía *et al.* (*MR* 112: 23, 2008; phylogeny).
- Cryptosporella** Sacc. (1877), *Gnomoniaceae*. 8, widespread. See Reid & Booth (*CJB* 65: 1320, 1987), Ananthapadmanaban (*TBMS* 90: 479, 1988; synonym of *Wuestneia*), Reid & Booth (*CJB* 67: 879, 1989), Lee *et al.* (*Stud. Mycol.* 50: 235, 2004), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny), Mejía *et al.* (*MR* 112: 23, 2008; phylogeny, monogr.).
- Cryptosporellaceae** Arx & E. Müll. (1954) = *Gnomoniaceae*.
- Cryptosporina** E.I. Hazard & Oldacre (1975), *Microsporidia*. 1.
- Cryptosporina** Höhn. (1905) = *Botryosphaeria* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Cryptosporiopsis** Bubák & Kabát (1912), anamorphic *Pezicula*, *Ocellaria*, Cac/St.0eH.15. c. 29, widespread (esp. temperate). *C. malicorticis* (syn. *Gloeosporium perennans*) (perennial canker of apple). See Dennis (*Kew Bull.* 29: 157, 1974; key), Johnston & Fullerton (*N.Z. J. Exp. Agr.* 16: 159, 1988; *C. citri* causing leaf spot of *Citrus*), Gené *et al.* (*MR* 94: 309, 1990; bud rot of *Corylus*), Dugan *et al.* (*Mycol.* 85: 551 and 565, 1993; morphology, pathogenicity, cytology etc. of *C. perennans* and *C. curvispora*), Kowalski *et al.* (*MR* 102: 347, 1998), Verkley (*Stud. Mycol.* 44: 180 pp., 1999; monogr.), Abeln *et al.* (*Mycol.* 92: 685, 2000; phylogeny), Sigler *et al.* (*Stud. Mycol.* 53: 53, 2005; N America).
- Cryptosporium** Kunze (1817), anamorphic *Pezizomycotina*. 25, widespread (temperate). See Sutton (*Mycol. Pap.* 141, 1977).
- Cryptostictella** Grove (1912) = *Discosia* fide Petrak & Sydow (*Annls mycol.* 23: 209, 1925), Grove (*British Stem- and Leaf-Fungi (Coelomycetes)* 2, 1937).
- Cryptostictis** Fuckel (1866) = *Seimatosporium* fide Shoemaker (*CJB* 42: 411, 1964).
- Cryptostroma** P.H. Greg. & S. Waller (1952), anamorphic *Pezizomycotina*, St.0eP.19. 1, N. America; Europe. *C. corticale* (sooty bark of *Acer*).
- Cryptosympodula** Verkley (1999), anamorphic *Scleropezicula*, Hso.???. 1, Canada. See Verkley (*Stud. Mycol.* 44: 132, 1999).
- Cryptothamnium** Wallr. (1842) = *Chaenocarpus* Spreng. fide Læssøe (*SA* 13: 55, 1994).
- Cryptothecia** Stirt. (1876) nom. cons., *Arthoniaceae* (L). 75, widespread (tropical). See Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952), Awasthi & Agarwal (*J. Indian bot. Soc.* 48: 62, 1969), Makhija & Patwardhan (*Biovigyanam* 11: 1, 1985; key 24 spp.), Thor (*Bryologist* 94: 278, 1991), Lücking (*Lichenologist* 27: 127, 1995; Costa Rica), Thor (*Symb. bot. upsal.* 32: 267, 1997; Australasia), Grube (*Bryologist* 101: 377, 1998), Grube & Lücking (*MR* 105: 1007, 2001; ontogeny), Sipman (*Biblthca Lichenol.* 86: 177, 2003; Singapore), Sparrius & Saipunkaew (*Lichenologist* 37: 507, 2005; Thailand), Lücking *et al.* (*Lichenologist* 38: 235, 2006; *C. candida* complex).
- Cryptotheciaceae** Bonord. (1864) = *Arthoniaceae*.
- Cryptothecium** Penz. & Sacc. (1897) [non *Cryptothecium* Hübener 1851, fossil *Musci*] = *Protocreopsis* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Cryptothele** Th. Fr. (1866), *Lichinaceae* (L). 8, widespread. See Henssen & Büdel (*Beih. Nova Hedwigia* 79: 381, 1984), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key).
- Cryptotheliaceae** Walt. Watson (1929) = *Trypetheliaceae*.
- Cryptotheliomyces** Cif. & Tomas. (1953) = *Cryptothele*.
- Cryptothelium** A. Massal. (1860), *Trypetheliaceae* (L). 1, tropical. See Eriksson (*Op. Bot.* 60, 1981), Harris (*Acta Amazon. Supl.* 14: 55, 1984; key 2 spp. Brazil), Eriksson & Hawksworth (*SA* 11: 56, 1992;

- status), Aptroot *et al.* (*Bibliotheca Lichenol.* 97, 2008; Costa Rica).
- Cryptotrichosporon** I. Okoli & Boekhout (2007), anamorphic *Trichosporonaceae*. 1, Nigeria. See Okoli *et al.* (*FEMS Yeast Res.* 7: 339, 2007).
- Cryptovalsa** Ces. & De Not. ex Fuckel (1870), Sordariomycetes. 24, widespread. See Hyde (*MR* 97: 799, 1993), Inderbitzin *et al.* (*MR* 103: 1628, 1999; Hong Kong), Mostert *et al.* (*Australas. Pl. Path.* 33: 295, 2004; on *Vitis*), Vasilyeva & Stephenson (*Fungal Diversity* 19: 189, 2005; USA).
- Cryptovalsaria** Lar.N. Vassiljeva & S.L. Stephenson (2007), Sordariomycetes. 1. See Vasiljeva & Stephenson (*Sydowia* 59: 154, 2007).
- Cryptumbellata** Udagawa & Uchiy. (1999), anamorphic *Pezizomycotina*, Hso.?.?. 1, China. See Udagawa & Uchiyama (*Mycotaxon* 70: 186, 1999).
- Crystallocystidium** (Rick) Rick (1940) nom. dub., Polyporales.
- Ctenoderma** Syd. & P. Syd. (1920) = Skierka fide Mains (*Mycol.* 31: 175, 1939).
- ctenoid**, comb-like.
- Ctenomyces** Eidam (1880), Arthrodermataceae. Anamorph *Chrysosporium*-like. 1, widespread. See Orr & Kuehn (*Mycopathologia* 21: 321, 1963), Currah (*Mycotaxon* 24: 1, 1985), Harmsen *et al.* (*Mycoses* 42: 67, 1999; DNA), Sugiyama & Mikawa (*Mycoscience* 42: 413, 2001; phylogeny), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny).
- Ctenosporites** Elsik & Janson. (1974), Fossil Fungi, anamorphic *Pezizomycotina*. 2 (Eocene), widespread. See Lange & Smith (*N. Jb. Geol. Paläont. Mh.* 11: 649, 1975).
- Ctenosporium** R. Kirschner (2006), anamorphic *Pezizomycotina*. 1, Panama. Possibly synonymous with the fossil genus *Ctenosporites*. See Kirschner (*Mycol. Progr.* 5: 136, 2006).
- Ctesium** Pers. (1827) = *Graphis* fide Staiger (*Bibliotheca Lichenol.* 85, 2002).
- Cubamyces** Murrill (1905) = *Trametes* fide Overholts (*Polyporaceae of the United States, Alaska, & Canada*, 1953).
- Cubasina** R.F. Castañeda (1986), anamorphic *Pezizomycotina*, Hso.#eP.1. 1, Cuba. See Castañeda (*Deuteromycotina de Cuba* Hyphomycetes IV: 6, 1986), Markovskaya & Treigienė (*Mikol. Fitopatol.* 38: 52, 2004).
- Cubonia** Sacc. (1889), ? Ascobolaceae. 3, Europe. Most species included in this genus belong in to *Pseudombrophila*, but a revision is needed. See Kimbrough & Korf (*Am. J. Bot.* 54: 9, 1967), Eckblad (*Nytt Mag. Bot.* 15: 1, 1968), Durand (*BSMF* 88: 155, 1973; ontogeny), Pfister (*Mycol.* 76: 843, 1984).
- Cucujomyces** Speg. (1917), Laboulbeniaceae. 14, widespread. See Rossi & Weir (*CJB* 74: 77, 1996; Indonesia), Weir & Rossi (*CJB* 75: 791, 1997; NZ), Weir & Rossi (*Mycol.* 93: 171, 2001; Bolivia), Santamaría (*Fl. Mycol. Iberica* 5, 2003; Iberian peninsula), Hughes *et al.* (*Mycol.* 96: 1355, 2004; New Zealand).
- Cucullaria** Corda (1842) = *Leotia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- cucullate**, hood-like or cowl-like in form.
- Cucullospora** K.D. Hyde & E.B.G. Jones (1986) [non *Cucullispora* Scheuring 1970, fossil-sporae dispersae] = *Cucullosporella*.
- Cucullosporella** K.D. Hyde & E.B.G. Jones (1990), Halosphaeriaceae. 1 (marine), Seychelles. See Jones & Hyde (*Mycotaxon* 37: 197, 1990), Alias *et al.* (*Mycoscience* 42: 405, 2001; ultrastr.), Pang *et al.* (*Nova Hedwigia* 77: 1, 2003; phylogeny).
- Cucurbitodithis** Petr. (1921) = *Curreya* fide von Arx & Müller (*Stud. Mycol.* 9, 1975), Silva-Hanlin & Hanlin (*MR* 103: 153, 1999).
- Cucurbitaria** Gray (1821), Cucurbitariaceae. Anamorphs *Camarosporium*, *Dichomera*, *Pleurostromella*, *Megaloseptoria*, *Pyrenochaeta*, *Diplodia*-like. c. 36 (on twigs), widespread. See Mirza (*Nova Hedwigia* 16: 161, 1968), Silva-Hanlin & Hanlin (*MR* 103: 153, 1999; DNA), Liew *et al.* (*Mol. Phylogen. Evol.* 16: 392, 2000; phylogeny), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Cucurbitariaceae** G. Winter (1885), Pleosporales. 5 gen. (+ 9 syn.), 49 spp.
Lit.: Mirza (*Nova Hedwigia* 16: 161, 1968), Barr & Boise (*Mem. N. Y. bot. Gdn* 49: 298, 1989), Barr (*Mem. N. Y. bot. Gdn* 62: 92 pp., 1990), Berbee (*Mol. Biol. Evol.* 13: 462, 1996), Ramaley & Barr (*Mycotaxon* 65: 501, 1997), Silva-Hanlin & Hanlin (*MR* 103: 153, 1999; DNA).
- Cucurbitariaceites** R.K. Kar, R.Y. Singh & Sah (1972), Fossil Fungi, Dothideomycetes. 2 (Tertiary), India.
- Cucurbitariella** Petr. (1917) = *Coniochaeta* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Cucurbitariopsis** C. Massal. (1889) ? = *Rhabdospora* fide Mussat (*Syll. fung.* 10: 1, 1892), Sutton (*Mycol. Pap.* 141, 1977).
- Cucurbitariopsis** Vassilkov (1960) = *Gemmamyces*.
- Cucurbitopsis** Bat. & Cif. (1957), *Pezizomycotina*. 1, Portugal. See Batista & Ciferri (*Publções Inst. Micol. Recife* 95: 3, 1957).
- Cucurbitula** Fuckel (1870) = *Coniochaeta* fide Petrini (*Sydowia* 44: 169, 1993).
- cudbear (corkir)**, Scottish names for lichens used in making dye, esp. *Ochrolechia tartarea*. See Dyeing.
- Cudonia** Fr. (1849), Cudoniaceae. 9, widespread (temperate). See Mains (*Am. J. Bot.* 27: 322, 1940), Nannfeldt (*Ark. Bot.* 30A no. 4: 1, 1942), Mains (*Mycol.* 48: 694, 1956; N. Am. spp.), Sharma & Rawla (*Bibliotheca Mycol.* 91: 203, 1983; India), Landvik *et al.* (*Mycoscience* 37: 237, 1997; phylogeny), Döring & Triebel (*Cryptog. Bryol.-Lichénol.* 19: 123, 1998; phylogeny), Gernandt *et al.* (*Mycol.* 93: 915, 2001; phylogeny), Wang *et al.* (*Mycol.* 94: 641, 2002; phylogeny, n. sp.), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006; phylogeny).
- Cudoniaceae** P.F. Cannon (2001), Rhytismatales. 2 gen. (+ 3 syn.), 21 spp.
Lit.: Landvik *et al.* (*Mycoscience* 37: 237, 1996; phylogeny), Döring & Triebel (*Cryptog. Bryol.-Lichénol.* 19: 123, 1998; phylogeny), Gernandt *et al.* (*Mycol.* 93: 915, 2001), Wang *et al.* (*Mycol.* 94: 641, 2002), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Cudoniella** Sacc. (1889), Helotiaceae. Anamorph *Tricladium*. c. 30, widespread. See Dennis (*Persoonia* 3: 72, 1964), Baral & Krieglsteiner (*Beih. Sydowia* 6, 1985; synonym of *Hymenoscyphus*), Webster *et al.* (*Nova Hedwigia* 60: 493, 1995; anamorph), Gamundí & Romero (*Fl. criptog. Tierra del Fuego* 10: 130 pp., 1998; Argentina), Wang *et al.* (*Am. J. Bot.* 92: 1565, 2005; phylogeny), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Wang *et al.* (*Mol. Phy-*

- logen. Evol.* 41: 295, 2006; phylogeny).
- Cudoniopsis** Speg. (1925), Sclerotiniaceae. 1, S. America.
- Culbersonia** Essl. (2000), Physciaceae. 2, Kenya; USA. See Esslinger (*Bryologist* 103: 771, 2000).
- Culcitalna** Meyers & R.T. Moore (1960), anamorphic *Halosphaeriaceae*, Hsp.≡ eP.1. 1 (marine), New-foundland. See Meyers & Moore (*Am. J. Bot.* 47: 348, 1960), Hambleton *et al.* (*Stud. Mycol.* 53: 29, 2005; phylogeny).
- Culicicola** Nieuwl. (1916) ≡ *Lamia*.
- Culicidospora** R.H. Petersen (1960), anamorphic *Pezizomycotina*, Hso.1bH.1. 2 (aquatic), widespread. See Petersen (*Mycol.* 55: 23, 1963), Descals (*MR* 109: 545, 2005; diagnostics).
- Culicinomyces** Couch, Romney & B. Rao (1974), anamorphic *Pezizomycotina*, Hso.0eH.15. 3 (in *Anopheles* and rotifers), USA; Australia. See Inmann & Bland (*CJB* 61: 2618, 1983; ultrastr. conidiogenesis), Sweeney *et al.* (*J. Invert. Path.* 42: 224, 1983; ultrastr.), Sigler *et al.* (*Mycol.* 79: 493, 1987; on *Aedes kochi*).
- Culicospora** J. Weiser (1977), Microsporidia. 1.
- Culicosporella** J. Weiser (1977), Microsporidia. 1.
- culmicolous**, living on stems, esp. those of grasses; caulicolous; **culmicole**, an organism which does this.
- culmomarasmin**, a wilt toxin of *Fusarium culmorum* (Gäumann *et al.*, *Phytopath. Z.* 36: 115, 1959).
- cultivar**, a variety in the horticultural (or agricultural) sense (see Art. 10, *International code of nomenclature for cultivated plants* [*Regnum veg.* 104], 1980). Snyder *et al.* (*J. Madras Univ.* 27: 185, 1957) used cultivar for infraspecific taxa of *Fusarium* but this term is only correctly used in mycology for trade varieties of cultivated mushrooms, etc.
- cultivated mushroom**, basidioma of *A. bisporus* (syn. *A. brunnescens*; name in need of conservation; see Malloch, *Mycol.* 68: 910, 1976, nomencl.).
- culture**, a growth of one organism or of a group of organisms for the purpose of experiment (esp. of fungi and other organisms on laboratory media) or sometimes for trade (e.g. a **mushroom** -); **continuous** -, one in which the culture medium is simultaneously added and withdrawn (harvested) so that the volume remains constant; see Calcott (*Continuous culture of cells*, 2 vols, 1981); **enrichment** -, a culture which favours the growth of the desired organism in a mixed culture or population; **pure** -, a - of one sort of organism; - **medium**, see medium; **type** -, see type.
- Culture collections**, see Genetic resource collections.
- culture methods**, see Media.
- Cumminsiella** Arthur (1933), Pucciniaceae. 8 (on *Berberis*, *Mahonia* (autoecious) (*Berberidaceae*)), Europe; America. See Baxter (*Mycol.* 49: 864, 1957; key), McCain & Hennen (*Syst. Bot.* 7: 48, 1982; keys etc.) *C. mirabilissima* is a neomycete in many regions on cultivated *Mahonia*.
- Cumminsina** Petr. (1955), ? Raveneliaceae. 1 (on *Grewia* (*Tiliaceae*)), Angola. See Petrak (*Sydowia* 9: 474, 1955).
- cumulate**, massed together; heaped up.
- Cumulospora** I. Schmidt (1985), anamorphic *Pezizomycotina*, Hso.#eP.?. 1 (marine), widespread. See Schmidt (*Mycotaxon* 24: 420, 1985), Peña & Aramburri (*Darwiniana* 35: 69, 1998; Argentina), Chatmala *et al.* (*Fungal Diversity* 17: 1, 2004; Thailand).
- cuneate**, see cuneiform.
- cuneiform (cuneate)**, thinner at one end than the other; wedge or axe-blade shaped (Fig. 23.23).
- Cuniculitrema** J.P. Samp. & R. Kirschner (2001), Cuniculitremaeae. Anamorph *Sterigmatosporidium*. 1, Germany. See Kirschner *et al.* (*Antonie van Leeuwenhoek* 80: 155, 2001).
- Cuniculitremaeae** J.P. Samp., R. Kirschner & M. Weiss (2001), Tremellales. 4 gen., 25 spp.
Lit.: Kirschner *et al.* (*Antonie van Leeuwenhoek* 80: 155, 2001).
- Cunningham** (Gordon Herriot; 1892-1962; New Zealand). Wounded at Gallipoli (1914); instructor, Horticulture Division, Department of Agriculture, Palmerston North (1917-1920) then Wellington (1920-1928); Head of Mycological Laboratory, Plant Research Station, Palmerston North (1928-1935); Director, Plant Diseases Division, Department of Scientific and Industrial Research, Auckland (1939-1957); Fellow of the Royal Society of London (1950). Pioneer New Zealand plant pathologist and mycologist. *Publs.* The Ustilaginaceae or smuts of New Zealand. *Transactions of the New Zealand Institute* (1924), *Fungus Diseases of Fruit-trees in New Zealand* (1925); *The Rust Fungi of New Zealand* (1931) *Plant Protection by the Aid of Therapeutants* (1935); *Gasteromycetes of Australia and New Zealand* (1944); *The Thelephoraceae of Australia and New Zealand. Bulletin of the New Zealand Department of Scientific and Industrial Research* (1963); Polyporaceae of New Zealand. *Bulletin of the New Zealand Department of Scientific and Industrial Research* (1965). *Biogs, obits etc.* Ramsbottom (*Biographical Memoirs of Fellows of the Royal Society* 10: 15, 1964) [bibliography, portrait]; Stafleu & Cowan (*TL-2* 1: 573, 1976).
- Cunninghamella** Matr. (1903), Cunninghamellaceae. 10, widespread. See Samson (*Proc. K. ned. Akad. Wet. Ser. C, Biol. Med. Sci.* 72: 322, 1969; key), Hawker *et al.* (*J. gen. Microbiol.* 60: 181, 1970; sporangium ultrastructure), Baijal & Mehrotra (*Sydowia* 33: 1, 1980; key), Shipton & Lunn (*TBMS* 74: 483, 1980; taxonomic criteria, key), Lunn & Shipton (*TBMS* 81: 303, 1983; key), Weitzman (*TBMS* 83: 527, 1984), Zheng & Chen (*Mycosystema* 5: 1, 1992), Dermoumi (*Mycoses* 36: 293, 1993; zygomycoses), Zheng & Chen (*Mycosystema* 7: 1, 1994), Zheng & Chen (*Mycosystema* 8-9: 1, 1995-1996), Zheng & Chen (*Mycotaxon* 69: 187, 1998), Su *et al.* (*MR* 103: 805, 1999; phylogeny), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny), White *et al.* (*Mycol.* 98: 872, 2006; phylogeny), Koyama *et al.* (*Respirology* 13: 309, 2008; mucormycosis).
- Cunninghamellaceae** Naumov ex R.K. Benj. (1959), Mucorales. 5 gen. (+ 3 syn.), 15 spp.
Lit.: Benny *et al.* (*Mycol.* 84: 639, 1992; emend.), Dermoumi (*Mycoses* 36: 293, 1993), Zheng & Chen (*Mycosystema* 7: 1, 1994), Zheng & Chen (*Mycosystema* 8-9: 1, 1995-1996), Zheng & Chen (*Mycotaxon* 69: 187, 1998), Su *et al.* (*MR* 103: 805, 1999).
- Cunninghamia** Curr. (1873) [non *Cunninghamia* R. Br. 1826, *Cycadaceae*] ≡ *Choanephora*.
- Cunninghammyces** Stalpers (1985), Cyphellaceae. 2, New Zealand; Réunion. See Hjortstam & Larsson (*Windahlia* 21, 1994; = *Xenasma*), Hjortstam *et al.* (*Syn. Fung.* 20: 42, 2005).
- cup fungus**, a discomycete (esp. *Leotiales* or *Pezizales*) ascoma. - **lichen**, a sp. of *Cladonia* having podetia expanded into goblet-like scyphi.

- Cuphocybe** R. Heim (1951) = *Cortinarius* fide Peintner *et al.* (*Mycotaxon* 83: 447, 2002).
- Cuphophyllus** (Donk) Bon (1985), Hygrophoraceae. c. 25, widespread. See Lodge (*Kew Bulletin* 54: 807, 1999; Lesser Antilles), Bañares & Arnolds (*Persoonia* 18: 135, 2002; Canary Islands).
- cupulate**, cup-like in form, as e.g. in conidiomata (Fig. 10 O).
- Cupulisporonites** Z.C. Song & Liu Cao (1994), Fossil Fungi. 1, Antarctica. See Song & Cao (*Monograph, State Antarctic Committee China* 3: 38, 1994).
- Cupulomyces** R.K. Benj. (1992), Laboulbeniaceae. 1, Grenada. See Benjamin (*Aliso* 13: 355, 1992), Santamaria (*MR* 99: 1071, 1995).
- Curculiospora** Arnaud (1954), anamorphic *Pezizomycotina*, Hso.0 = hP.1. 1, France.
- curling factor**, see griseofulvin.
- Curreya** Sacc. (1883), Cucurbitariaceae. Anamorph *Coniothyrium*-like. 2 (on conifers), widespread (north temperate). See von Arx & van der Aa (*Sydowia* 36: 1, 1983), Eriksson (*SA* 5: 127, 1986), Barr (*Mycotaxon* 29: 501, 1987), Barr (*Mem. N. Y. bot. Gdn* 62, 1990), Kruys *et al.* (*MR* 110: 527, 2006; phylogeny).
- Curreyella** (Sacc.) Lindau (1897) = *Discostroma* fide Kang *et al.* (*MR* 103: 53, 1999).
- Curreyella** Massee (1895) = *Plicaria* fide Eckblad (*Nytt Mag. Bot.* 15: 1, 1968).
- Curtis** (Moses Ashley; 1808-1872; USA). Became priest, Wilmington, North Carolina (1835); teacher, Raleigh, North Carolina (1837-1839); missionary, Hillsboro (1841-1847) then Society Hill (1847-1856) then again Hillsboro (1856-1872), North Carolina. Student and collector of American fungi who collaborated with Tuckerman (q.v.) and Berkeley (q.v.), sending them specimens collected personally and received from other field biologists mainly in the USA but also from Cuba. Collections in FH and K. *Biogs, obits etc.* Berkeley & Berkeley (*A Yankee botanist.*, 1986); Petersen (*Mycotaxon* 9: 459, 1979); Petersen ('B. & C': the mycological association of M.J. Berkeley and M.A. Curtis. *Bibliotheca Mycologica* 72: 1, 1980); Shear & Stevens (*Mycol.* 11: 181, 1919); Snell & Dick (*Mycol.* 45: 968, 1953); Stafleu & Cowan (*TL-2* 1: 573, 1976).
- Curucispora** Matsush. (1981), anamorphic *Pezizomycotina*, Hso.1bH.1. 2, Ponape. See Matsushima (*Matsush. Mycol. Mem.* 2: 4, 1981).
- Curvatispora** V.V. Sarma & K.D. Hyde (2001), Clypeosphaeriaceae. 1, Singapore. See Sarma & Hyde (*Nova Hedwigia* 72: 480, 2001).
- Curvibasidium** Samp. & Golubev (2004), Microbotryomycetes. 2, Japan; Europe. See Sampaio *et al.* (*Int. J. Syst. Evol. Microbiol.* 54: 1402, 2004).
- Curviciadiella** Decock & Crous (2006), anamorphic *Nectriaceae*, Hso.???. 1, French Guiana. See Decock & Crous (*Stud. Mycol.* 55: 225, 2006).
- Curviciadium** Decock & Crous (1998) = *Curviciadiella* fide Decock & Crous (*Mycol.* 90: 276, 1998), Crous *et al.* (*Stud. Mycol.* 55: 213, 2006).
- Curvidigitus** Sawada (1943), anamorphic *Pezizomycotina*, Hsy.0 = bH.?. 1, Taiwan. See Pirozynski (*Mycol. Pap.* 129, 1972).
- Curvisporium**, see *Curvusporium*.
- Curvularia** Boedijn (1933), anamorphic *Cochliobolus*, Hsy. = eP.26. 54, widespread. *C. lunata* common on crop plants, esp. trop. (Lam-Quang-Bach, *Fiches Phytopath. trop.* 15, 1964). See Kendrick & Cole (*CJB* 46: 1279, 1968; spore devel.), Sivanesan (*Mycol. Pap.* 158, 1987; key), Alcorn (*Mycotaxon* 39: 361, 1990; additions to genus), Alcorn (*Mycotaxon* 41: 329, 1991), Berbee *et al.* (*Mycol.* 91: 964, 1999; ITS), Olivier *et al.* (*Mycol.* 92: 736, 2000; phylogeny), Hosokawa *et al.* (*Mycoscience* 44: 227, 2003; morphology), Sivanesan *et al.* (*Aust. Syst. Bot.* 16: 275, 2003; Australia), Sun *et al.* (*Mycoscience* 44: 239, 2003; species concepts), Carter & Boudreaux (*J. Clin. Microbiol.* 42: 5419, 2004; clinical), Bhattacharya *et al.* (*BMC Evolutionary Biology* 5: 58, 2005; introns), Pimentel *et al.* (*J. Clin. Microbiol.* 43: 4288, 2005; clinical).
- Curvulariopsis** M.B. Ellis (1961), anamorphic *Pezizomycotina*, Hsy. = eP.10. 1, Ecuador. See Ellis (*Mycol. Pap.* 82: 39, 1961).
- Curvusporium** Corbetta (1963) = *Curvularia* fide Sutton (*in litt.*), Hosokawa *et al.* (*Mycoscience* 44: 227, 2003).
- cuspidate** (e.g. of a pileus or cystidium), having a well-marked sharp outgrowth or point at the top.
- Cuspidatispora** Shearer & Bartolata (2006), Lasiosphaeriaceae. 1, USA. See Miller *et al.* (*Mycoscience* 47: 220, 2006).
- Cuspidosporium** Cif. (1955) = *Exosporium* fide Ellis (*Mycol. Pap.* 82, 1961).
- Custingophora** Stolk, Hennebert & Klopotek (1968), anamorphic *Sordariomycetes*, Hso.0eP.15. 2, widespread. See Barr & Crane (*CJB* 57: 835, 1979), Viljoen *et al.* (*MR* 103: 497, 1999), Réblová & Winka (*Mycol.* 92: 939, 2000; phylogeny), Pinnoi *et al.* (*Nova Hedwigia* 77: 213, 2003; Thailand).
- Cuticularia** Ducomet (1907), anamorphic *Pezizomycotina*, Hso.-.-. 1, Europe.
- cutis** (cuticle) (of basidiomata), the outer layer consisting of compressed hyphae parallel to the surface; the upper and lower layers of the cutis are sometimes distinguished as epi- and sub-. See Shaffer (*Brittonia* 22: 230, 1970; cuticular terminology in *Russula*), Singer (*Agaricales in Modern Taxonomy* edn 4: 69, 1986); also pellis.
- Cutomycetes** Thüm. (1878) = *Puccinia* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- CYA**, see Media.
- cyanescent**, becoming blue.
- Cyanicium** Locq. (1979) = *Cortinarius* fide Kuyper (*in litt.*).
- Cyanisticta** Gyeln. (1931) = *Pseudocyphellaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Cyanoannulus** Raja, J. Campb. & Shearer (2003), Annulatascaceae. 1, USA. See Raja *et al.* (*Mycotaxon* 88: 8, 2003), Campbell & Shearer (*Mycol.* 96: 822, 2004).
- Cyanobaeis** Clem. (1909) = *Baeomyces* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Cyanobasidium** Jülich (1979) = *Lindtneria* fide Hjortstam (*Mycotaxon* 28: 19, 1987).
- cyanobiont**, see photobiont.
- Cyanocephalum** Zukal (1893) ? = *Thelocarpon* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Cyanochyta** Höhn. (1915), anamorphic *Gibberella*, Cpd.1eH.?. 1, Europe. See Sutton (*Mycol. Pap.* 141, 1977).
- Cyanoderma** Höhn. (1919) [non *Cyanoderma* Weber Bosse 1887, *Rhodophyceae*] = *Cyanodermella*.
- Cyanodermella** O.E. Erikss. (1981), Stictidaceae. 2,

- Europe; N. America. See Eriksson (*Ark. Bot. ser. 2* 6: 381, 1967; as *Cyanoderma*), Winka *et al.* (*Lichenologist* 30: 455, 1998; DNA), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Ekman & Tønsberg (*MR* 106: 1262, 2002; phylogeny).
- Cyanodiscus** E. Müll. & M.L. Farr (1971), Saccardiaceae. 1 or 2, USA (subtropical); Cuba. See Müller & Farr (*Mycol.* 63: 1080, 1971), Reynolds & Gilbert (*Cryptog. Mycol.* 27: 249, 2006; Panamá).
- Cyanodontia** Hjortstam (1987), Meruliaceae. 1, E. Africa. See Hjortstam (*Mycotaxon* 28: 23, 1987).
- Cyanohypha** Jülich (1982) = *Botryobasidium* Donk fide Langer (*Biblthca Mycol.* 158, 1994).
- Cyanopatella** Petr. (1949), anamorphic *Pezizomycotina*, Cpd.0eH/1eP.?. 1, Iran.
- cyanophilous** (of spores, etc.), readily absorbing a blue stain such as cotton blue or gentian violet.
- Cyanophomella** Höhn. (1918), anamorphic *Gibberella*, Cpd.0-1eH.?. 1, Europe.
- cyanophycophilous** (of fungi), ones lichenized with a cyanobacterium (Pike & Carroll, in Alexopoulos & Mims, *Introductory mycology*, edn 3, 1980); see photobiont.
- Cyanoporina** Groenh. (1951), ? Pyrenothricaceae (L). 1, Java. See Groenhardt (*Reinwardtia* 1: 198, 1951).
- Cyanopulvis** J. Fröhl. & K.D. Hyde (2000), Xylariaceae. 1, Australia. See Fröhlich & Hyde (*Fungal Diversity Res. Ser.* 3: 308, 2000).
- Cyanopyrenia** H. Harada (1995), ? Eurotiomycetes (L). 1 (aquatic), Japan. See Harada (*Lichenologist* 27: 249, 1995).
- Cyanospora** Heald & F.A. Wolf (1910) = *Robergea* fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).
- Cyanosporus** McGinty (1909) = *Polyporus* P. Micheli ex Adans. fide Stevenson & Cash (*Bull. Lloyd Libr. Mus.* 35: 130, 1936).
- Cyanotheca** Pascher (1914) nom. dub., ? Fungi.
- cyanotrophic** (of fungi, esp. lichen-forming spp.), obtaining nutrients (esp. nitrates fixed from the atmosphere) by forming regular connexions to free-living or $\pm$ lichenized cyanobacteria; see Poelt & Mayrhofer (*Pl. Syst. Evol.* 158: 265, 1988); see also cephalodium.
- Cyathela** Raf. (1819) nom. dub., Fungi. No spp. included.
- Cyathella** Raf. (1815) nom. dub., Fungi. No spp. included.
- Cyathia** P. Browne (1756) = *Cyathus* fide Stalpers (*in litt.*).
- Cyathicula** De Not. (1863) = *Crocicreas* fide Carpenter (*Mem. N. Y. bot. Gdn* 33, 1981), Triebel & Baral (*Sendtnera* 3: 199, 1996), Gamundí & Romero (*Fl. criptog. Tierra del Fuego* 10: 130 pp., 1998; Argentina), Iturriaga *et al.* (*MR* 103: 28, 1999; nomencl.), Gamundí (*Darwiniana* 41: 29, 2003; Chile).
- cyathiform**, like a cup, a little wider at the top than at the bottom, and sometimes stalked.
- Cyathipodia** Boud. (1907) = *Helvella* fide Dissing (*Dansk bot. Ark.* 25 no. 1, 1966).
- Cyathisphaera** Dumort. (1822) = *Cucurbitaria* fide Nannfeldt (*Svensk bot. Tidskr.* 69: 49, 1975).
- Cyathodes** P. Micheli ex Kuntze (1891) = *Cyathus*.
- Cyathus** Haller (1768), Agaricaceae. c. 45 (on soil, wood, etc.), widespread. The Bird's Nest Fungi. See Brodie (*Bot. Notiser* 130: 453, 1977; world key), Gomez & Pérez-Silva (*Rev. Mex Micol.* 4: 161, 1988; key Mexican spp.), Zhou *et al.* (*Fungal Diversity* 17: 243, 2004; China), Sarasini (*Gasteromiceti Epigei*: 406 pp., 2005).
- Cybebe** Tibell (1984) = *Chaenotheca* fide Middelborg & Mattson (*Sommerfeltia* 5, 1987), Sparrius *et al.* (*Mycotaxon* 83: 357, 2002; Taiwan).
- Cyberliber** (www.cybertruffle.org.uk/cyberliber). An open source of mycological literature on the internet, providing access to scanned images of all the main mycological catalogues and thesauruses, and of many volumes of mycological books and journals. There are, in addition, lists of published mycological works in alphabetical order by author, and a search facility to find works by any specified mycological author.
- Cyclaneusma** DiCosmo, Peredo & Minter (1983), Leotiomycetes. 2 (on *Pinus*), widespread. See Cannon & Minter (*Mycol. Pap.* 155, 1986; India), Choi & Simpson (*Mycotaxon* 54: 455, 1995; development), Gernandt *et al.* (*Mycol.* 93: 915, 2001; phylogeny), Minter (*Mycotaxon* 87: 43, 2003).
- Cycledium** Wallr. (1833) = *Schizoxylon*.
- Cycledum**, see *Cycledium*.
- Cyclobium** C. Agardh (1821) = *Clisosporium*.
- Cyloconium** Castagne (1845) nom. rej. = *Spilocaea* fide Hughes (*CJB* 36: 727, 1958), Braun (*Taxon* 54: 538, 2005; nomencl.).
- Cyclocybe** Velen. (1939) = *Agrocybe* fide Kuyper (*in litt.*).
- Cyclocytospora** Höhn. (1928) = *Cytospora* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Cycloderma** Klotzsch (1832) nom. dub., Agaricales. See Lloyd (*Mycol. Notes* 17: 181, 1904) probably an unopened *Geastrum*.
- Cyclodomella** P.N. Mathur, V.V. Bhatt & Thirum. (1959) = *Coniella* fide Petrak (*Sydowia* 14: 352, 1960).
- Cyclodomus** Höhn. (1909), anamorphic *Maculatifrondes*, Cpd.0eH.15. 3, USA; S. America.
- Cyclodothis** P. Syd. (1913) = *Mycosphaerella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Cyclographa** Vain. (1921) = *Catarraphia* fide Egea & Torrente (*Cryptog. Bryol.-Lichénol.* 14: 329, 1993).
- Cyclographina** D.D. Awasthi (1979) = *Diorygma* fide Awasthi (*Norw. Jl Bot.* 26: 169, 1979), Archer (*Telopea* 10: 589, 2004; Australia), Kalb *et al.* (*Symb. Bot. Upsal.* 34 no. 1: 140, 2004).
- cycloheximide** (actidione), an antibiotic from *Streptomyces griseus* (*J. Am. Chem. Soc.* 69: 174, 1947); antibacterial and antifungal. For use in isolating fungi pathogenic for humans, see Georg *et al.* (*J. Lab. Clin. Med.* 44: 222, 1954). - **tolerance**, used to distinguish plant pathogenic fungi, e.g. *Ceratocystis* from *Ophiostoma* (Harrington, *Mycol.* 72: 1123, 1981).
- Cyclomarsonina** Petr. (1965), anamorphic *Pezizomycotina*, St.1eH/1eP.?. 1, India. See Petrak (*Sydowia* 18: 391, 1964).
- Cyclomyces** Kunze ex Fr. (1830) nom. rej. = *Hymenochaete* fide Wagner & Fischer (*Mycol. Progr.* 1: 93, 2002).
- Cyclomycetella** Murrill (1904) = *Hymenochaete* fide Donk (*Reinwardtia* 1: 483, 1952; as *Cyclomyces*).
- Cyclopeltella** Petr. (1953), anamorphic *Cyclopeltis*, Cpt.0eH.?. 1, Philippines. See Petrak (*Sydowia* 7: 373, 1953).
- Cyclopeltis** Petr. (1953), Micropeltidaceae. Anamorph *Cyclopeltella*. 1, Philippines. See Petrak (*Sydowia* 7: 370, 1953).
- Cyclophomopsis** Höhn. (1920) = *Phomopsis* (Sacc.) Bubák. fide Sutton (*Mycol. Pap.* 141, 1977).

- Cyclopleurotus** Hasselt (1824) = *Pleurotus* fide Singer (*Agaric. mod. Tax.* 4th ed, 1986).
- Cycloporellus** Murrill (1907) = *Cyclomycetella*.
- Cycloporus** Murrill (1904) = *Coltricia* fide Pegler (*The polypores [Bull. BMS Suppl.]*, 1973), Ryvarden (*Khumbu Himal.* 6: 380, 1977).
- Cyclopus** (Quél.) Barbier (1907) = *Agrocybe*.
- Cycloschizaceae** Locq., D. Pons & Sal.-Cheb. (1981) = *Parmulariaceae*.
- Cycloschizella** Höhn. (1919) = *Cycloschizon* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Cycloschizon** Henn. (1902), *Parmulariaceae*. 11, widespread (tropical). See Inácio & Minter (*IMI Descr. Fungi Bact.* 145 nos 1441-1450, 2000).
- cyclosis**, cytoplasmic streaming; characteristic of eukaryotes.
- cyclosporin** (-e, **cyclosporin A**, Sandimmun), a ring-shaped polypeptide from *Tolypocladium inflatum* first reported by Dreyfuss *et al.* (*Eur. J. appl. Microbiol.* 3: 125, 1976) which selectively inhibits the immune system in humans, especially affecting T cells; since 1983 approved for general use during kidney, heart, liver, pancreas, and bone marrow transplants, reducing organ rejection rates and increasing patient survival; see Winter (*in Calhoun, 1986 Yearbook of science and the future*: 160, 1985; review). Also used for selective isolation of basidiomycetes.
- Cyclostoma** P. Crouan & H. Crouan (1867) = *Stictis*.
- Cyclostomella** Pat. (1896), *Parmulariaceae*. 2, C. America. See Inácio & Minter (*IMI Descr. Fungi Bact.* 145 nos 1441-1450, 2000).
- Cyclothea** Theiss. (1914), *Microthyriaceae*. 9, widespread (tropical). See Hosagoudar & Abraham (*New Botanist* 20: 109, 1993).
- Cyclothyrium** Petr. (1923), anamorphic *Thyridaria*, St.0eP.15. 2 (on *Juglans*), British Isles; India. See Sutton (*The Coelomycetes*, 1980).
- Cylicogone** Emden & Veenb.-Rijks (1974) = *Conioscypha* fide Sutton (*in litt.*), Réblová & Seifert (*Stud. Mycol.* 50: 95, 2004).
- Cylindrina** Pat. (1886) ? = *Stictis* fide Sherwood (*Mycotaxon* 6: 215, 1977).
- Cylindrium** Bonord. (1851) = *Fusidium* fide Hughes (*CJB* 36: 727, 1958).
- Cylindrobasidiaceae** Jülich (1982) = *Meruliaceae*.
- Cylindrobasidium** Jülich (1974), *Physalacriaceae*. 6, widespread. See Jülich (*Persoonia* 8: 72, 1974).
- Cylindrocarpon** Wollenw. (1913), anamorphic *Neonectria*, Hsp. = eH.15. 58 (esp. in soil; sometimes pathogenic), widespread. See Booth (*Mycol. Pap.* 104, 1966; key), Samuels (*N.Z. Jl Bot.* 16: 73, 1978; *Nectria* teleomorphs), Brayford (*TBMS* 89: 347, 1987; description of *C. bugnicourtii*), Brayford (*Mycopathologia* 100: 115, 1987; 10 descriptions and illustrations), Brayford & Samuels (*Mycol.* 85: 612, 1993), Samuels & Brayford (*Sydowia* 45: 55, 1993), Hennequin *et al.* (*J. Clin. Microbiol.* 37: 3586, 1999; clinical diagnostics), Iwen *et al.* (*J. Clin. Microbiol.* 38: 3375, 2000; clinical strain), Mantiri *et al.* (*CJB* 79: 334, 2001; *Neonectria* teleomorphs), Rossman *et al.* (*Mycol.* 93: 100, 2001; phylogeny), Watanabe *et al.* (*Mycoscience* 42: 591, 2001; Japan), Summerbell & Schroers (*J. Clin. Microbiol.* 40: 2866, 2002; phylogeny), Seifert *et al.* (*Phytopathology* 93: 1533, 2003; on ginseng), Brayford *et al.* (*Mycol.* 96: 572, 2004), Halleen *et al.* (*Stud. Mycol.* 50: 431, 2004), Petit & Gubler (*Pl. Dis.* 89: 1051, 2005; on *Vitis*), Castlebury *et al.* (*CJB* 84: 1417, 2006; phylogeny on *Fagus*), Halleen *et al.* (*Stud. Mycol.* 55: 227, 2006; on *Vitis*), Schroers *et al.* (*MR* 112: 82, 2008; 3-septate spp.).
- Cylindrocarpostylus** R. Kirschner & Oberw. (1999), anamorphic *Pezizomycotina*, Hso.?.?. 1 (in bark beetle galleries), Europe. See Kirschner & Oberwinkler (*MR* 103: 1155, 1999), Kubátová *et al.* (*Czech Mycol.* 53: 237, 2001; Czech Republic).
- Cylindrocephalum** Bonord. (1851) = *Chalara* fide Hughes (*CJB* 36: 727, 1958).
- Cylindrochytridium** Karling (1941), *Chytridiaceae*. 2, USA; British Isles.
- Cylindrochytrium**, see *Cylindrochytridium*.
- Cylindrocladiella** Boesew. (1982), anamorphic *Nectri-cladiella*, Hso. = eH.15. 11, widespread. See Crous & Wingfield (*MR* 97: 433, 1993; key), Victor *et al.* (*MR* 102: 273, 1998), Schoch *et al.* (*Stud. Mycol.* 45: 45, 2000; phylogeny), Crous (*Taxonomy and Pathology of Cylindrocladium (Calonectria) and Allied Genera*: 278 pp., 2002; review), Collier *et al.* (*Australas. Pl. Path.* 34: 489, 2005; on *Vitis*).
- Cylindrocladiopsis** J.M. Yen (1979) = *Cylindrocladium* fide Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 1: 216, 1995), Crous & Seifert (*Fungal Diversity* 1: 53, 1998).
- Cylindrocladium** Morgan (1892), anamorphic *Calonectria*, Hso. = eH.15. 66, widespread. See Wormald (*TBMS* 27: 71, 1944), Alfenas (*Fitopatol. Brasil* 11: 275, 1986; key), Stevens *et al.* (*Mycol.* 82: 436, 1990; aminopepsidase specificity and identification), Crous *et al.* (*S. Afr. For. Jl* 1576: 69, 1991; spp. in S. Africa forest nurseries), Peerally (*Mycotaxon* 40: 323, 1991; key and review), Crous & Wingfield (*S. Afr. J. Bot.* 58: 397, 1992; states of *Calonectria*), Crous *et al.* (*Syst. Appl. Microbiol.* 16: 266, 1993; techniques for characterization of 3-septate spp.), El-Gholl *et al.* (*CJB* 71: 466, 1993; *C. ovatum* n.sp. from *Eucalyptus*), Watanabe (*Mycol.* 86: 151, 1994; 3 spp. on *Phellodendron*), Crous *et al.* (*Sydowia* 50: 1, 1998), Crous *et al.* (*CJB* 77: 1813, 1999; phylogeny based on DNA), Schoch *et al.* (*Mycol.* 91: 286, 1999; population structure), Schoch *et al.* (*Mycol.* 92: 665, 2000), Kang *et al.* (*Syst. Appl. Microbiol.* 24: 206, 2001; species concepts), Schoch *et al.* (*Pl. Dis.* 85: 941, 2001; population genetics), Schoch *et al.* (*MR* 105: 1045, 2001; phylogeny), Henricot & Culham (*Mycol.* 94: 980, 2002; on *Buxus*), Crous *et al.* (*Stud. Mycol.* 50: 415, 2004), Risède & Simoneau (*Eur. J. Pl. Path.* 110: 139, 2004; on *Musa*), Watanabe & Nakamura (*Mycoscience* 45: 351, 2004; Japan), Crous *et al.* (*Stud. Mycol.* 55: 213, 2006).
- Cylindrocolla** Bonord. (1851), anamorphic *Calloria*, Hsp.0eH.?. 5, widespread (north temperate).
- Cylindrodendrum** Bonord. (1851), anamorphic *Nectriaceae*, Hso.0eH.15. 3, Europe. *C. album* synanamorph of *Cylindrocarpon*). See Petch (*TBMS* 27: 81, 1944), Buffina & Hennebert (*Mycotaxon* 19: 323, 1984), Summerbell *et al.* (*CJB* 67: 573, 1989).
- Cylindrodochium** Bonord. (1851) = *Cylindrosporium*.
- Cylindrogloeum** Petr. (1941), anamorphic *Pezizomycotina*, Cac.0-1eH.15. 2, Lapland.
- Cylindromyces** C. Manoharachary, D.K. Agarwal & N.K. Rao (2004), anamorphic *Pezizomycotina*, H??.?. 1, India. See Manoharachary *et al.* (*Indian Phytopath.* 57: 161, 2004).
- Cylindronema** Schulzer (1866) nom. dub., anamorphic *Pezizomycotina*. See Carmichael *et al.* (*Genera of*

- Hyphomycetes*, 1980).
- Cylindrophoma** (Berl. & Voglino) Höhn. (1918), anamorphic *Pezizomycotina*, Cpd.0eH.?. 1, Italy.
- Cylindrophora** Bonord. (1851) nom. dub., anamorphic *Pezizomycotina*. See de Hoog (*Persoonia* 10: 67, 1978).
- Cylindrospora** I.V. Issi & Voronin (1986), Microsporidia. 38.
- Cylindrosporella** Höhn. (1916), anamorphic *Stegophora*. 3. See Sutton (*Mycol. Pap.* 141, 1977), Kaneko & Kobayashi (*Mycoscience* 43: 181, 2002; on *Betulaceae*).
- Cylindrosporium** Grev. (1822), anamorphic *Pyrenopeziza*, Cac.0eH.15. 3, widespread (north temperate). *C. concentricum*, light leaf spot of *Brassica*. See Nag Raj & Kendrick (*CJB* 49: 2119, 1971), Rawlinson *et al.* (*TBMS* 71: 425, 1978), Foster *et al.* (*Physiological and Molecular Plant Pathology* 55: 111, 1999; mating types), Paavolainen *et al.* (*MR* 104: 611, 2000; on *Betula*), Andrianova & Minter (*IMI Descr. Fungi Bact.* 163 nos 1621-1630, 2005), Priest (*Fungi of Australia: Septoria*, 2006; Australia).
- Cylindrosyndrium** W.B. Kendr. & R.F. Castañeda (1990), anamorphic *Venturiaceae*, Hso.≡ eH.10. 6, widespread. See Castañeda Ruiz & Kendrick (*Univ. Waterloo Biol. Ser.* 32, 1990), Lücking (*Lichenologist* 35: 33, 2003), Crous *et al.* (*Stud. Mycol.* 58: 185, 2007; phylogeny).
- Cylindrotaenium** Thomé (1867) nom. dub., ? Fungi.
- Cylindrotheca** Bonord. (1864), *Pezizomycotina*. 1, Europe.
- Cylindrothyrium** Maire (1907), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, France.
- Cylindrotrichum** Bonord. (1851), anamorphic *Chaetosphaeria*, Hsy.0eH.16. 13, Europe. See Gams & Holubová-Jechová (*Stud. Mycol.* 13, 1976; key), DiCosmo *et al.* (*Mycol.* 75: 949, 1983; synonym of *Chaetopsis*), Rambelli & Onofri (*TBMS* 88: 393, 1987), Réblová & Gams (*Czech Mycol.* 51: 1, 1999; teleomorph), Réblová (*Stud. Mycol.* 45: 149, 2000; review), Réblová & Winka (*Mycol.* 92: 939, 2000; phylogeny), Fernández & Huhndorf (*Fungal Diversity* 18: 15, 2005).
- Cylindroxiphium** Bat. & Cif. (1963), anamorphic *Pezizomycotina*, Cpd.0eH.15. 1, USA. See Batista & Ciferri (*Quad. Lab. crittogam., Pavia* 31: 77, 1963).
- Cyllamyces** Ozkose, B.J. Thomas, D.R. Davies, G.W. Griff. & Theodorou (2001), *Neocallimastigaceae*. 1, British Isles. See Ozkose *et al.* (*CJB* 79: 668, 2001).
- Cylomyces** Clem. (1931) ≡ *Listeromyces*.
- Cymadothea** F.A. Wolf (1935) = *Mycosphaerella* fide Cannon (*Mycol. Pap.* 163, 1991; nomencl.).
- Cymatella** Pat. (1899), *Marasmiaceae*. 4, Antilles.
- Cymatellopsis** Parmasto (1985), *Marasmiaceae*. 1, E. Africa. See Parmasto (*Nova Hedwigia* 40: 463, 1984).
- Cymatoderma** Jungh. (1840), *Meruliaceae*. 9, widespread (tropical). See Welden (*Mycol.* 52: 856, 1962; Am. spp.), Reid (*Beih. Nova Hedwigia* 18: 95, 1965; key), Douanla-Meli & Langer (*Mycotaxon* 90: 323, 2004).
- Cymbella** Pat. (1886) [non *Cymbella* C. Agardh 1830, *Bacillariophyta*] ≡ *Chromocyphella*.
- cymbiform**, boat-shaped; navicular (Fig. 23.32).
- Cymbothyrium** Petr. (1947), anamorphic *Pezizomycotina*, St.0eP.1. 1, Europe.
- Cynema** Maas Geest. & E. Horak (1995), *Tricholomataceae*. 1, Papua New Guinea. See Maas Geesteranus & Horak (*Bibliotheca Mycol.* 159: 208, 1995).
- Cyniclomyces** Van der Walt & D.B. Scott (1971), *Saccharomycetales*. 1, Europe. See Phaff & Miller in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 154, 1998), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Cynicus** Raf. (1815) nom. dub., Fungi. No spp. included.
- Cynophallus** (Fr.) Corda (1842) nom. rej. ≡ *Mutinus*.
- Cypellomyces**, see *Cypheliomyces*.
- Cypheliaceae** Zahlbr. (1903) = *Caliciaceae*.
- Cypheliomyces** E.A. Thomas ex Cif. & Tomas. (1953) = *Cyphelium* Ach. fide Tibell (*Beih. Nova Hedwigia* 79: 597, 1984).
- Cypheliopsis** (Zahlbr.) Vain. (1927) = *Thelomma* fide Tibell (*Beih. Nova Hedwigia* 79: 597, 1984).
- Cyphelium** Ach. (1815), *Caliciaceae* (L). c. 12, widespread (esp. north and south temperate). See Weber (*Bryologist* 70: 197, 1967), Tibell (*Svensk bot. Tidskr.* 65: 138, 1971; Eur.), Tibell (*Beih. Nova Hedwigia* 79: 597, 1984), Middelborg & Mattson (*Sommerfeltia* 5: 1, 1987; Norway), Tibell (*Symb. bot. upsal.* 27 no. 1: 279 pp., 1987; Australasia), Pant & Awasthi (*Biovigyanam* 15: 3, 1989; India, Nepal), Tibell (*Fl. Neotrop. Monogr.* 69: 78 pp., 1996; neotropics), Tibell (*Symb. bot. upsal.* 32 no. 1: 291, 1997; anamorphs), Wedin & Tibell (*CJB* 75: 1236, 1997; phylogeny), Tibell (*Bibliotheca Lichenol.* 71: 107 pp., 1998; S America), Tibell (*Nordic Lichen Flora* 1. Introductory Parts; Calicioid Lichens and Fungi: 20, 1999; Scandinavia), Wedin *et al.* (*CJB* 78: 246, 2000; phylogeny), Wedin *et al.* (*Taxon* 51: 655, 2002; phylogeny), Tibell & Thor (*J. Hattori bot. Lab.* 94: 205, 2003; Japan), Peršoh *et al.* (*Mycol. Progr.* 3: 103, 2004; asci), Tibell (*J. Hattori bot. Lab.* 100: 809, 2006; India).
- Cyphelium** Chevall. (1826) = *Chaenotheca* fide Tibell (*Beih. Nova Hedwigia* 79: 597, 1984).
- Cyphelium** De Not. (1846), *Coniocybaceae*. 1, Europe.
- Cyphella** Fr. (1822), *Cyphellaceae*. 2, widespread. See Matheny *et al.* (*Mycol.* 98: 982, 2006; phylogeny).
- cyphella** (pl. -ae), a break in the lower (rarely upper) cortex of a lichen thallus which is roundish or ovate and in section appears as a cup-like structure lined with a layer of loosely connected, frequently globular, cells formed from the medulla, characteristic of *Sticta*; also used for pores open to the halliomedulla in *Oropogon*.
- Cyphellaceae** Lotsy (1907), *Agaricales*. 16 gen. (+ 1 syn.), 31 spp. The family name has previously been used for a diversity of fungi. Many of the genera characterised by a cyphelloid habit have been distributed among several families of the *Agaricales*.
- Lit.*: Pilát (*Annls mycol.* 22: 204, 1924), Pilát (*Annls mycol.* 23: 144, 1925), Cooke (*Mycol.* 49: 680, 1957; *Porothelaceae*), Donk (*Persoonia* 1: 25, 1959), Cooke (*Sydowia Beih.* 4, 1961; *Porothelaceae*), Donk (*Persoonia* 2: 331, 1962), Reid (*Persoonia* 3: 97, 1964; Michigan), Donk (*Acta Bot. Neerl.* 15: 95, 1966; reassessment), Donk (*Checklist of European polypores* [Verh. K. ned. Akad. Wet. 62], 1974).
- Cyphellathelia** Jülich (1972) = *Pellidiscus* fide Hjortstam (*Windahlia* 15: 59, 1986).
- Cyphellina** Rick (1959) nom. dub. = *Tomentella* Pat. fide Donk (*Persoonia* 3: 199, 1964).
- Cyphellocalathus** Agerer (1981), *Tricholomataceae*. 1, Bolivia. See Agerer (*Mycol.* 73: 491, 1981) = La-

- chnella (Tricholomat.) fide, Singer (*Agaric. mod. Tax.* 4th ed: 386, 1986).
- Cyphellomyces** Speg. (1906) = Phellorinia fide Stalpers (*in litt.*).
- Cyphellophora** G.A. de Vries (1962), anamorphic *Chaetothyriaceae*, Hso.≡ eP.15. 11 (on human skin etc.), widespread. See Vries *et al.* (*Antonie van Leeuwenhoek* 52: 141, 1986), Walz & de Hoog (*Antonie van Leeuwenhoek* 53: 143, 1987; n.sp. and cf. *Annelodentimyces*), Decock *et al.* (*Antonie van Leeuwenhoek* 84: 209, 2003; phylogeny), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny).
- Cyphellopsidaceae** Jülich (1982) = Marasmiaceae.
- Cyphellopsis** Donk (1931) = Merismodes fide Kuyper (*in litt.*).
- Cyphellopus** Fayod (1889) nom. dub., ? Bolbitiaceae. 1, British Isles. See Pearson (*TBMS* 20: 521, 1935).
- Cyphellopycnis** Tehon & G.L. Stout (1929) = Phomopsis (Sacc.) Bubák. fide Sutton (*TBMS* 47: 497, 1964).
- Cyphellostereum** D.A. Reid (1965), Agaricomycetes. 2, widespread. *Hymenochaetales* or *Agaricales* (*Rickenella* clade). See Reid (*Beih. Nova Hedwigia* 18: 484 pp., 1965; key), Salcedo *et al.* (*Nova Hedwigia* 82: 81, 2006).
- Cyphidium** Magnus (1875) = Olpidium fide Sparrow (*Aquatic Phycomycetes* Edn 2: 1187 pp., 1960).
- Cyphina** Sacc. (1884) = Sarcopodium fide Sutton (*Mycol. Pap.* 141, 1977).
- Cyphospilea** Syd. (1926) = Coleroa fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Cyptotrama** Singer (1960), Physalacriaceae. 15, S. America. See Singer (*Lilloa* 30: 375, 1960).
- Cyrenella** Goch. (1981), anamorphic *Cystobasidiomycetes*. 1 (with clamp connexions), USA. See Gocheaur (*Mycotaxon* 13: 268, 1981), Bauer *et al.* (*Mycol. Progr.* 5: 41, 2006).
- Cyrta** Bat. & H. Maia (1961) [non *Cyrta* Lour. 1790, *Styracaceae*] = Calopadia fide Lücking *et al.* (*Lichenologist* 30: 121, 1998).
- Cyrtidium** Vain. (1921), ? Dothideomycetes. 2, Europe.
- Cyrtidula** Minks (1876), Dothideomycetes. 2, Italy. See Harris (*More Florida Lichens*, 1995).
- Cyrtocnion** Link ex Rchb. (1828) nom. dub., anamorphic *Pezizomycotina*.
- Cyrtographa** Müll. Arg. (1894) = Minksia fide Zahlbruckner (*Catalogus Lichenum Universalis* 4, 1926).
- Cyrtopsis** Vain. (1921), Dothideomycetes. 1, Europe.
- cyst** (1) an encysted cell (? the product of meiosis after karyogamy), usually aggregated into a cystosorus which germinates to produce a zoospore (*Plasmodiophorales*); (2) an encysted zoospore (planospore) which becomes a gametangium (*Blastocladales*); **macro-** (of *Myxomycota*), an encysted aggregate of myxoamoebae; the resting form of a young plasmodium; the alternative to the sorocarp in some cellular slime moulds (dictyostelids) (Nickerson & Raper, *Am. J. Bot.* 60: 190, 1973); propagule, especially the walled structure of the encysted zoospore (*Peronosporales*); resting spores of chrysomonads etc.; **micro-** (of *Mycetozoa*), an encysted myxamoeba or swarm spore; **spore-**, a cell, hollow organ or sac-like structure enclosing a mass of protoplasm containing spores as in the *Ascosphaeraceae* (Skou, 1982).
- Cystangium** Singer & A.H. Sm. (1960), Russulaceae. 32, Australia; S. America. Basidioma gasteroid. See Miller *et al.* (*Mycol.* 93: 344, 2001; basidioma gasteroid; probably polyphylletic and should be merged with *Russula*), Trappe *et al.* (*Mycotaxon* 81: 195, 2002; nomenclature), Lebel (*Aust. Syst. Bot.* 16: 371, 2003; australasian spp.).
- cystesium**, a cell which differentiates to adhere to a cystidium arising from the opposite hymenium (Horner & Moore, *TBMS* 88: 488, 1987).
- Cystidiella** Malan (1943), anamorphic *Pezizomycotina*, Hso.0eH.1. 1, Italy. With secondary conidia.
- Cystidiendendron** Rick (1943) nom. dub., Hydnaceae. See Donk (*Persoonia* 3: 199, 1964).
- Cystidiodontia** Hjortstam (1983), Cystostereaceae. 2, widespread. See Hjortstam (*Mycotaxon* 17: 571, 1983).
- cystidiole** (of hymenomycetes), a simple hymenial cell of about the same diameter as the basidia but remaining sterile and protruding beyond the hymenial surface.
- Cystidiophorus** Bondartsev & Ljub. (1963) nom. inval., Polyporaceae. 1.
- cystidium** (pl. -ia), a sterile body, frequently of distinctive shape, occurring at any surface of a basidioma, particularly the hymenium from which it frequently projects (Fig. 12). Cystidia have been classified and named according to their: (1) *origin*: **hymenial** - (**tramal** -), originating from hymenial (tramal) hyphae; **pseudo-**, derived from a conducting element, filamentous to fusoid, oily contents, embedded not projecting; **coscino-**, see coscinoid; **skeleto-**, the apical part of a skeletal hypha (frequently ± inflated) projecting into or through the hymenium; false seta; **macro-**, arising deep in the trama in Lactario-Russulae; **hypho-**, hypha-like, derived from generative hyphae. (2) *position* (first by Buller, 2): on the pileus surface (**pileo-**, **dermato-**, Fayod); at the edge (**cheilo-**), side (**pleuro-**), or within (**endo-**) a lamella; on the stipe (**caulo-**). (3) *form*: **lepto-**, smooth, thin-walled; **lampro-**, thick-walled, with or without encrustation (**setiform lampro-**, awl-shaped, wall pigmented; **asteroseta**, a radially branched lampro-; **microsclerid**, a versiform, endolampro-; **lyo-**, cylindrical to conical, very thick-walled, abruptly thin-walled at apex, not encrusted, colourless, as in *Tubulicrinis* (Donk, 1956); **monilioid gloeo-**, (torulose gloeo- (Bourdout & Galzin, 1928); moniliform paraphysis (Burt, 1918); pseudophysis; **schizo-** (Nikolayeva, 1956, 1961)), monilioid, frequently with a beaded apex (as in *Hericiaceae* and *Corticaceae*). (4) *contents*: **gloeo-**, thin-walled, usually irregular, contents hyaline or yellowish and highly refractile; **chryso-**, like lepto- but with highly staining contents; **hypo-**, (Larsen & Burdsall, *Mem. N.Y. bot. Gdn* 28: 123, 1976); **oleo-**, having an oily resinous exudate; **pseudo-**, see (1) above. See also hyphidium, seta. Reviews of cystidia include Romagnesi (*Rev. Mycol., Paris* 9 (suppl.): 4, 1944), Talbot (*Bothalia* 6: 249, 1954), Lentz (*Bot. Rev.* 20: 135, 1954), Smith (*in Ainsworth & Sussman (Eds), The fungi* 2: 151, 1966), Price (*Nova Hedw.* 24: 515, 1975; types in polypores).
- Cystingophora** Arthur (1907) = Ravenelia fide Arthur (*Manual Rusts US & Canada*, 1934).
- Cystoagaricus** Singer (1947), Psathyrellaceae. 4, America (subtropical). See Singer (*Mycol.* 39: 85, 1947), Vellinga (*MR* 108: 354, 2004; posn.).
- Cystobasidiaceae** Gäum. (1926), Cystobasidiales. 2 gen., 9 spp.

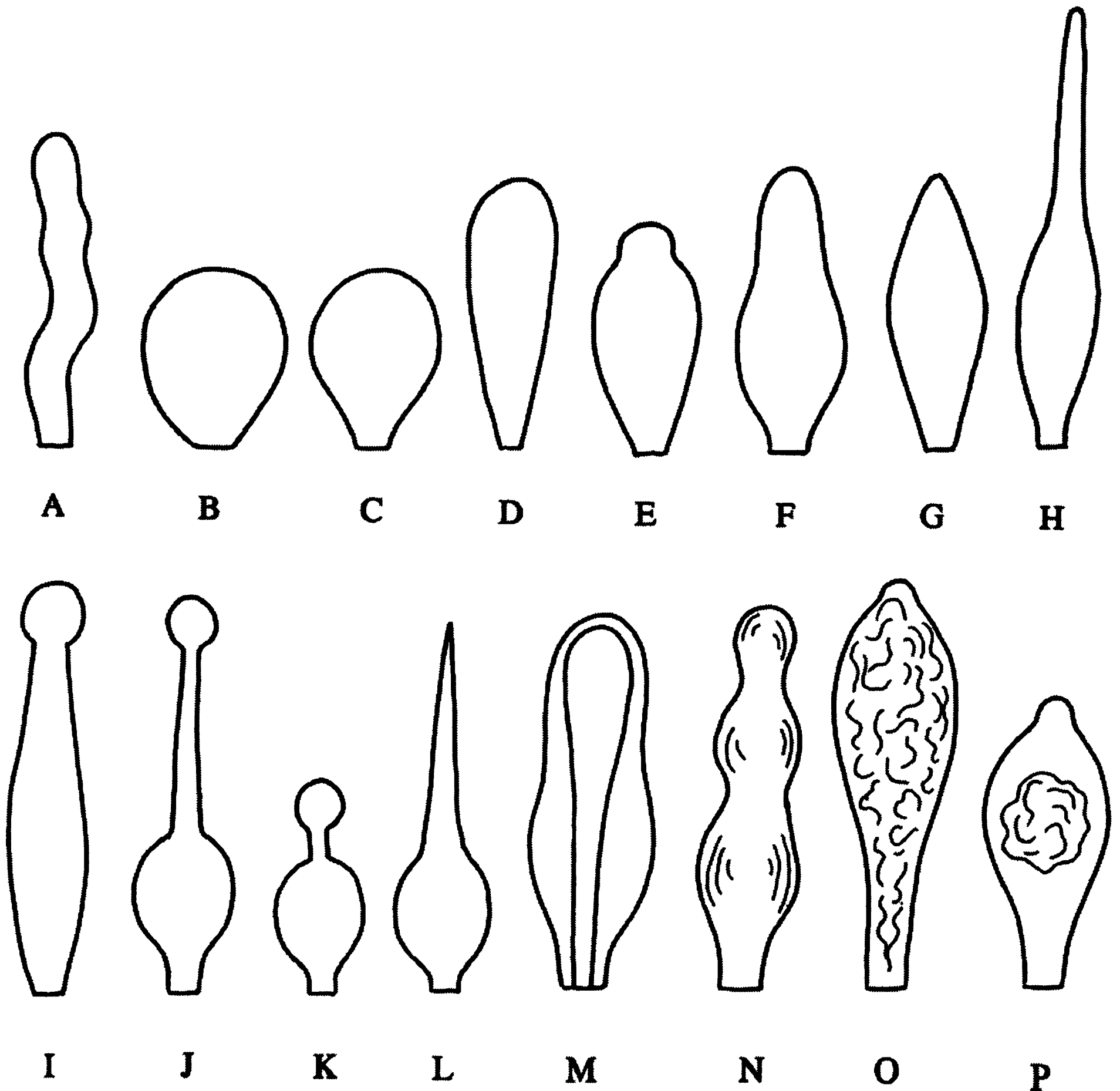


Fig. 14. Cystidia. A, hyphoid (*Collybia*); B, globose (*Agaricus*); C, pyriform (*Agaricus*); D, clavate (*Inocybe*); E, utriform (*Psathyrella*); F, lageniform (*Pholiota*); G, fusoid (*Psathyrella*); H, lanceolate (*Hypholoma*); I, capitate (*Hyphoderma*); J, tibiiform (*Galerina*); K, lecythiform (*Conocybe*); L, urticoid (*Naucoria*); M, metuloid (*Lentinus*); N, gloecystidium (*Gloeocystidiellum*); O, macrocystidium (*Russula*); P, chrysocystidium (*Stropharia*). Not to scale.

Cystobasidiales R. Bauer, Begerow, J.P. Samp., M. Weiss & Oberw. (2006). Cystobasidiomycetes. 1 fam., 2 gen., 9 spp. Fam.:

Cystobasidiaceae

For *Lit.* see under fam.

Cystobasidiomycetes R. Bauer, Begerow, J.P. Samp., M. Weiss & Oberw. (2006). Pucciniomycotina. 3 ord., 1 fam., 7 gen., 14 spp. Ord.:

- (1) **Cystobasidiales**
- (2) **Erythrobasidiales**
- (3) **Naohideales**

For *Lit.* see ord. and fam.

Cystobasidium (Lagerh.) Neuhoﬀ (1924), Cystobasidiaceae. c. 5, widespread. See Martin (*Mycol.* 31: 507, 1939), Olive (*Mycol.* 44: 564, 1952).

cystochroic, see colour.

Cystocoleus Thwaites (1849), anamorphic *Capnodiales*, Hso.-.- (L). 1, widespread. See Muggia *et al.* (*MR*

112: 50, 2008; phylogeny).

Cystocybe Velen. (1921) nom. dub. ? = *Cortinarius* fide Singer (*Agaric. mod. Tax.* edn 3, 1975).

Cystodendron Bubák (1914), anamorphic *Mollisia*, Hsp.0eH/1eP.15. 1, Europe. See Gams (*Stud. Mycol.* 45: 192, 2000), Crous *et al.* (*Eur. J. Pl. Path.* 109: 845, 2003; phylogeny).

Cystoderma Fayod (1889), Agaricaceae. c. 35, widespread (esp. temperate). Probably a separate family is justified. See Justo & Castro (*A Pantorra* 2: 45, 2002), Saar (*Mycotaxon* 86: 455, 2003; key temperate Eurasia spp), Jamoni (*Funghi e Ambiente* 94-95: 51, 2004), Saar & Læssøe (*Mycotaxon* 96: 123, 2006; species from high Andean Ecuador).

Cystodermella Harmaja (2002), Agaricaceae. 12, widespread. Probably a separate family (with *Cystoderma* is justified. See Harmaja (*Karstenia* 42: 43, 2002), Saar (*Mycotaxon* 86: 455, 2003; key).

- Cystodium** Fée (1837), ? Dothideomycetes. 1, widespread (tropical).
- Cystofilobasidiaceae** K. Wells & Bandoni (2001), Cystofilobasidiales. 9 gen. (+ 1 syn.), 20 spp.
Lit.: Kwon-Chung (*Stud. Mycol.* 30: 75, 1987), Wery *et al.* (*Yeast* Chichester 12: 641, 1996), Fell & Statzell-Tallman in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 676, 1998), Kwon-Chung in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 646, 1998), Miller & Phaff in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 789, 1998), Fell & Blatt (*J. Industr. Microbiol. Biotechnol.* 23: 677, 1999), Fell *et al.* (*Int. J. Syst. Bacteriol.* 49: 907, 1999), Diaz & Fell (*Antonie van Leeuwenhoek* 77: 7, 2000), Sampaio *et al.* (*Int. J. Syst. Evol. Microbiol.* 51: 221, 2001).
- Cystofilobasidiales** Fell, Roeijmans & Boekhout (1999). Tremellomycetes. 1 fam., 9 gen., 20 spp. Fam.:
- Cystofilobasidiaceae**
Lit.: Fell *et al.* (*IJSB* 49: 911, 1999 (taxonomy), Fell *et al.* (*IJSEM* 50: 1351, 2000; mol. phylogeny).
- Cystofilobasidium** Oberw. & Bandoni (1983), Cystofilobasidiaceae. 5 (some marine), widespread. See Oberwinkler *et al.* (*Syst. Appl. Microbiol.* 4: 114, 1983), Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 1351, 2000; mol. phylogeny), Weiss *et al.* (*Frontiers in Basidiomycote Mycology*: 7, 2004).
- Cystogloea** P. Roberts (2006), Basidiomycota. 1 (on perithecia of *Pseudotrichia*), Sweden. See Roberts (*Acta Mycologica Warszawa* 41: 25, 2006).
- Cystogomphus** Singer (1942), Gomphidiaceae. 1, France (introduced).
- Cystolepiota** Singer (1952), Agaricaceae. c. 10, widespread. See Knudsen (*Bot. Tidsskr.* 73: 124, 1978; key), Johnson & Vilgalys (*Mycol.* 90: 971, 1998; phylogeny), Johnson (*Mycol.* 91: 443, 1999), Hausknecht & Pidlich-Aigner (*Öst. Z. Pilzk.* 13: 1, 2004; Austria), Vellinga (*MR* 108: 354, 2004; phylogeny).
- Cystolobis** Clem. (1909) = *Knightiella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Cystomyces** Syd. (1926), Raveneliaceae. 1 (on *Lonchocarpus* (?) (*Leguminosae*)), C. America. See Walker *et al.* (*Australas. Pl. Pathol.* 35: 1, 2006).
- Cystopage** Drechsler (1941), Zoopagaceae. 7, N. America; British Isles. See Drechsler (*Mycol.* 33: 251, 1941), Drechsler (*Mycol.* 37: 1, 1945), Drechsler (*Mycol.* 47: 364, 1955), Drechsler (*Mycol.* 49: 387, 1957), Drechsler (*Mycol.* 51: 787, 1959), Dyal (*Sydowia* 27: 293, 1976; keys parasites of nematodes and amoebae, bibliogr.), Kasim (*Acta Mycologica Warszawa* 33: 161, 1998), Shimada & Saikawa (*Nippon Kingakukai Kaiho* 47: 1, 2006; chlamydospore germination).
- Cystopezizella** Svrček (1983) = *Calycina* fide Baral (*SA* 13: 113, 1994).
- Cystophora** Rabenh. (1844) [non *Cystophora* J. Agardh 1841, *Algae*] = *Voglinoana*.
- Cystopsora** E.J. Butler (1910), Pucciniaceae. 2 (on *Antidesma* (0, I, III) (*Euphorbiaceae*); *Olea* (*Oleaceae*)), India; Indonesia. 0, I, III. See Thirumalachar (*Bot. Gaz.* 107: 74, 1945), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983; syn. of *Zaghouania*).
- cystosorus** (of *Chytridiales*), a group of united cysts or resting spores.
- cystospore** (1) an encysted zoospore formed at the exit to the zoosporangium and germinating to produce a new zoospore (planospore) as in *Achlya* (*Oomycetes*), *Achlyogeton* and *Achlyella* (*Chytridiomycetes*); (2) (of *Amoebidiales*) spores released from an encysted amoeboid cell.
- Cystosporogenes** E.U. Canning, R.J. Barker, J.P. Nicholas & A.M. Page (1984), Microsporidia. 3.
- Cystostereaceae** Jülich (1982), Agaricales. 6 gen., 16 spp.
Lit.: Chamuris (*Mycol.* 78: 380, 1986), Chamuris (*Mycol. Mem.* 14: 247 pp., 1988), Hjortstam (*Mycotaxon* 42: 149, 1991), Ginns (*Mycol.* 90: 19, 1998), Larsson *et al.* (*MR* 108: 983, 2004).
- Cystostereum** Pouzar (1959), Cystostereaceae. 6, widespread. See Hallenberg & Ryvarden (*Mycotaxon* 2: 135, 1975).
- Cystostiptoporus** Dhanda & Ryvarden (1975) = *Microsporellus* fide Ryvarden (*Gen. Polyp.*: 135, 1991).
- Cystotelium** Syd. (1921) = *Ravenelia* fide Sydow & Sydow (*Monographia Uredinearum seu Specierum Omnium ad hunc usque Diem Descriptio et Adumbratio Systematica* 3, 1915), Dietel (*Nat. Pflanzenfam.* 6, 1928; syn. of *Haploravenelia*).
- Cystotheca** Berk. & M.A. Curtis (1860), Erysiphaceae. Anamorph *Oidium* subgen. *Setoidium*. 4, Asia; N. America. See Katumoto (*Rep. Tottori mycol. Inst.* 10: 437, 1973; key), Braun (*Beih. Nova Hedwigia* 89, 1987; key), Saenz & Taylor (*CJB* 77: 150, 1999; mol. syst.), Braun & Takamatsu (*Schlechtendalia* 4: 1, 2000; phylogeny), Takamatsu *et al.* (*MR* 104: 1304, 2000; phylogeny, host relations), Takamatsu (*Mycoscience* 45: 147, 2004; evolution).
- Cystothyrium** Speg. (1888) nom. conf., anamorphic *Pezizomycotina*. See Petrak & Sydow (*Annls mycol.* 33: 157, 1935).
- Cystotricha** Berk. & Broome (1850), anamorphic *Helotiales*, St.1eH.1. 1, British Isles. See Wu *et al.* (*MR* 102: 179, 1998).
- Cystotrichiopsis** B.A. Abbas, B. Sutton & Ghaffar (2001), anamorphic *Pezizomycotina*, C?..?. 1, Pakistan. See Abbas *et al.* (*Pakist. J. Bot.* 33: 365, 2001).
- Cytidia** Qué. (1888), Corticiaceae. 5, widespread (esp. N. America). *C. salicina*, a common red fungus on *Salix*. See Cooke (*Mycol.* 43: 196, 1951; key), Donk (*Persoonia* 1: 70, 1959), Legg & Roberts (*Field Mycology* 1: 45, 200; UK).
- Cyidiaceae** Jülich (1982) = Corticiaceae.
- Cyidiella** Pouzar (1954) = *Auriculariopsis* fide Stalpers (*Persoonia* 13: 495, 1988).
- Cytispora** Fr. (1823), *Pezizomycotina*. 1, Europe.
- cytochalasin**, one of a series of related fungal metabolites (e.g. from *Helminthosporium*, *Metarhizium*, *Phoma*, *Xylariaceae*, *Zygosporium*) which inhibit cytokinesis so that multinucleate cells result (Carter, *Nature* 213: 261, 1967), Turner (1971: 352); - B = phomin.
- cytochroic**, see colour.
- Cytodiplospora** Oudem. (1894) = *Diplodina* fide Sutton (*Mycol. Pap.* 141, 1977).
- Cytodiscula** Petr. (1931), anamorphic *Pezizomycotina*, St.0eH.?. 1, Madeira.
- Cytogloeum** Petr. (1925), anamorphic *Pezizomycotina*, Cac.0eH.15. 1, Europe.
- Cytology**. The study of cell fungal contents, esp. the nucleus, is usually well covered in mycology textbooks. The nuclear membrane may (*Basidiobolus ranarum*) or may not (*Saccharomyces cerevisiae*) break down during mitosis. Pulse field gel electro-

phoresis (q.v.) has shown that fungal nuclei contain 3 (*Schizosaccharomyces pombe*) to c. 21 (*Ustilago hordei*) chromosomes (see Mills & McCluskey, *Molecular plant-microbe interactions* 3: 351-357, 1990). Mitotic chromosomes are smaller in fungi than meiotic ones. Usually, a well-defined 'metaphase plate' is absent and disjunction of sister chromatids is asynchronous during mitosis (see review Aist & Morris, *Fungal. Genet. Biol.* 27: 1-25, 1999). Cyclic changes of condensation/decondensation states of fungal rDNA were observed by fluorescence *in situ* hybridisation (FISH) during mitosis. In the ascomycetes *Cochliobolus heterostrophus* and *Haematonectria haematococca* rDNA is decondensed throughout its entire length at interphase and condensation reaches a maximum at metaphase, remaining in that state through anaphase (Taga *et al.*, *MR* 107: 1012-1020, 2003). Pulse field gel electrophoresis (PFGE) can aid visualisation of minute chromosomes and reveals that different isolates of the same fungal species frequently have chromosomes differing in size and the presence of supernumerary, conditionally dispensable, chromosomes. Some supernumerary chromosomes carry functional genes, like antibiotic resistance (Miao *et al.*, *Science* 254: 1773-1776, 1991) or, in *Nectria haematococca*, the ability to cause disease symptoms on host plants (Wasmann & VanEtten, *Mol. Plant-Microb. Interact.* 9: 793-803, 1996). DNA fingerprinting (Owen, *J. Med. Microbiol.* 30: 898, 1989), restriction fragment length polymorphisms (RFLP) (Kusters-van-Someren *et al.*, *Curr. Genet.* 19: 21, 1991) and amplified fragment length polymorphism (AFLP) (*Clin. Microbiol. Rev.* 13: 332-370, 2000) are used to study fungal genomes, to characterize species and strains of fungi. Single or double stranded DNA or RNA mycoviruses and double stranded DNA or RNA plasmids may be present in fungal cytoplasm. Hyphal tips of extending hyphae contain a very high concentration of macrovesicles (100-250 nm diam.), microvesicles (40-70 nm diam.), and coated vesicles (vesicles surrounded by a basket-like lattice of fibrous protein called clathrin); the microvesicles may correspond to chitosomes (Bracker *et al.*, *Proc. Natl. Acad. Sci. USA* 73: 4570, 1976); the concentration of vesicles at the hyphal tip can sometimes be observed as a phase-dark body known as the Spitzenkörper (Steinberg, *Eukaryotic Cell* 6:351-360, 2007). Specialized hyphae, called conidial anastomosis tubes (CATs), are produced by conidia and by conidial germ tubes of some fungi. In contrast to germ tubes, CATs are cellular elements that are morphologically and physiologically distinct: microtubules and nuclei pass through fused CATs, they are thinner, shorter, lack branches, exhibit determinate growth, and home toward each other (Rocka *et al.*, *Eukaryotic Cell* 4: 911-919, 2005). The fungal cytoskeleton contains microfilaments (4-9 nm diam.) formed by the polymerization of G-actin, microtubules (30-40 nm diam.) formed by the polymerization of α - and β -tubulin, and filasomes (aggregates of microfilaments coated with vesicles). The cytoplasm contains mitochondria, microbodies, hydrogenosomes (in anaerobic fungi), Golgi bodies (in *Chromista*), smooth and rough endoplasmic reticula, 80S ribosomes, glycogen and lipid globules. Spherical Worinin bodies (e.g. in *Fusarium* spp.) or hexagonal crystals (*Neurospora crassa*) are associated with the septal pores of *Ascomycota*. Nuclei of fila-

mentous fungi can migrate within the cytoplasm along microtubules, driven by the microtubule dependent motor protein dynein. Cellular differentiation, mating, and filamentous growth are regulated in many fungi by environmental and nutritional signals. Signal transduction cascades: protein kinase cascade and cyclic AMP signaling pathway, regulate development, mating and virulence of fungi that has been well studied in *Candida albicans*, *Cryptococcus neoformans*, *Saccharomyces cerevisiae* and *Ustilago maydis* (Lengeler *et al.*, *Microbiol. Mol. Biol. Rev.* 64: 746-785, 2000). See also Chromosome numbers.

Lit.: Arora (Ed.) (*Handbook of Fungal Biotechnology*, 2nd ed., 2003), Howard & Gow (Eds) (*Biology of the Fungal Cell*, 2nd ed., 2007), Gull & Oliver (*The Fungal Nucleus*, 1981), San-Blas & Calderone (Eds) (*Pathogenic Fungi: Structural Biology and Taxonomy*, 2004), Talbot, N. (Ed.) (*Molecular and Cell Biology of Filamentous Fungi: a Practical Approach*, 2001), Tsuchiya *et al.*, *Mycol.* 96: 208-210, 2004).

cytolysis, breaking up or solution of the cell wall.

Cytomelanconis Naumov (1951), ? Melanconidaceae. Anamorph *Cytospora*-like. 1 (from bark), former USSR.

Cytonaema Höhn. (1914), anamorphic *Pezizomycotina*, St.0eH.15. 1, Austria.

Cytophoma Höhn. (1914) = *Cytospora* fide Défago (*Phytopath. Z.* 14: 103, 1944).

Cytophyllopsis R. Heim ex R. Heim (1958) = *Weraroa* fide Singer & Smith (*Bull. Torrey bot. Club* 85: 324, 1958).

Cytoplacosphaeria Petr. (1920), anamorphic *Pezizomycotina*, St.≡ eH.15. 1, Europe. See Poon & Hyde (*Bot. Mar.* 41: 141, 1998; Hong Kong).

Cytoplea Bizz. & Sacc. (1885), anamorphic *Roussoella*, St.0eP.15. 5, widespread. See Sutton (*The Coelomycetes*, 1980), Hyde *et al.* (*MR* 100: 1522, 1996; teleomorph), Hyde (*MR* 101: 609, 1997), Kang *et al.* (*Fungal Diversity* 1: 147, 1998).

Cytopleastrum Abbas, Sutton, Ghaffar & A. Abbas (2004), anamorphic *Pezizomycotina*. 1, Pakistan. See Abbas *et al.* (*Pakist. J. Bot.* 36: 457, 2004).

cytoskeleton, intracellular network of protein filaments that is insoluble in non-ionic detergents.

Cytosphaera Died. (1916), anamorphic *Pezizomycotina*, St.0eH.1. 2, Asia; Australia.

Cytospora Ehrenb. (1818), anamorphic *Valsa*, St.0eH.15. c. 110, widespread. See Défago (*Phytopath. Z.* 14: 103, 1944), Gvritishvili (*Fungi of the genus Cytospora Fr. in the USSR*, 1982), Gille (*Arch. phytopath. Pflanz.* 26: 237, 1990; spp. on *Prunus*), Old *et al.* (*MR* 95: 1253, 1991), Pluim *et al.* (*Pl. Dis.* 78: 551, 1994; infraspecific variation), Adams (*Phytopathology* 85: 1129, 1995; host/parasite relations), Adams *et al.* (*Mycol.* 94: 947, 2002; phylogeny).

Cytosporella Sacc. (1884), anamorphic *Pezizomycotina*, St.0eH.15. 32, widespread (temperate). See Aa *et al.* (*N.Z. J. Bot.* 39: 543, 2001; New Zealand).

Cytosporina Sacc. (1884) = *Dumortieria* fide Sutton (*Mycol. Pap.* 141, 1977).

Cytosporites Babajan & Tasl. (1970), Fossil Fungi. 1 (Tertiary), former USSR.

Cytosporium Sacc. (1884) = *Cellulosporium*.

Cytosporopsis Höhn. (1918) = *Cytospora* fide Sutton (*Mycol. Pap.* 141, 1977).

Cytostaganis Clem. & Shear (1931) = *Cytostagonospora*.

Cytostagonospora Bubák (1916), anamorphic *Pezizo-*

- mycotina*, Cpd.0fH.15. 3, Australia; Europe. See Sutton & Swart (*TBMS* 87: 99, 1986; n. comb.), Abbas *et al.* (*Pakist. J. Bot.* 33: 229, 2001; Pakistan), Priest (*Fungi of Australia: Septoria*, 2006; Australia).
- Cytotriplospora** Bayl. Ell. & Chance (1921) = *Strasseria* fide Sutton (*Mycol. Pap.* 141, 1977), Parmelee & Cauchon (*CJB* 57: 1660, 1979).
- Cyttaria** Berk. (1842), Cyttariaceae. Anamorph *Cyttariella*. 10 (on *Nothofagus*), south temperate. Some species are edible. See White (*TBMS* 37: 431, 1954), Kobayasi (*TMSJ* 7: 118, 1966), Gamundí (*Darwiniana* 16: 461, 1971), Kobayasi (*TMSJ* 19: 473, 1978), Humphries *et al.* in Stone & Hawksworth (Eds) (*Coevolution and systematics*: 55, 1986), Mengoni (*Boln Soc. argent. Bot.* 24: 393, 1986), Gamundí (*Fl. criptog. Tierra del Fuego* 10 no. 4: 1, 1987), Minter *et al.* (*Mycologist* 1: 7, 1987), Crisci *et al.* (*Cladistics* 4: 279, 1988), Gamundí & de Lederkremer (*Ciencia Investig.* 43: 4, 1989), Mengoni (*Boln Soc. argent. Bot.* 26: 7, 1989), Gamundí (*SA* 10: 69, 1991), Landvik & Eriksson in Hawksworth (Ed.) (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. 269 269: 225, 1994), Gernandt *et al.* (*Mycol.* 93: 915, 2001; phylogeny), Gamundí & Minter (*IMI Descr. Fungi Bact.* 160 nos 1591-1600, 2004; descr. 10 spp.), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006; phylogeny), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Cyttariaceae** Speg. (1887), Cyttariales. 2 gen., 11 spp.
Lit.: Humphries *et al.* (*Coevolution and Systematics* 32: 55, 1986), Minter *et al.* (*Mycologist* 21: 7, 1987), Crisci *et al.* (*Cladistics* 4: 279, 1988), Gamundí (*SA* 10: 69, 1991; review), Landvik & Eriksson (*NATO ASI Series* 269: 225, 1994), Döring & Triebel (*Cryptog. Bryol.-Lichénol.* 19: 123, 1998), Landvik *et al.* (*Mycoscience* 39: 49, 1998; DNA) also see under *Cyttaria*. Placed provisionally within the *Helotiales* but molecular data for many constituent families is lacking so that order may be polyphyletic, Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Cyttariales** Luttr. ex Gamundí (1971). Leotiomyces. 1 fam., 2 gen., 11 spp. Fam.:
Cyttariaceae
 For *Lit.* see under fam.
- Cyttariella** Palm (1932), anamorphic *Cyttaria*. 1, S. America. See Santesson (*Svensk bot. Tidskr.* 39: 319, 1945), Gamundí (*Fl. criptog. Tierra del Fuego* 10: 126 pp., 1986), Mengoni (*Boln Soc. argent. Bot.* 26: 7, 1989).
- Cyrtarophylloopsis** R. Heim (1968), Bolbitiaceae. 1, India. Basidioma gasteroid. See Heim (*Revue Mycol. Paris* 33: 211, 1968).
- Cyrtarophyllum** (R. Heim) Singer (1936) = *Galeropsis* fide Heim (*Revue Mycol. Paris* 15: 3, 1950).
- CZ**, see *Media*.
- Dacampia** A. Massal. (1853), Dacampiaceae. 3 (on lichens), Europe. See Eriksson (*Op. Bot.* 60, 1981), Crivelli (*Über die heterogene Ascomycetengattung Pleospora Rbh.*, 1983), Henssen (*Cryptog. Bot.* 5: 149, 1995), Halici & Hawksworth (*Fungal Diversity* 28: 49, 2008; key).
- Dacampiaceae** Korb. (1855), Pleosporales. 16 gen. (+ 7 syn.), 121 spp.
Lit.: Barr (*Prodr. Cl. Loculoasc.*, 1987), Hawksworth & Diederich (*TBMS* 90: 293, 1988), Alstrup & Hawksworth (*Meddr Grønland Biosc.* 31: 90 pp., 1990), Wang *et al.* (*MR* 111: 1268, 2007; phylogeny).
- Dacampiosphaeria** D. Hawksw. (1980) = *Pyrenidium* fide Hawksworth (*TBMS* 80: 547, 1983).
- Dacrina** Fr. (1825) nom. dub., ? Hydnaceae.
- Dacrina** Fr. (1832) = *Strumella* fide Saccardo (*Syll. fung.* 4: 742, 1886).
- Dacrydium** Link (1809) nom. conf., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 144, 1977).
- Dacrymycella** Bizz. (1885), anamorphic *Pezizomycotina*, Hsp.0eH.13. 2, Europe; Java.
- Dacrymyces** Nees (1816), Dacrymycetaceae. c. 39, widespread. See McNabb (*N.Z. J. Bot.* 11: 461, 1973; key), Reid (*TBMS* 62: 449, 1974; key Brit. spp.), Mathiesen (*Svampe* 23: 46, 1991; Danish spp.), Hahn & Karasch (*Zeitschrift für Mykologie* 68: 31, 2002), Burdsall & Laursen (*Memoirs of the New York Botanical Garden* 89: 107, 2004; New Zealand subantarctic islands n.spp.), Shirouzou *et al.* (*Mycoscience* 48: 388, 2007; phylogeny).
- Dacrymycetaceae** J. Schröt. (1888), Dacrymycetales. 9 gen. (+ 8 syn.), 101 spp.
Lit.: McNabb (*N.Z. J. Bot.* 3: 59, 1965), Reid (*TBMS* 62: 433, 1974), Maekawa (*CJB* 65: 583, 1987), Oberwinkler (*Stud. Mycol.* 30: 61, 1987), Ing (*Mycologist* 4: 34, 1990), Maekawa & Zang (*Mycotaxon* 61: 343, 1997), Duhem (*Bull. trimest. Soc. mycol. Fr.* 114: 1, 1998), Mossebo *et al.* (*Cryptog. Mycol.* 22: 119, 2001), Weiss & Oberwinkler (*MR* 105: 403, 2001), Binder & Hibbett (*Mol. Phylogen. Evol.* 22: 76, 2002), Larsson *et al.* (*MR* 108: 983, 2004), Shirouzou *et al.* (*Mycoscience* 48: 388, 2007; phylogeny).
- Dacrymycetales** Henn. (1898). Dacrymycetes. 1 fam., 9 gen., 101 spp. Fam.:
Dacrymycetaceae
Lit.: Donk (1951-63, VIII; *Proc. Kon. nederl. Akad. Wet. C* 67 (2), 1964; 1966: 264), Kennedy (*Mycol.* 50: 874, 1959; gen. key), Reid (*TBMS* 62: 433, 1974; Br. spp.; keys).
- Dacrymycetes** Doweld (2001), Agaricomycotina. 1 ord., 1 fam., 9 gen., 101 spp. Ord.:
Dacrymycetales
Lit.: Doweld (*Prosylabus*: LXXVII, 2001), Hibbett *et al.* (*MR* 111: 509, 2007; phylogeny).
- Dacryobasidium** Jülich (1982) = *Cristinia* fide Hjortstam & Grosse-Brauckmann (*Mycotaxon* 47: 405, 1993).
- Dacryobolaceae** Jülich (1982) = Meruliaceae.
- Dacryobolus** Fr. (1849), Fomitopsidaceae. 5, widespread. See Eriksson (*Symb. bot. upsal.* 16 no. 1: 115, 1958), Christiansen (*Dansk bot. Ark.* 19: 244, 1960), Parmasto (*Consp. System. Corticiac.*: 98, 1968; taxonomy), Manjon *et al.* (*An. Jard. bot. Madr.* 40: 297, 1984; key Eur. spp.).
- Dacryodoichium** P. Karst. (1896) = *Graphiola* fide Sutton (*in litt.*).
- dacryoid**, having one end rounded and the other more or less pointed; pear-like or tear-like in form.
- Dacryoma** Samuels (1988), anamorphic *Nectria*, St.0-1eH.15. 3, Indonesia; Peru. See Samuels (*Brittonia* 40: 328, 1988), Matsushima (*Matsush. Mycol. Mem.* 10, 2001; Peru).
- Dacryomitra** Tul. & C. Tul. (1872) = *Calocera* fide McNabb (*N.Z. J. Bot.* 3: 31, 1965).
- Dacryomyces**, see *Dacrymyces*.
- Dacryomycetopsis** Rick (1958) nom. dub., Basidiomycota. See Rick (*Iheringia Série Botânica* 2: 53, 1958).
- Dacryonaema** Nannf. (1947), Dacrymycetaceae. 1,

- Europe. See Lisická (*Czech Mycology* 48: 217, 1995; Slovakia).
- Dacryopinax** G.W. Martin (1948), Dacrymycetaceae. c. 15, widespread (esp. tropical). See McNabb (*N.Z. Jl Bot.* 3: 59, 1965; key), Lowy (*Mycotaxon* 13: 428, 1981; key trop. Am. spp.), Sierra & Cifuentes (*Mycotaxon* 92: 243, 2005; key), Roberts (*Mycotaxon* 96: 83, 2006; Caribbean).
- Dacryopsella** Höhn. (1915) = Pistillina fide Donk (*Reinwardtia* 2: 435, 1954).
- Dacryopsida** Nees (1816) nom. dub., Agaricomycetes.
- Dacryopsis** Masee (1891) = Ditiola Fr. fide Kennedy (*Mycol.* 56: 298, 1964).
- Dacryoscyphus** R. Kirschner & Zhu L. Yang (2005), anamorphic Dacrymycetaceae. 1, China. See Kirschner & Yang (*Antonie van Leeuwenhoek* 87: 331, 2005).
- Dactuliochaeta** G.L. Hartm. & J.B. Sinclair (1988), anamorphic Pleosporales, Cpd.0eH.15. 1 (on *Glycine*), Africa. For *Pyrenochaeta* with *Dactuliophora* synanamorph. See Hartman & Sinclair (*Mycol.* 80: 696, 1988).
- Dactuliophora** C.L. Leakey (1964), anamorphic Pleosporales, Hsp.#eP.42. 4, widespread (esp. Africa). See Datnoff *et al.* (*TBMS* 87: 297, 1986; as *Pyrenochaeta*), Ramaley (*Mycol.* 91: 132, 1999).
- Dactylaria** Sacc. (1880), anamorphic Helotiales, Hso.1≡ eH.10. c. 109, widespread. Probably polyphyletic. See Bhatt & Kendrick (*CJB* 46: 1253, 1968; type sp.), de Hoog & von Arx (*Kavaka* 1: 55, 1973), de Hoog & van Oorschot (*Proc. K. ned. Akad. Wet. Ser. C, Biol. Med. Sci.* 86: 55, 1983), de Hoog (*Stud. Mycol.* 26: 1, 1985; key 41 spp.), Dixon & Salkin (*J. Clin. Microbiol.* 24: 12, 1986; medical spp.), Sawadogo & Cayrol (*Riv. Scient.*: 27, 1990), Castañeda Ruiz & Kendrick (*Univ. Waterloo Biol. Ser.* 35: 1, 1991; Cuba), Saikawa & Kaneko (*Mycoscience* 35: 89, 1994; infection process), Castañeda Ruiz *et al.* (*Mycotaxon* 58: 253, 1996; Cuba), Rubner (*Stud. Mycol.* 39, 1996), Goh & Hyde (*MR* 101: 1265, 1997; revision), Liou & Tzean (*Mycol.* 89: 876, 1997; phylogeny), Ahrén *et al.* (*FEMS Microbiol. Lett.* 158: 179, 1998; phylogeny), Paulus *et al.* (*Fungal Diversity* 14: 143, 2003; Australia).
- Dactylariopsis** Mekht. (1967) = Arthrotrys fide Schenck *et al.* (*CJB* 55: 977, 1977), Scholler *et al.* (*Sydowia* 51: 89, 1999; synonymy with *Drechlerella*).
- Dactylella** Grove (1884), anamorphic Orbilia, Hso.≡ eH.10. c. 62 (mainly on nematodes), widespread (esp. north temperate). See Subramanian (*J. Indian bot. Soc.* 42: 291, 1963), Zhang *et al.* (*Mycosystema* 7: 111, 1995; review), Rubner (*Stud. Mycol.* 39, 1996), Liou & Tzean (*Mycol.* 89: 876, 1997; phylogeny), Ahrén *et al.* (*FEMS Microbiol. Lett.* 158: 179, 1998; phylogeny), Webster *et al.* (*MR* 102: 99, 1998; teleomorph), Hagedorn & Scholler (*Sydowia* 51: 27, 1999; phylogeny), Zhang *et al.* (*Mycosystema* 20: 51, 2001; ontogeny), Barron (*Biodiversity of Fungi Inventory and Monitoring Methods*: 435, 2004; review).
- Dactylellina** M. Morelet (1968) = Monacrosporium fide Scholler *et al.* (*Sydowia* 51: 89, 1999; gen. concept), Li *et al.* (*Mycol.* 97: 1034, 2006; phylogeny).
- Dactyliaceae** Nann. (1934) = Orbiliaceae.
- Dactylifera** Alcorn (1987), anamorphic Pezizomycotina, Hso.0bP.26. 1, Australia. See Alcorn (*Mycotaxon* 28: 71, 1987).
- Dactylina** G. Arnaud ex Subram. (1964) = Lactydina.
- Dactylina** Nyl. (1860), Parmeliaceae (L). c. 10, widespread. See Lyngé (*Skr. Svalbard Ishavet* 59, 1933), Follmann *et al.* (*Willdenowia* 5: 7, 1968), Thomson & Bird (*CJB* 56: 1602, 1978; N. Am. spp., key), Kärnefelt & Thell (*Nova Hedwigia* 62: 487, 1996; revision), Thell *et al.* (*Mycol. Progr.* 1: 335, 2002; phylogeny), Mattsson & Articus (*Symb. bot. upsal.* 34 no. 1: 237, 2004; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Randle & Saag (*Central European Lichens*: 75, 2006; key European spp.).
- Dactylium** Nees (1816) nom. rej. = Monacrosporium fide Gams & Rubner (*Taxon* 46: 335, 1997).
- Dactyloblastus** Trevis. (1853) = Phlyctis fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- dactyloid**, finger-like.
- Dactylomyces** Sopp (1912), Trichocomaceae. Anamorph *Polypaecilum*. 2 (thermophilic), Europe; N. America. See also *Coonemeria*. See Apinis (*TBMS* 50: 576, 1967), Mouchacca (*Cryptog. Mycol.* 18: 19, 1997; review).
- Dactyloporus** Herzer (1893), Fossil Fungi, Agaricomycetes. 1 (Carboniferous), N. America. See Seward (*Fossil plants* 1: 211, 1898).
- Dactylospora** Körb. (1855), Dactylosporaceae. c. 49 (on lichens, hepatics or wood), widespread. See Hafellner (*Beih. Nova Hedwigia* 62, 1979), Bellemère & Hafellner (*Cryptog. Mycol.* 3: 71, 1982; asci), Döbbeler & Triebel (*Bot. Jahrb. Syst.* 107: 503, 1985; on *Hepaticae*), Au *et al.* (*Mycoscience* 37: 129, 1996; ultrastr.), Kohlmeyer & Volkmann-Kohlmeyer (*Mycotaxon* 67: 247, 1998; marine spp.), Sarrión *et al.* (*Lichenologist* 34: 361, 2002; Spain), Ihlen *et al.* (*Bryologist* 107: 357, 2004; key).
- Dactylosporaceae** Bellem. & Hafellner (1982), ? Lecanorales (L). 1 gen. (+ 6 syn.), 49 spp.
Lit.: Döbbeler & Triebel (*Bot. Jahrb. Syst.* 107: 503, 1985), Au *et al.* (*Mycoscience* 37: 129, 1996), Kohlmeyer & Volkmann-Kohlmeyer (*Mycotaxon* 67: 247, 1998), Jones *et al.* (*Mycoscience* 40: 317, 1999).
- Dactylosporangium** Thiemann, Pagani & Beretta (1967), Actinobacteria. q.v.
- Dactylosporina** (Cléménçon) Dörfelt (1985), Marasmiaceae. 2, S. America. Or perhaps *Physalacriaceae*. See Dörfelt (*Feddes Repert.* 96: 236, 1985).
- Dactylosporites** Paradkar (1976), Fossil Fungi. 1 (Cretaceous), India. See Paradkar (*Journal of Palynology* 10: 120, 1974).
- Dactylosporium** Harz (1872), anamorphic Pezizomycotina, Hso.#eP.10. 2, Europe; Cuba. See Hughes (*Naturalist Hull*: 63, 1952), Seifert & Hughes (*N.Z. Jl Bot.* 38: 489, 2000).
- Dactylosporium** Mekht. (1967) = Dactylellina.
- dadih** (**dadih**), a fermented product of buffalo milk popular in Western Sumatra. See Gandjar *et al.* (*IMC3 Abstr.*: 452, 1983; microbiology).
- Daedala** Hazsl. (1887) = Hypodermina fide Darker (*CJB* 45: 1399, 1967).
- Daedalea** Pers. (1801), Fomitopsidaceae. 7, widespread. *D. quercina* (wood rot). See Corner (*Beih. Nova Hedwigia* 86: 265 pp., 1987), Legon (*Mycologist* 19: 44, 2005).
- Daedaleaceae** Jülich (1982) = Fomitopsidaceae.
- Daedaleites** Mesch. (1892), Fossil Fungi. 2 (Tertiary), Europe.
- Daedaleopsis** J. Schröt. (1888), Polyporaceae. 6, widespread. See Pegler (*The polypores* [Bull. BMS

- Suppl.*, 1973), Ko & Jung (*Antonie van Leeuwenhoek* 75: 191, 1999; molecular phylogeny), Bernicchia *et al.* (*MR* 110: 14, 2006; neolithic DNA).
- Daedaloides** Lázaro Ibiza (1916) = *Cryptoderma* fide Pegler (*The polypores* [*Bull. BMS Suppl.*], 1973).
- Daldinia** Ces. & De Not. (1863) nom. cons., Xylariaceae. Anamorph *Nodulisporium*. c. 30, widespread. *D. concentrica* ('calico wood', 'cramp balls' on *Fraxinus*). See Pérez-Silva (*Boln. Soc. mex. Micol.* 7: 51, 1973; Mexican spp.), Thind & Dargan (*Kavaka* 6: 15, 1979; Indian spp.), Petrini & Müller (*Mycol. Helv.* 1: 501, 1986; key 5 spp. Eur.), Læssøe (*SA* 13: 43, 1994; syn. of *Hypoxylon*), Ju *et al.* (*Mycotaxon* 61: 243, 1997; monogr.), Rogers *et al.* (*Mycotaxon* 72: 507, 1999; typification), Johannesson *et al.* (*MR* 104: 275, 2000; Europ.), Johannesson *et al.* (*Mycol.* 93: 440, 2001; population structure), Johannesson *et al.* (*Mol. Ecol.* 10: 1665, 2001; genetic variation), Stadler *et al.* (*Mycotaxon* 80: 167, 2001; European spp.), Stadler *et al.* (*Mycotaxon* 77: 379, 2001; biochemistry), Stadler *et al.* (*Mycol. Progr.* 1: 31, 2002; ascospore ornamentation), Stadler *et al.* (*MR* 108: 257, 2004; cryptic spp.), Stadler *et al.* (*MR* 108: 1025, 2004; large-spored spp.), Hsieh *et al.* (*Mycol.* 97: 844, 2005; phylogeny), Triebel *et al.* (*Nova Hedwigia* 80: 25, 2005; phylogeny), Bitzer *et al.* (*MR* 112: 251, 2008; phylogeny, chemistry).
- Daleomyces** Setch. (1924) = *Peziza* Fr. fide Korf (*Mycol.* 48: 711, 1956), Antonín (*Czech Mycol.* 57: 249, 2005; Czech Republic).
- Damnosporium** Corda (1842) = *Bactridium* fide Saccardo (*Syll. fung.* 4: 691, 1886).
- damping-off**, a rotting of seedlings at soil level. In **pre-emergent** - the young plant is attacked at germination so that the seedling does not come up. Species of *Fusarium*, *Phytophthora*, *Pythium* and *Rhizoctonia* are common - **fungi**. Soil sterilization is frequently the best control measure (see Cheshunt compound).
- Danaëa** Caneva & Rambelli (1981) [non *Danaëa* Sm. 1793, *Pteridophyta*] ≡ *Kiliophora*.
- Dangeard** (Pierre Clement Augustin; 1862-1947; France). On the academic staff, Faculty of Sciences, Caen (1886-1891) then Poitiers (1891-1908) then Paris (1908-1924); Professor of Botany, Sorbonne, Paris (1924 onwards). A distinguished mycologist, protozoologist, algologist, cytologist, and morphologist. He provided data for classification of many fungi, especially those with algal or protozoan affinities. *Publs. Recherches sur le développement du périthèce chez les Ascomycètes. Le Botaniste* (1907). *Biogs, obits etc.* Grumann (1974: 313); Heim (*Revue de Mycologie* 12: 97, 1947) [portrait]; Moreau (*Revue Générale de Botanique* 57: 193, 1950) [portrait]; Stafleu & Cowan (*TL-2* 1: 596, 1976).
- Dangeardia** Schröd. (1898), Chytridiaceae. 7, Europe; N. America. See Batko (*Acta Mycologica Warszawa* 12: 407, 1970).
- Dangeardiana** Valkanov ex A. Batko (1970), Chytridiaceae. 4 (on *Eudorina*), Bulgaria. See Batko (*Acta Mycologica Warszawa* 6: 430, 1970).
- Dangeardiella** Sacc. & P. Syd. (1899), Melanommataceae. 2 (on *Pteridophyta*), Europe. See Obrist (*Phytopath. Z.* 35: 379, 1959), Liew *et al.* (*Mol. Phylogen. Evol.* 16: 392, 2000; phylogeny), Câmara *et al.* (*MR* 107: 516, 2003; phylogeny).
- dangeardien (dangeardium)**, collective term for both asci and basidia; structures where diploid nuclei are formed, undergo meiosis and form haploid spores (Moreau, *Botaniste* 34: 315, 1949). See van der Walt & Johanssen (*Ant. v. Leeuwenhoek* 40: 185, 1974; concept in yeast taxonomy).
- Dangeardiomyces**, *Basidiomycetes*, *Protobasidiomycetes* and *Ascomycetes* excluding *Periascomycetes* (Moreau, 1953).
- DAOM**, Canadian National Mycological Herbarium (Ottawa, Canada); founded 1929; part of the Centre for Land and Biological Resources Research, Agriculture Canada; genetic resource collection CCFC; see Cody *et al.* (*Systematics in Agriculture Canada at Ottawa 1886-1986*, 1986).
- DAP pathway**, alpha, beta-diaminopimelic acid pathway for lysine synthesis (cf. AAA pathway).
- Dapsilosporium** Corda (1837) = *Melanconium* fide Saccardo (*Syll. fung.* 3: 1, 1884), Sutton (*Mycol. Pap.* 141, 1977).
- DAR**, Plant Pathology Branch Herbarium New South Wales (Rydalmere, NSW, Australia); founded 1890; collections vested in a Trust established by the NSW Parliament from 1983 and supported by the government.
- Darbishirella** Zahlbr. (1898) = *Ingaderia* See Tehler (*CJB* 68: 2458, 1990; cladistics), Feige & Lumbsch (*Mycotaxon* 48: 381, 1993).
- Darkera** H.S. Whitney, J. Reid & Piroz. (1975), Helotiales. Anamorph *Tiarosporella*. 2, Europe; N. America. See Whitney *et al.* (*CJB* 53: 3052, 1975), Gernandt *et al.* (*Mycol.* 93: 915, 2001; phylogeny).
- Darluca** Castagne (1851) = *Sphaerellopsis* Cooke fide Sutton (*Mycol. Pap.* 141, 1977).
- Darlucella** Höhn. (1919) = *Sphaerellopsis* Cooke fide Sutton (*Mycol. Pap.* 141, 1977).
- Darlucis** Clem. (1931) = *Heteropatella* fide Sutton (*Mycol. Pap.* 141, 1977).
- Daruvedia** Dennis (1988), Dothideomycetes. 1, British Isles. See Barr (*Mycotaxon* 51: 191, 1994; posn).
- Darwiniella** Speg. (1887) nom. dub., *Pezizomycotina*. See Petrak & Sydow (*Annls mycol.* 34: 22, 1936).
- Dasturella** Mundk. & Khesw. (1943), Phakopsoraceae. 3 (on *Rubiaceae* (0, I where known); on *Poaceae* (esp., II, III)), India. See Thirumalachar *et al.* (*Bot. Gaz.* 108: 371, 1947), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003; syn. of *Kweilingia*), Thaung (*Australasian Mycologist* 24: 29, 2005; Burma).
- Dasybolus** Clem. & Shear (1931) ≡ *Dasyobolus*.
- Dasyobolus** (Sacc.) Sacc. (1895) = *Ascobolus* fide van Brummelen (*Persoonia Suppl.* 1: 1, 1967).
- Dasypezis** Clem. (1909) = *Lachnum* fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).
- Dasypthora** Clem. (1909) nom. rej. = *Nectriopsis* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Dasypyrena** Speg. (1912) = *Actinopeltis* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Dasyscypha** Fuckel (1870) = *Neodasyscypha* Suková & Spooner.
- Dasyscyphella** Tranzschel (1898), Hyaloscyphaceae. 23, Asia; N. America. See Dennis (*Kew Bull.* 27: 273, 1972), Raitviir (*Eesti NSV Tead. Akad. Toim. Biol. seer* 26: 33, 1977), Baral (*Z. Mykol.* 59: 3, 1993), Galán & Raitviir (*Nova Hedwigia* 58: 453, 1994), Raitviir & Järv (*Proc. Est. Acad. Sci. Biol. Ecol.* 46: 94, 1997), Leenurm *et al.* (*Sydowia* 52: 30, 2000; ultrastr.), Raitviir (*Polish Botanical Journal* 47: 227, 2002; revision), Suková (*Czech Mycol.* 57: 139, 2005; Czech Republic).
- Dasyscyphus** Nees ex Gray (1821) = *Lachnum*. For-

- merly used for many members of the *Hyaloscyphaeae* with distinctive apothecial hairs. fide Holm (*TBMS* 67: 333, 1976), Korf (*Mycotaxon* 5: 515, 1977), Holm (*Mycotaxon* 7: 139, 1978), Dimitrova (*Phytologica Balcanica* 6: 133, 2000; Bulgaria).
- Dasysphaeria** Speg. (1912), *Pezizomycotina*. 1, S. America.
- Dasyspora** Berk. & M.A. Curtis (1853), *Uropyxidaceae*. 1 (on *Annonaceae*), America (tropical). See Hennen & Figueredo (*Mycol.* 73: 350, 1981).
- Dasysticta** Speg. (1912), anamorphic *Pezizomycotina*, Cpd.0eH.15. 1, S. America.
- Dasystictella** Höhn. (1919) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Datronia** Donk (1967), *Polyporaceae*. 5, north temperate. See Ryvarden & Gilbertson (*Europ. Polyp.* 1: 230, 1993).
- datum** (pl. **data**), facts, figures, information and observations. Often used adjectivally, e.g. data bank, data matrix, database.
- Davidgallowaya** Aptroot (2007), *Parmeliaceae* (L). 1, Papua New Guinea. See Aptroot (*Biblthca Lichenol.* 95: 137, 2007).
- Davidiella** Crous & U. Braun (2003), *Davidiellaceae*. Anamorph *Cladosporium*. 33, widespread. See Braun *et al.* (*Mycol. Progr.* 2: 8, 2003), Park *et al.* (*Mycotaxon* 89: 441, 2004; indoor spp.), Seifert *et al.* (*CJB* 82: 914, 2004; phylogeny), Crous *et al.* (*MR* 110: 264, 2006), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny), Crous *et al.* (*Stud. Mycol.* 58: 1, 2007; phylogeny), Schubert *et al.* (*Stud. Mycol.* 58: 105, 2007; phylogeny).
- Davidiellaceae** C.L. Schoch, Spatafora, Crous & Shoemaker (2007), *Capnodiales*. 4 gen. (+ 11 syn.), 185 spp. See Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny), Crous *et al.* (*Stud. Mycol.* 58: 1, 2007; phylogeny).
- Davincia** Penz. & Sacc. (1901) = *Crocicreas* fide Carpenter (*Mem. N. Y. bot. Gdn* 33: 1, 1981).
- Davinciella** (Sacc. & D. Sacc.) Trotter (1928) ≡ *Mero-dontis*.
- Davisiella** Petr. (1924), anamorphic *Pezizomycotina*, Cpd.0eH/#eH.15. 1, USA.
- Davisomycella** Darker (1967), *Rhytismataceae*. 10, widespread. See Minter & Ivory (*TBMS* 91: 171, 1988), Ganley *et al.* (*Proc. natn Acad. Sci. U.S.A.* 101: 10107, 2004; endophytes), Hou *et al.* (*Nova Hedwigia* 83: 511, 2006; China).
- Davisoniella** H.J. Swart (1988), anamorphic *Mycosphaerella*, St.0eP.19. 1, Australia. See Swart (*TBMS* 90: 289, 1988), Crous *et al.* (*Stud. Mycol.* 55: 99, 2006; phylogeny).
- Dawsicola** Döbbeler (1981), *Helotiales*. 1 (on *Musci*), New Zealand. See Döbbeler (*Sydowia* 38: 41, 1986), Döbbeler (*Biodiv. Cons.* 6: 721, 1997).
- Dawsomyces** Döbbeler (1981), ? *Arthoniomycetes*. 2 (on *Musci*), New Guinea; Australia. See Döbbeler (*Mitt. bot. StSamml. Münch.* 17: 426, 1981), Döbbeler (*Biodiv. Cons.* 6: 721, 1997).
- Dawsophila** Döbbeler (1981), *Dothideomycetes*. 2, New Guinea; New Zealand. See Grube (*Bryologist* 101: 377, 1998).
- de Bary** (Heinrich Anton; 1831-1888; Germany). Doctor of Medicine, Berlin (1853); practising surgeon, Frankfurt-am-Main, the town of his birth (1853); privat docent in botany, Tübingen (1853-1855); Professor, Freiburg (1855-1867); Professor, Halle (1867-1872); Professor, Strasburg University (1872-1888); editor, *Botanische Zeitung* (1867-1887). His writings on mycology (and on algology, bacteriology and botany) were outstanding, his interests being more biological and physiological than systematic: from his investigations on life histories, parasites and saprobes, *Mycetozoa* (see Martin, *Proceedings of the Iowa Academy of Science* 65: 20, 1958), the nature of lichens, etc., he made new and important discoveries. Heteroecism in the *Pucciniales* was made clear by his experiments and he gave accounts of development and of sex in a number of 'phycomycetes' and 'ascomycetes'. His teaching (many of his students became noted) and writings had a very great effect on later development of mycology, and it is generally accepted that he was 'the founder of modern mycology'. *Publs. Untersuchungen über die Brandpilze* (1853); *Die Mycetozoen* (1859); *Morphologie und Physiologie der Pilze* (1866) [edn 2, 1884; English edn, 1887]. *Biogs, obits etc.* Reess (*Bericht der Deutschen Botanischen Gesellschaft* 6: viii, 1888); Smith (*Phytopathology* 1: 1, 1911) [portrait]; Sparrow (*Mycol.* 70: 222, 1978); Stafleu & Cowan (*TL-2* 1: 135, 1976).
- de Bary bubbles**, air bubbles in ascospores; first described by de Bary (1884: 106). See Dodge (*Bull. Torrey bot. Cl.* 84: 431, 1957).
- de Notaris** (Giuseppe; 1805-1877; Italy). Graduate in medicine, Padua (1830); Professor of Botany, University of Genoa (1839-1872); Professor of Botany, Rome (1872-1877). Made early investigations of Italian ascomycetes, including lichen-forming species, and introduced reforms in ascomycete taxonomy; also published extensively on Italian liverworts and mosses. Main collections in Rome (RO). *Publs. Micromycetes Italici Novi vel Minus Cogniti* (1839-1855); *Sferiacei Italici* (1863); also other papers, especially on ascomycetes. *Biogs, obits etc.* Cooke (*Grevillea* 5: 143, 1877); Graniti (*Rendiconti della Accademia Nazionale delle Scienze detta dei XL Serie V* 15: 9, 1991) [portrait]; Stafleu & Cowan (*TL-2* 1: 622, 1976).
- Dearness** (John; 1852-1954; Canada). School inspector, East Middlesex (1874-1899); Vice-Principal (1899-1918) then Principal (1918-1922) London Normal School. Self-taught amateur mycologist; the first Canadian mycologist to receive international recognition. Collections in DAOM (Parmelee, *Mycol.* 70: 509, 1978). *Publs.* New and noteworthy fungi I-VI. *Mycol.* (1916-1929); (with House) New or noteworthy species of fungi I-IV. *Bulletin of the New York State Museum* (1918-1925). *Biogs, obits etc.* Tamblyn (*Mycol.* 47: 909, 1955) [bibliography, portrait]; Ginns (*Mycotaxon* 26: 47, 1986); Stafleu & Cowan, *TL-2* 1: 605, 1976).
- Dearnessia** Bubák (1916), anamorphic *Pezizomycotina*, Cpd.≡ eH.1. 1, Canada.
- death cap**, basidiomata of the highly poisonous *Amanita phalloides*.
- Debarya** Schulzer (1866) = *Hypocrea*. The type no longer exists, so application is dubious. fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Debaryella** Höhn. (1904), ? *Sordariomycetes*. 2, Europe. The type is lost and affinities are obscure. fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Réblová & Seifert (*Stud. Mycol.* 50: 95, 2004).
- Debaryolipomyces** Ramírez (1957) nom. nud., ? *Saccharomycetes*. See Batra in Subramanian (Ed.) (*Taxonomy of fungi* 1: 187, 1978).

Debaryomyces Klöcker (1909) nom. rej. = *Torulaspora* fide van der Walt & Johanssen (*CSIR Res. Rept.* 325, 1975).

Debaryomyces Lodder & Kreger-van Rij (1984) nom. cons., Saccharomycetales. 19, widespread. See Hendriks *et al.* (*Syst. Appl. Microbiol.* 15: 98, 1992; posn), Yamada *et al.* (*J. gen. appl. Microbiol.* Tokyo 38: 623, 1992; gen. concept), Cai *et al.* (*Int. J. Syst. Bacteriol.* 46: 542, 1996; rDNA), Nakase *et al.* in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 157, 1998), Ramos *et al.* (*J. gen. appl. Microbiol.* Tokyo 44: 399, 1998; ITS), Nishikawa *et al.* (*Medical Mycology* 37: 101, 1999; PCR identification), Corredor *et al.* (*FEMS Microbiol. Lett.* 193: 171, 2000; DNA probes), Petersen *et al.* (*Int. J. Food Microbiol.* 69: 11, 2001; DNA typing), Thanh *et al.* (*FEMS Yeast Res.* 2: 415, 2002; from woodlice), Corredor *et al.* (*Antonie van Leeuwenhoek* 83: 215, 2003; chromosomes), Petersen & Jespersen (*Journal of Applied Microbiology* 97: 205, 2004; genetic diversity), Martorell *et al.* (*FEMS Yeast Res.* 5: 1157, 2005; molecular identification), Romero *et al.* (*FEMS Yeast Res.* 5: 455, 2005; molecular detection), Quirós *et al.* (*Antonie van Leeuwenhoek* 90: 211, 2006; IGS analysis), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).

Debaryoscyphus Arendh. & R. Sharma (1986) = *Hamatocanthoscypha* fide Huhtinen (*Karstenia* 29: 545, 1990).

Debaryozyma Van der Walt & Johanssen (1978) nom. rej. ≡ *Debaryomyces* Lodder & Kreger ex Kreger.

Decaisnella Fabre (1879), Massariaceae. 11, widespread. See Barr (*Sydowia* 38: 11, 1986), Barr (*SA* 5: 127, 1986; status), Barr (*N. Amer. Fl.* ser. 2 13: 129 pp., 1990; key, posn), Abdel-Wahab & Jones (*CJB* 81: 598, 2003; Australia), Checa & Blanco (*Mycotaxon* 91: 353, 2005; Spain).

Decampia Mudd (1861) ≡ *Dacampia*.

Decapitatus Redhead & Seifert (2000), anamorphic *Mycena*. 1. See Redhead *et al.* (*Taxon* 49: 789, 2000).

decay, the destruction of plant or animal material by fungi and other microorganisms.

Deccanodia Singhai (1974), Fossil Fungi, anamorphic *Pezizomycotina*. 1 (Eocene), India.

deciduous (of spores, etc.), falling away at maturity; shed, either with (e.g. teliospores) or without (e.g. urediniospores) a fragment of the pedicel or sporophore; cf. persistent.

Deckenbachia Jacz. (1931) ≡ *Coenomyces*.

declinate, bent or curved down or forwards.

declivate (declivous), sloping.

decolourate, colourless.

Decomposition. In the strict sense, is the breakdown of organic materials through biological activity, although the physical processes of leaching and fragmentation are sometimes considered a part of decomposition. Fungal decomposition, particularly of plant remains, is a key element worldwide in the recycling of nutrients. The products resulting from biological decomposition by fungi are energy for the decomposer, inorganic elements and compounds, and simple organic compounds such as CO₂ or alcohol which result from aerobic and anaerobic respiration (fermentation), respectively. Products containing complex organic compounds with phenolic rings (humic acids) can result from partial decomposition of lignin, and are an important component of soil organic matter. The release of mineral nutrients through

decomposition is known as nutrient mineralization. When fungi decompose organic matter such as wood or straw in which the ratio of carbon to inorganic nutrients (especially nitrogen and phosphorus) is high, the nutrient mineralization phase is often preceded by a nutrient immobilization phase. During nutrient immobilization, the decomposers incorporate mineral nutrients from their organic substrate and sometimes from the surrounding environment into their biomass. See Carroll & Wicklow (Eds) (*The fungal community*, edn 2, 1992), Dix & Webster (*Fungal ecology*, 1995). See also: Biodegradation.

Deconica (W.G. Sm.) P. Karst. (1879) = *Psilocybe* (Fr.) P. Kumm. fide Singer (*Agaric. mod. Tax.*, 1951).

Decorospora Inderb., Kohlm. & Volkm.-Kohlm. (2002), Pleosporaceae. 1 (marine), widespread. See Inderbitzin *et al.* (*Mycol. Progr.* 94: 657, 2002).

decorticate, having no cortex.

decumbent, resting on the substratum with the ends turned up.

decurrent (of lamellae), running down the stipe (Fig. 19E).

decurved (of the pileus edge), bent down.

decussate (of lichen thalli), having the surface divided and crossed by dark lines.

Dedalea, see *Daedalea*.

dediploidization (in ascomycetes and basidiomycetes), the making of haploid cells (or hyphae) by a dikaryotic diploid mycelium or cell.

deer balls (*Lycoperdon* nuts or harts' truffles), *Elaphomyces* ascomata.

Deflexula Corner (1950) = *Pterula* fide Kuyper (*in litt.*).

Degelia Arv. & D.J. Galloway (1981), Pannariaceae (L). 11, widespread (temperate). See Jørgensen & James (*Biblhca Lichenol.* 38: 253, 1990; key), Lumbsch & Kothe (*Mycotaxon* 43: 277, 1992; thallus SEM), Jørgensen & James (*Lichenologist* 30: 533, 1998), Jørgensen (*Bryologist* 103: 670, 2000; N America), Jørgensen *et al.* (*Lichenologist* 32: 257, 2000; n. spp.), Jørgensen (*Biblhca Lichenol.* 78: 109, 2001; Australia), Ekman & Jørgensen (*CJB* 80: 625, 2002; phylogeny), Jørgensen (*N.Z. Jl Bot.* 40: 327, 2002; New Zealand), Wiklund & Wedin (*Cladistics* 19: 419, 2003; phylogeny), Jørgensen (*Biblhca Lichenol.* 88: 229, 2004; S hemisphere), Miadlikowska & Lutzoni (*Am. J. Bot.* 91: 449, 2004; phylogeny), Wedin & Wiklund (*Symb. bot. upsal.* 34 no. 1: 469, 2004; phylogeny), Jørgensen & Sipman (*J. Hattori bot. Lab.* 100: 695, 2006; New Guinea), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).

Degeliella P.M. Jørg. (2004), Pannariaceae (L). 2, austral. See Jørgensen (*Biblhca Lichenol.* 88: 235, 2004).

dehiscence papilla, morphologically and ultrastructurally distinct protuberance on an undischarged sporangium that becomes converted into an exit tube.

dehiscent (dehiscing) (of asci or fruit-bodies), opening when mature, by pores or by becoming broken into parts.

Deichmannia Alstrup & D. Hawksw. (1990), anamorphic *Pezizomycotina*, Hsp.#eP.1. 1 (on lichens), Greenland. See Alstrup & Hawksworth (*Meddr Grønland Biosc.* 31: 26, 1990).

Deighton (Frederick Claude; 1903-1992; England, later Sierra Leone). Plant Pathologist, British Colonial Of-

- fice (up to 1955); Mycologist, IMI (1955-1973). With Hughes, a pioneer of the mycota of West Africa, in particular Sierra Leone; also noted as an expert on *Cercospora* and related genera. Collections in IMI. *Publs.* Seventeen numbers of the series *Mycological Papers. Biogs, obits etc.* Ainsworth (*Brief Biographies of British Mycologists* p. 57, 1996).
- Deightonia** Petr. (1947) = *Vanderystiella* fide Petrak (*Sydowia* 5: 328, 1951).
- Deightoniella** S. Hughes (1952), anamorphic *Mycosphaerellaceae*, Hso.1 = eP.19. 10, widespread (esp. tropical). *D. torulosa* (fruit spot ('speckle') of banana. See Ellis (*DH*, 1971), Constantinescu (*Proc. K. Ned. Akad. Wet. Ser. C, Biol. Med. Sci.* 86: 137, 1983), Ondřej (*Česká Mykol.* 38: 39, 1984; Czech spp.), Barr (*Mycol.* 77: 549, 1985), Crous *et al.* (*Mycosphaerella Leaf Spot Diseases of Bananas: Present Status and Outlook* Proceedings of the 2nd International Workshop on *Mycosphaerella* Leaf Spot Diseases Held in San José, Costa Rica, 20-23 May 2002: 43, 2003).
- Deigloria** Agerer (1980), *Marasmiaceae*. 10, widespread (neotropics). See Agerer (*Mycotaxon* 12: 188, 1980).
- Dekkera** Van der Walt (1964), ? *Pichiaceae*. Anamorph *Brettanomyces*. 5, widespread. See Smith *et al.* (*Yeast* Chichester 6: 299, 1990), Molina *et al.* (*Int. J. Syst. Bacteriol.* 43: 32, 1993; molec., key), Yamada *et al.* (*Biosc., Biotechn., Biochem.* 58: 1893, 1994; molec. syst.), Smith *et al.* in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 174, 1998), Cocolin *et al.* (*Appl. Environm. Microbiol.* 70: 1347, 2004; molecular detection), Martorell *et al.* (*Int. J. Food Microbiol.* 106: 79, 2006; molecular typing), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Dekkeromyces** Santa María & C. Sánchez-Pinto (1970) = *Kluyveromyces* fide Batra in Subramanian (Ed.) (*Taxonomy of fungi* 1: 187, 1978).
- Dekkeromyces** Wick. & K.A. Burton (1956) nom. inval. = *Kluyveromyces* fide Batra in Subramanian (Ed.) (*Taxonomy of fungi* 1: 187, 1978).
- Delacourea** Fabre (1879) = *Lophiostoma* fide Barr (*Sydowia* 38: 11, 1985), Eriksson & Hawksworth (*SA* 6: 123, 1987).
- Delacroixia** Sacc. & P. Syd. (1899) = *Conidiobolus* fide Tyrrell & McLeod (*J. invert. Path.* 20: 11, 1972).
- Delastreopsis** Mattir. (1905) = *Lespiaultinia* fide Trappe (*TBMS* 65: 496, 1975).
- Delastria** Tul. & C. Tul. (1843), *Pezizales*. 1 (hypogeous), Europe (southern); N. Africa.
- Delentaria** Corner (1970), *Gomphaceae*. 1, Brazil. See Corner (*Beih. Nova Hedwigia* 33: 225, 1970).
- Delicatula** Fayod (1889), ? *Tricholomataceae*. 2, widespread (temperate). See Antonín (*Czech Mycol.* 54: 205, 2003).
- deliquescent**, becoming liquid, e.g. after maturing.
- Delisea** Fée (1825) [non *Delisea* J.V. Lamour. 1819, *Algae*] = *Plectocarpon*.
- Delitescor** Earle (1909) = *Psilocybe* (Fr.) P. Kumm. fide Singer (*Agaric. mod. Tax.*, 1951).
- Delitschia** Auersw. (1866), *Delitschiaceae*. 51 (coprophilous), widespread. See Luck-Allen & Cain (*CJB* 53: 1827, 1975; key), Parguey-Leduc (*BSMF* 94: 409, 1978; ontogeny), Barr (*N. Amer. Fl. ser. 2* 13: 129 pp., 1990; posn), Barrasa & Checa (*Rev. Iberoam. Micol.* 7: 5, 1990; key 8 spp.), Eriksson & Hawksworth (*SA* 10: 138, 1991), Pelaez *et al.* (*Mycotaxon* 50: 115, 1994; West Africa), Hyde & Steinke (*Mycoscience* 37: 99, 1996; aquatic spp.), Richardson (*MR* 102: 1038, 1998), Winka & Eriksson (*Phylogenetic Relationships Within the Ascomycota Based on 18S rDNA Sequences* Akademisk Avhandling [Thesis (PhD), Department of Ecology and Environmental Science, Umeå University]: [17] pp., 2000; phylogeny), Bell (*CBS Diversity Ser.* 3, 2005), Kruys *et al.* (*MR* 110: 527, 2006; phylogeny), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Delitschiaceae** M.E. Barr (2000), *Pleosporales*. 3 gen. (+ 2 syn.), 54 spp.
Lit.: Barr (*Mycotaxon* 76: 105, 2000), Liew *et al.* (*Mol. Phylogen. Evol.* 16: 392, 2000), Winka & Eriksson (*Phylogenetic Relationships Within the Ascomycota Based on 18S rDNA Sequences* Akademisk Avhandling [Thesis (PhD), Department of Ecology and Environmental Science, Umeå University]: [17] pp., 2000), Bell & Mahoney (*Muelleria* 15: 3, 2001), Kruys *et al.* (*MR* 110: 527, 2006).
- Delitschiella** Sacc. (1905) = *Delitschia* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Delortia** Pat. & Gaillard (1888), anamorphic *Pezizomycotina*, Hsp.0 = hH.1. 4 (aquatic), America (tropical); Africa. See Pirozynski (*Mycol. Pap.* 129, 1972), Goh & Hyde (*MR* 101: 42, 1997; Australia).
- Delphinella** (Sacc.) Kuntze (1898), *Dothideales*. Anamorphs *Dothiorella*, *Sclerophoma*. 6, widespread (esp. north temperate). See Barr (*Contr. Univ. Mich. Herb.* 9: 523, 1972), Froidevaux (*Nova Hedwigia* 23: 679, 1973), Barr (*Harvard Pap. Bot.* 6: 25, 2001; revision), Lumbsch & Lindemuth (*MR* 105: 901, 2001; phylogeny), Morozova & Vasil'eva (*Mikol. Fitopatol.* 37: 59, 2003; Siberia), Tsuneda *et al.* (*Mycol.* 96: 1128, 2004; phylogeny), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Delpinoella** Sacc. (1899), *Pezizomycotina*. 1, Africa.
- Delpinoia** Kuntze (1891), *Ascodichaenaceae*. Anamorph *Macroallantina*. 2, Europe. See Speer (*BSMF* 103: 9, 1987).
- Delpontia** Penz. & Sacc. (1901), ? *Stictidaceae*. 1 (on *Pteridophyta*), Java. See Sherwood (*Mycotaxon* 5: 1, 1977).
- deltoid**, triangular in shape.
- Deltosperma** W.Y. Zhuang (1988), anamorphic *Unguiculariopsis*, St.0eP.15. 4, N. America; Europe. See Zhuang (*Mycotaxon* 32: 31, 1988), Zhuang (*MR* 104: 507, 2000).
- Dematiaceae** Fr. (1832). (obsol.). Having dark-coloured hyphae and/or conidia.
- dematiaceous** (of mycelium, spores, etc.), pigmented, more or less darkly. Cf. moniliaceous.
- Dematiocladium** Allegr., Aramb., Cazau & Crous (2005), anamorphic *Nectriaceae*, H??.?. 1, Brazil. See Crous *et al.* (*MR* 109: 836, 2005), Decock *et al.* (*Mycol.* 98: 488, 2006; phylogeny).
- Dematioscypha** Svrček (1977), *Hyaloscyphaceae*. Anamorph *Haplographium*. 3, Europe; New Zealand. See Huhtinen (*Mycotaxon* 30: 9, 1987; 3 spp.), Spooner (*Biblthca Mycol.* 116, 1987), Raitviir (*Czech Mycol.* 52: 289, 2001; key), Raitviir (*Scripta Mycologica Tartu* 20, 2004).
- Dematium** Pers. (1801) nom. conf., anamorphic *Pezizomycotina*. See Hughes (*CJB* 36: 727, 1958), Morgan-Jones & Goos (*Mycol.* 84: 921, 1992).
- Dematoidium** Stautz (1931) ? = *Aureobasidium* fide Hermanides-Nijhof (*Stud. Mycol.* 15: 143, 1977).
- Dematophora** R. Hartig (1883), anamorphic

- Rosellinia*, Hsy.0eP.11. 1, widespread. *D. necatrix* (white root rot of apple and pear). See Watanabe (*Ann. phytopath. Soc. Japan* 58: 65, 1992; sporulation in vitro), Schnittler & Novozhilov (*Mycotaxon* 71: 387, 1999; Taiwan), Nakamura *et al.* (*Mycoscience* 41: 503, 2000; teleomorph), Petrini (*N.Z. J. Bot.* 41: 71, 2003; New Zealand), Petrini & Petrini (*MR* 109: 569, 2005; revision).
- deme** (suffix), a neutral term, always used with a prefix, and denoting any group of individuals within a taxon (q.v.; usually a species); first proposed by Gilmour & Gregor (*Nature* 144: 333, 1939); occasionally used in mycology, e.g. agamodeme (predominantly apomictic), photosymbiodeme (of lichen thalli with different photobionts).
- demicyclic**, see *Pucciniales* and Table 5.
- Dencoeliopsis** Korf (1971), Helotiaceae. 2, Europe; USA. See Holm & Holm (*Symb. bot. upsal.* 21 no. 3: 6, 1977; possible synonymy with *Rutstroemia*), Zhuang (*Mycotaxon* 32: 97, 1988).
- Dendrina** Fr. (1829) nom. dub., anamorphic *Pezizomycotina*. See Lindau (*Rabenh. Krypt.-Fl.* 1: 203, 1907).
- Dendrisocaulon** Nyl. (1888), Lobariaceae (L). 10, widespread. See James & Henssen in Brown *et al.* (Eds) (*Lichenology: progress and problems*: 27, 1976), Thomas *et al.* (*Biblthca Lichenol.* 82: 123, 2001; phylogeny), Tønsberg & Goward (*Bryologist* 104: 12, 2001; Pacific), Lohtander *et al.* (*MR* 106: 777, 2002; phylogeny), Takahashi *et al.* (*J. Hattori bot. Lab.* 100: 783, 2006; photosymbiodemes).
- dendritic**, irregularly branched; tree-like; dendroid.
- Dendrochaete** G. Cunn. (1965) = *Echinochaete* fide Reid (*Kew Bull.* 17: 278, 1963).
- dendrochin**, an antifungal antibiotic from *Dendrodochium toxicum* toxic to farm animals (Bilal, *Antibiotic-producing microscopic fungi*: 139, 1963).
- Dendrocladium** (Pat.) Lloyd (1919) = *Ramaria* Fr. ex Bonord. fide Corner (*Reinwardtia* 2: 457, 1954).
- Dendroclathra** Voglmayr & Delg.-Rodr. (2001), anamorphic *Pezizomycotina*, Hso.?.?. 1 (aero-aquatic), Cuba. See Voglmayr & Delgado-Rodríguez (*CJB* 79: 995, 2001).
- Dendrocollybia** R.H. Petersen & Redhead (2001), Tricholomataceae. Anamorph *Tilachlidiopsis*. 1, widespread (temperate). See Hughes *et al.* (*MR* 105: 164, 2001).
- Dendrocorticium** M.J. Larsen & Gilb. (1974), Corticiaceae. 7, widespread. See Larsen & Gilbertson (*Norw. J. Bot.* 24: 99, 1977).
- Dendrocyphella** Petch (1922), Agaricales. 1, Sri Lanka. See Kost (*MR* 102: 505, 1998).
- Dendrodochium** Bonord. (1851) = *Clonostachys* fide Tulloch (*Mycol. Pap.* 130, 1972; status), Schroers *et al.* (*Mycol.* 91: 365, 1999; syn. of *Clonostachys*), Schroers (*Stud. Mycol.* 46: 1, 2001), Ramaley (*Mycotaxon* 90: 181, 2004).
- Dendrodomus** Bubák (1915), anamorphic *Pezizomycotina*, Cpd.0eH.15. 1, Europe.
- Dendrodontia** Hjortstam & Ryvarden (1980), Corticiaceae. 1, Africa. See Hjortstam & Ryvarden (*Mycotaxon* 10: 273, 1980).
- Dendroecia** Arthur (1906) = *Ravenelia* fide Sydow & Sydow (*Monographia Uredinearum seu Specierum Omnium ad hunc usque Diem Descriptio et Adumbratio Systematica* 3, 1915), Dietel (*Nat. Pflanzenfam.* 6, 1928; syn. of *Haploravenelia*).
- Dendrogaster** Buchholz (1901) = *Hymenogaster* fide Smith (*Mycol.* 58: 100, 1966), Fogel (*Mycol.* 77: 72, 1985).
- Dendrographa** Darb. (1895), Roccellaceae (L). 3, N. America; C. America. See Tehler (*CJB* 68: 2458, 1990; cladistics), Sundin & Tehler (*Bryologist* 99: 19, 1996), Lohtander *et al.* (*Bryologist* 101: 404, 1998; species pairs, DNA), Myllys *et al.* (*Lichenologist* 31: 461, 1999; phylogeny), Lumbsch *et al.* (*Mol. Phylogen. Evol.* 34: 512, 2005; phylogeny), Tehler & Irestedt (*Cladistics* 23: 432, 2007).
- Dendrographiella** Agnihothr. (1972), anamorphic *Pezizomycotina*, Hsy.≡ eP.28. 1 (on latex of *Hevea*), India. See Agnihothrudu (*Proc. Indian Acad. Sci. series B* 75: 156, 1972).
- Dendrographium** Masee (1892), anamorphic *Pezizomycotina*, Hsy.≡ eP.27. 2, S. America; India.
- dendrohyphidium**, see hyphidium.
- dendroid**, tree-like in form; dendritic.
- Dendroleptosphaeria** Sousa da Câmara (1932) ? = *Leptosphaeria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Dendromyceliates** K.P. Jain & R.K. Kar (1979), Fossil Fungi. 1 (Miocene), India. = *Cryptophiale* (Ascomycetes, inc. sed.) fide Sutton (*in litt.*).
- Dendromyces** Libosch. (1810) = *Battarrea* fide Stalpers (*in litt.*).
- Dendrophagus** Murrill (1905) [non *Dendrophagus* Toumey 1900, *Loranthaceae*] = *Ganoderma* fide Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974).
- Dendrophoma** Sacc. (1880) = *Dinemasporium* fide Sutton (*TBMS* 48: 611, 1965).
- Dendrophora** (Parmasto) Chamuris (1987), Peniophoraceae. 3, widespread. See Chamuris (*Mycotaxon* 28: 543, 1987).
- Dendrophysellum** Parmasto (1968), Corticiaceae. 1, former USSR. See Parmasto (*Consp. System. Corticiac.*: 146, 1968).
- dendrophysis**, see hyphidium.
- Dendroplella** Munk (1953) ? = *Hendersonia* Berk. fide Barr & Holm (*Taxon* 33: 109, 1984).
- Dendropolyporus** (Pouzar) Jülich (1982) = *Polyporus* P. Micheli ex Adans. fide Ryvarden (*Syn. Fung.* 5, 1991).
- Dendrosarcos**, see *Dendrosarcus*.
- Dendrosarcus** Paulet (1793), Fungi.
- Dendroseptoria** Alcalde (1948), anamorphic *Pezizomycotina*, Cpd.1bH.1. 1, Europe. See Diederich *et al.* (*Belg. J. Bot.* 134: 127, 2001).
- Dendrosphaera** Pat. (1907), Trichocomaceae. 1, Indo-China; East Indies. See Boedijn (*Bull. Jard. bot. Buitenz. ser. 3* 13: 472, 1935), Malloch in Samson & Pitt (Eds) (*Advances in Penicillium and Aspergillus systematics* 102: 365, 1985; posn), Kuraishi *et al.* (*NATO ASI Series A: Life Sciences* 185: 407, 1990; ubiquinones), Kuraishi *et al.* (*Antonie van Leeuwenhoek* 77: 179, 2000; ubiquinones).
- Dendrosphaeraceae** Cif. ex Benny & Kimbr. (1980) = Trichocomaceae.
- Dendrospora** Ingold (1943), anamorphic *Pezizomycotina*, Hso.1bH.1. 9 (aquatic), British Isles. See Descals & Webster (*TBMS* 74: 135, 1980), Roldán *et al.* (*Mycotaxon* 29: 21, 1987; Spain), Sreekala & Bhat (*Frontiers in Microbial Biotechnology and Plant Pathology*: 295, 2002), Kendrick (*CJB* 81: 75, 2003; morphogenesis), Descals (*MR* 109: 545, 2005; diagnostics).
- Dendrosporium** Plakidas & Edgerton ex J.L. Crane (1972), anamorphic *Pezizomycotina*, Hsy.1eH.10. 1,

- N. America; India. See Crane (*TBMS* 58: 423, 1972), Kendrick (*CJB* 81: 75, 2003; morphogenesis).
- Dendrosporomyces** Nawawi, J. Webster & R.A. Davey (1977), anamorphic *Agaricomycetes*. 1 (aquatic, with dolipore septa), Malaysia. See Nawawi *et al.* (*TBMS* 68: 59, 1977).
- Dendrostilbe** Dearn. (1924) nom. dub., anamorphic *Pezizomycotina*. ? An error for *Dendrostilbella*.
- Dendrostilbella** Höhn. (1905), anamorphic *Clausenomyces*, Hsp.0eH.15. 7, widespread. See Seifert (*Stud. Mycol.* 27: 1, 1985).
- Dendrothele** Höhn. & Litsch. (1907), Corticiaceae. 36, widespread. See Lemke (*CJB* 42: 723, 1964; as *Aleurocorticium*), Legon *et al.* (*Mycologist* 16: 114, 2002), Nakasone (*Nova Hedwigia* 83: 99, 2006).
- Dendrotrichoscypha** Svrček (1977) = *Mollisia* fide Sharma (*Portug. Acta Biol.* 15: 281, 1989; key), Huhtinen (*SA* 11: 170, 1993).
- Dendryphiaceae** Corda (1840) ? = Pleosporaceae.
- Dendryphiella** Bubák & Ranoj. (1914) = *Dendryphon* fide Hughes (*CJB* 36: 727, 1958), Ellis (*Dematiceous Hyphomycetes*, 1971; 2 spp.), Michaelis *et al.* (*Mycol.* 79: 514, 1987; genetics and systematics), Mohamad *et al.* (*MR* 93: 400, 1989; separation of spp. by ELISA), Guo & Zhang (*Mycosystema* 18: 236, 1999).
- Dendryphon** Wallr. (1833), anamorphic *Pleosporaceae*, Hso.≡ bP.26. 4, widespread. See Siboe *et al.* (*Mycotaxon* 73: 283, 1999; Kenya), Farr (*Mycol.* 92: 145, 2000; teleomorph), Farr *et al.* (*Mycol.* 92: 145, 2000), Inderbitzin *et al.* (*CJB* 84: 1304, 2006).
- Dendryphiopsis** S. Hughes (1953), anamorphic *Kirschsteiniothelia*, Hso.≡ eP.24. 5, widespread. See Hughes (*N.Z. Jl Bot.* 16: 360, 1978), Subramanian & Sekar (*Kavaka* 15: 87, 1987; teleomorph), Goh *et al.* (*Fungal Diversity* 1: 85, 1998; ribosomal RNA analysis), Olivier & Loria (*FEMS Microbiol. Lett.* 168: 235, 1998; PCR primers for detection), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Dendryphiosphaera** Lunghini & Rambelli (1978), anamorphic *Pezizomycotina*, Hso.≡ eP.1. 3, pantropical. See Lunghini & Rambelli (*G. bot. ital.* 112: 185, 1978), Nawawi & Kuthubutheen (*Mycotaxon* 32: 461, 1988), Castañeda Ruiz *et al.* (*Mycotaxon* 67: 9, 1998).
- denigrate**, blackened.
- Dennis** (Richard William George; 1910-2003; England). Mycologist (1944-1951) then Head of Mycology (1951-1976), Royal Botanic Gardens, Kew. A great and prolific mycologist, widely travelled, with very wide experience of arctic, temperate and tropical fungi, but particularly an expert on discomycetes; also known for his interest in Celtic art and the Scottish islands. *Publs.* (with Wakefield q.v.) *Common British Fungi: a guide to the more common larger Basidiomycetes of the British Isles* (1950); *Fungus flora of Venezuela and adjacent countries Kew Bulletin Additional Series* (1970); *British Ascomycetes* (1981) [revised edn with supplement]; *Fungi of the Hebrides* (1986). *Biogs, obits etc.* Spooner & Roberts (*MR* 108: 1097, 2004) [bibliography, portrait]; Spooner & Roberts (*Mycol.* 96: 187, 2004).
- Dennisiella** Bat. & Cif. (1962), Coccodiniaceae. Anamorph *Microxyphium*-like. 7, widespread (esp. tropical). See Hughes (*Mycol.* 68: 693, 1976), Reynolds & Gilbert (*Aust. Syst. Bot.* 18: 265, 2005; Australia).
- Dennisioidiscus** Svrček (1976), Helotiales. 10, Europe; Papua New Guinea. See Baral & Krieglsteiner (*Beih. Sydowia* 6, 1985), Nauta & Spooner (*Mycologist* 14: 21, 2000; UK).
- Dennisiomyces** Singer (1955), Tricholomataceae. 5, S. America. See Singer (*An. Soc. Biol. Pernambuco* 13: 225, 1955).
- Dennisiopsis** Subram. & Chandrash. (1977), Pezizales. 2, India. See van Brummelen (*Persoonia* 16: 425, 1998; comparison with *Coprotus*).
- Dennisographium** Rifai (1977), anamorphic *Pezizomycotina*, Hsy.0eH.15. 1, Java. See Rifai (*Kew Bull.* 31: 726, 1977), Seifert (*Mem. N. Y. bot. Gdn* 59: 109, 1990).
- dense body vesicle (DBV)**, cytoplasmic vesicle, associated with phosphorylated glucan metabolism, found in a variety of TEM morphological states ranging from a single (or several) electron-opaque core in an amorphous matrix to a highly structured, myelin-like arrangement of alternating electron-opaque and electron-translucent layers.
- Densocarpa** Gilkey (1954) = *Stephensia* fide Trappe (*TBMS* 65: 496, 1975), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Densospora** McGee (1996), Zygomycota. 4, Australia. See McGee (*Aust. Syst. Bot.* 9: 330, 1996), Gleason & McGee (*Australasian Mycologist* 22: 73, 2004; ultrastr.).
- dentate**, toothed (Fig. 23.45). Cf. denticulate.
- denticle**, a small tooth-like projection esp. one on which a spore is borne.
- Denticularia** Deighton (1972), anamorphic *Pezizomycotina*, Hso.0eP.3. 5, widespread (esp. tropical). See de Hoog (*Persoonia* 10: 51, 1978), Chamuris *et al.* (*Mycotaxon* 24: 319, 1985), Alcorn *et al.* (*Australas. Pl. Path.* 28: 115, 1999; Australia), Siboe *et al.* (*Mycotaxon* 73: 283, 1999; Kenya).
- denticulate**, having small teeth. Cf. dentate.
- Dentinaceae** Kotl. & Pouzar (1972) = Hydnaceae.
- Dentinum** Gray (1821) = *Hydnum* fide Hall & Stuntz (*Mycol.* 63: 1113, 1971; key).
- Dentipellis** Donk (1962), Hericiaceae. 4, widespread. See Ginns (*Windahlia* 16: 35, 1986; key).
- Dentipratulum** Domański (1965), Auriscalpiaceae. 1, Europe. See Domański (*Acta Mycologica Warszawa* 1: 6, 1965).
- Dentocircinomyces** R.F. Castañeda & W.B. Kendr. (1990), anamorphic *Pezizomycotina*, Hso.0eH.10. 1 (on *Eucalyptus*), Cuba. See Castañeda & Kendrick (*Univ. Waterloo Biol. Ser.* 32: 17, 1990).
- Dentocorticium** (Parmasto) M.J. Larsen & Gilb. (1974), Polyporaceae. 3, widespread. See Larsen & Gilbertson (*Norw. Jl Bot.* 24: 99, 1977).
- denuded**, uncovered or glabrous by loss of scales, etc.
- depauperate**, poorly developed.
- Depazea** Fr. (1818) = *Asteroma* fide Sutton (*Mycol. Pap.* 141, 1977).
- Depazites** Geinitz (1855), Fossil Fungi. 16 (Tertiary, Quaternary), Europe.
- dependent**, hanging down.
- Dephilippia** Rambelli (1959) = *Circinotrichum* fide Pirozynski (*Mycol. Pap.* 84, 1962).
- deplanate**, flat.
- depressed** (1) (of a pileus), having the middle lower than the edge (Fig. 19N); (2) (of lamellae), sinuate (q.v.).
- depside (depsidone)**, see Metabolic products.
- Derexia** Naras. (1970), anamorphic *Pezizomycotina*, Hso.0eH.1. 1 (on *Lecanium*), India; Java. See Narasimhan (*Indian Phytopath. Suppl. Issue* 23: 20,

- 1970).
- derived**, of a character that has changed from the form in which it appeared in an ancestor.
- derm (dermium)** (of basidiomata), an outer layer in which the hyphae are perpendicular to the surface (Lowag, 1941); cf. cortex;.
- Dermapteromyces** Thaxt. (1931), Laboulbeniaceae. 3, America (tropical). See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- Dermascia** Tehon (1935) ? = Lophodermium fide Darker (*CJB* 45: 1399, 1967).
- Dermatangium** Velen. (1926) = Tremella Pers. fide Donk (*Persoonia* 4: 179, 1966).
- Dermatea** Fr. (1849) = Dermea.
- Dermateaceae** Fr. (1849), Helotiales. 33 gen. (+ 31 syn.), 315 spp. Much reduced compared with traditional treatments.
- Lit.*: Nannfeldt (*Nov. Acta Reg. Soc. Sc. Upsal.* ser. 4 8 no. 2, 1932), Baral (*Z. Mykol.* 53: 119, 1987), Gamundí (*Fl. criptog. Tierra del Fuego* 10: 126 pp., 1986), Dyer *et al.* (*MR* 100: 1219, 1996), Spiers & Hopcroft (*MR* 102: 1025, 1998), Nauta & Spooner (*Mycologist* 13: 3, 1999; keys Br. gen.), Nauta & Spooner (*Mycologist* 13: 65, 1999; keys Br. gen.), Nauta & Spooner (*Mycologist* 13: 146, 1999; keys Br. gen.), Spooner & Nauta (*Mycologist* 13: 98, 1999; keys Br. gen.), Stewart *et al.* (*MR* 103: 1491, 1999), Verkley (*Stud. Mycol.* 44: 180 pp., 1999), Abeln (*Mycol.* 92: 685, 2000; phylogeny of *Peziculoideae*), Abeln *et al.* (*Mycol.* 92: 685, 2000), Nauta & Spooner (*Mycologist* 14: 21, 2000; keys Br. gen.), Nauta & Spooner (*Mycologist* 14: 65, 2000; keys Br. gen.), Dyer *et al.* (*Fungal Genetics Biol.* 33: 173, 2001), Jong *et al.* (*MR* 105: 658, 2001), Verkley *et al.* (*MR* 107: 689, 2003), Cunningham (*Australas. Pl. Path.* 33: 453, 2004), Pärtel & Raitviir (*Mycol. Progr.* 4: 149, 2005), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006).
- Dermatella** P. Karst. (1871) = *Pezicula* Tul. & C. Tul. fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932), Verkley (*Stud. Mycol.* 44, 1999).
- Dermateopsis** Nannf. (1932), Helotiales. 1, widespread (temperate). See Gamundí (*Fl. criptog. Tierra del Fuego* 10, 1987).
- Dermatina** (Almq.) Zahlbr. (1922) = *Arthonia*. See *Mycoporum*. fide Harris (*Mich. Bot.* 12: 3, 1973).
- Dermatina** (Sacc.) Höhn. (1909) = *Pezicula* Tul. & C. Tul. fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).
- Dermatiscum** Nyl. (1867), Caliciaceae (L). 3, S. Africa; N. America. See Brusse (*Mycotaxon* 25: 161, 1986), Nordin (*Symb. bot. upsal.* 32 no. 1: 195, 1997; ultrastr.), Scheidegger *et al.* (*Lichenologist* 33: 25, 2001; phylogeny), Helms *et al.* (*Mycol.* 95: 1078, 2003; phylogeny), Lendemer (*Bryologist* 106: 311, 2003).
- dermatitis verrucosa**, see chromomycosis.
- Dermatocarpaceae** Stizenb. (1862) = Verrucariaceae.
- Dermatocarpella** H. Harada (1993) = *Placidium* fide Breuss (*Annl. naturh. Mus. Wien* Ser. B, Bot. Zool. 98: 35, 1996).
- Dermatocarpon** Eschw. (1824), Verrucariaceae (L). 17 (esp. damp rocks), widespread. See Doppelbauer (*Nova Hedwigia* 2: 279, 1960; structure), Awasthi & Upreti (*J. Econ. Taxon. Bot.* 7: 7, 1985; key 4 spp. India), Janex-Favre & Wagner (*BSMF* 102: 161, 1986; pycnidia), Harada (*Nat. Hist. Res.* 2: 113, 1993; gen. concept), Breuss (*Öst. Z. Pilzk.* 4: 137, 1995; section *Polyrhizion*), Heidmarsson (*Bryologist* 99: 315, 1996; pruina), Heidmarsson (*Ann. bot. fenn.* 35: 59, 1998; Scandinavia), Orange (*Lichenologist* 30: 1, 1998; UK), Breuss (*Biblthca Lichenol.* 86: 99, 2003; Canada), Heidmarsson (*MR* 107: 459, 2003; phylogeny), Schmitt *et al.* (*Mycol.* 97: 362, 2005; morphology, phylogeny), Amtoft (*Bryologist* 109: 182, 2006; N America), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny), Gueidan *et al.* (*MR* 111: 1145, 2007; phylogeny), Amtoft *et al.* (*Bryologist* 111: 1, 2008; N America).
- Dermatocarpon** W. Mann (1825) = *Endocarpon* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- dermatocyst (dermatocystidium)**, see cystidium (1).
- Dermatodea** Vent. (1799) = *Nephroma* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Dermatodothella** Viégas (1944), Dothideomycetes. 1, Brazil.
- Dermatodothis** Racib. ex Theiss. & Syd. (1914), Dothideomycetes. 6, Asia; S. America. See Müller (*Sydowia* 28: 148, 1976; key).
- Dermatoidium** Stautz [not traced] nom. dub., anamorphic *Pezizomycotina*.
- Dermatomeris** Reinsch (1890) = *Mastodia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- dermatomycosis**, see mycosis.
- Dermatophilus** (Van Saceghem) M.A. Gordon (1964), Actinobacteria. q.v.
- Dermatophyte**. A fungus parasitizing keratinized tissue (hair, skin, nails) of humans and animals and causing **dermatophytosis** (pl. -es) (ringworm, tinea). These fungi, which are typically anamorphic fungi (hyphomycetes) with teleomorphs in the *Arthrodermataceae* (*Onygenales*), have frequently been treated as a special group the 'Dermatophytes' or Ringworm Fungi. Ringworm is cosmop. and dermatophytes, or non- or weakly pathogenic dermatophyte-like fungi, occur widely in soil and other keratin containing substrata such as bird's nests or horns of some mammals. There are 3 main gen. (*Epidermophyton*, *Microsporum*, *Trichophyton* distinguished by characteristic macroconidia), + c. 30 syn., c. 40 spp. (1,000 names).
- Lit.*: Sabouraud (*Les Teignes*, 1910), Bruhns & Alexander (*in* Jadassohn, *Handbuch der Haut- und Geschlechtskrankheiten* 2, 1930), Dawson (*Rev. med. vet. Mycol.* 6: 223, 1968; ringworm in animals), Emmons (*Arch. Derm. Syph., Chicago* 30: 337, 1934), Georg (*Animal ringworm in public health*, 1959 [US Dep. Health, Educ., & Welfare]), Gotz (*Die Pilzkrankheiten der Haut durch Dermatophyten*, 1962 [= *Jadassohn Handb., Ergänzungwerk* 4 (3)]), Hironaga (*Jap. J. med. mycol.* 24: 283, 1983, anamorph-teleomorph connexions), Kushwaha & Guarro (Eds) (*Biology of dermatophytes and other keratinophilic fungi*, 174 pp., 2000), Stockdale (*Biol. Rev.* 28: 84, 1952; nutrition). See also Lewis *et al.* (1958), Conant *et al.* (1971) under Medical and veterinary mycology; griseofulvin; Wood's light.
- dermatophytid**, a pustular allergic eruption (**id-reaction**) of the skin at a distance from a primary infection by a dermatophyte.
- Dermatosoraceae** Vánky (2001) = Anthracoideaceae.
- Dermatosorus** Sawada ex L. Ling (1949), Anthracoideaceae. 6 (on *Cyperaceae*), Africa; Asia; Australia; S. America. See Langdon (*TBMS* 68: 447, 1977), Vánky (*TBMS* 89: 61, 1987), Vánky (*Mycotaxon* 54:

- 215, 1995; key), Vánky & Shivas (*Fungal Diversity* 14: 243, 2003; Australia).
- Dermea** Fr. (1825), Dermateaceae. Anamorphs *Foveostroma*, *Micropera*, *Gelatinosporium*, *Corniculariella*. 22, widespread (esp. temperate). See Groves (*Mycol.* 38: 351, 1946), Funk (*CJB* 54: 2852, 1976), Verkley (*Stud. Mycol.* 44: 125, 1999), Abeln (*Mycol.* 92: 685, 2000; phylogeny), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006; phylogeny), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Derminus** (Fr.) Staude (1857) nom. rej. = *Pholiota* fide Donk (*Bull. Jard. Bot. Buitenzorg Sér. 3* 18: 271, 1949).
- dermis** (of lichens), the limiting layer of a thallus (obso.).
- Dermiscellum** Hafellner, H. Mayrhofer & Poelt (1979), Physciaceae (L.). 1, N. America. See Hafellner *et al.* (*Herzogia* 5: 55, 1979), Nordin & Mattsson (*Lichenologist* 33: 3, 2001; morphology, phylogeny), Scheidegger *et al.* (*Lichenologist* 33: 25, 2001; evolution), Helms *et al.* (*Mycol.* 95: 1078, 2003; phylogeny), Lendemer (*Bryologist* 106: 311, 2003; nomencl.).
- Dermocybe** (Fr.) Wünsche (1877) = *Cortinarius* fide Kuyper (*in litt.*; a monophyletic taxon, recognition of which as a genus makes *Cortinarius* non-monophyletic).
- Dermoloma** J.E. Lange ex Herink (1959), Tricholomataceae. c. 15, widespread. See Svrček (*Česká Mykol.* 20: 256, 1966; key), Arnolds (*Persoonia* 14: 519, 1992), Arnolds (*Persoonia* 17: 665, 2002; *Dermoloma magicum*).
- Dermolomataceae** Bon (1979) nom. rej. = Tricholomataceae.
- Dermomycoides** Granata (1919), ? Chytridiales. 2, Europe.
- Dermosporium** Link (1815) = *Aegerita* fide Saccardo (*Syll. fung.* 4: 644, 1886).
- Descalsia** A. Roldán & Honrubia (1989), anamorphic *Pezizomycotina*, Hso.1bH.10. 1 (aquatic), Spain. See Roldán & Honrubia (*MR* 92: 494, 1989).
- Descematia** Nieuwl. (1916) = *Sphaerocephalum*.
- descending** (descendant) (of an annulus), having the free edge below the attached (cf. ascending).
- Descolea** Singer (1950), Cortinariaceae. c. 15, widespread. See Horak (*Persoonia* 6: 231, 1971; key), Lago *et al.* (*Mycotaxon* 78: 37, 2001; *Descolea-Setchelliogaster-Descomyces* complex), Peintner *et al.* (*Am. J. Bot.* 88: 2168, 2001; phylogeny).
- Descomyces** Bougher & Castellano (1993), Cortinariaceae. 5, Australasia. Now widespread having spread with *Eucalyptus*. *Descomyces* is not yet conserved against *Hymenangium*. See Francis & Bougher (*Australasian Mycologist* 21: 81, 2002).
- Describing, naming and publishing**, see Hawksworth (*Mycologist's handbook*: 48, 1974), Classification, Nomenclature, Species, Systematics.
- Desertella** Mouch. (1979), anamorphic *Pezizomycotina*, Hso.0eH.10. 1 (from soil), Egypt. See Mouchaca (*Revue Mycol. Paris* 43: 71, 1979).
- Desetangsia** Nieuwl. (1916) = *Sphaerotheca* Lév.
- Deshpandiella** Kamat & Ullasa (1973), Phyllochoraceae. Anamorph *Mycohypallage*. 1 (biotrophic on leaves), India. See Hawksworth (*SA* 5: 128, 1986).
- Deslandesia** Bat. (1962) nom. inval. = *Limacinula* Höhn. fide Reynolds (*Bull. Torrey bot. Club* 98: 157, 1971).
- Desmaturus** (Schltdl.) Kalchbr. (1880) = *Lysurus* fide Dring (*Kew Bull.* 35: 1, 1980).
- Desmazierella** Crié (1878) nom. dub., anamorphic *Pezizomycotina*.
- Desmazierella** Lib. (1829), Chorioactidaceae. Anamorph *Verticicladium*. 2 (on conifer needles), Europe. See Benkert (*Gleditschia* 19: 173, 1991), Landvik *et al.* (*Nordic Jl Bot.* 17: 403, 1997; phylogeny), Meléndez-Howell *et al.* (*Mycotaxon* 68: 53, 1998; ultrastr.), Harrington *et al.* (*Mycol.* 91: 41, 1999; phylogeny), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Pfister *et al.* (*MR* 112: 513, 2008).
- Desmazières** (Jean Baptiste Henri Joseph; 1787-1862; France). A merchant of Lille, the 'possesseur d'une belle fortune', and amateur mycologist. *Publs.* The exsiccatum series *Plantes Cryptogames du Nord de la France* (1825-1860), and his papers relating to these collections in *Annales de Science Naturelles* Paris and *Mémoires de la Société Scientifique de Lille. Biogs, obits etc.* Anon. (*Bulletin de la Société Royale de Botanique de Belgique* 1: 102, 1862); Grummann (1974: 274); Stafleu & Cowan (*TL-2* 1: 630, 1976).
- Desmazieria** Mont. (1852) [non *Desmazieria* Dumort. 1822, *Poaceae*] = *Niebla*.
- Desmella** Syd. & P. Syd. (1919), Pucciniales. 3 (on *Pteridophyta*), America (tropical); Hawaii, Australia. See Cummins (*Annls mycol.* 38: 335, 1940), Thirumalachar & Cummins (*Mycol.* 40: 417, 1948), Hennen & Ono (*Mycol.* 70: 569, 1978), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003; placed in *Uropyxidaceae*).
- Desmellopsis** J.M. Yen (1969), Pucciniales. 1 (on *Aframomum* (*Zingiberaceae*)), Gabon. See Yen (*Rev. mycol.* 34: 20, 1969), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983; syn. of *Puccinia*).
- Desmidiospora** Thaxt. (1891), anamorphic *Pezizomycotina*, Hso.0bP.1. 2, N. America. See Clark & Prusso (*Mycol.* 78: 865, 1986; on ants), Evans (*Trichomycetes and Other Fungal Groups* Robert W. Lichwardt Commemoration Volume: 119, 2001; review).
- Desmopatella** Höhn. (1924) = *Phacidiella* P. Karst. fide Sutton (*Mycol. Pap.* 141, 1977).
- Desmosorus** Ritschel, Oberw. & Berndt (2005), Pucciniales. 1 (on *Cattleya* (*Orchidaceae*)), America (tropical); elsewhere on cultivated orchids. See Ritschel *et al.* (*Mycol. Progr.* 4: 333, 2005).
- Desmotascus** F. Stevens (1919) = *Botryosphaeria* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Desmotelium** Syd. (1937) = *Chaconia* fide Laundon (*Mycotaxon* 3: 132, 1975).
- Desmotrichum** Lév. (1843) = *Gonatobotrys* fide Saccardo (*Syll. fung.* 4: 169, 1886).
- Desportesia** I.V. Issi & Voronin (1986), Microsporidia. 1.
- destroying angel**, the pure white agaric, *Amanita virosa*, ingestion of 1 mg of which can prove fatal; toxins are cyclic polypeptides, esp. amanitins.
- Destuntzia** Fogel & Trappe (1985), Gomphaceae. 5, N. America. See Fogel & Trappe (*Mycol.* 77: 732, 1985; key), Albee-Scott (*MR* 111: 1030, 2007; phylogeny).
- determinate** (1) clearly marked; definite; (2) (of conidiophores), growth ceasing with the production of terminal conidia.
- detersile** (of villosity), removable so that the surface becomes bare.

- Detonia** Sacc. (1889) = *Plicaria* fide Korf (*Mycol.* 52: 648, 1960), Moravec (*Mycotaxon* 30: 473, 1987).
- Detonina** Kuntze (1891) ≡ *Apiospora*.
- detoxification**, the conversion of a toxin (e.g. an inhibitory phytoalexin) to non-toxic (non-inhibitory) products.
- deuteroconidium** (of dermatophytes), a spore-like cell, the outcome of the division of a hemispore (protococonidium).
- deuterogamy**, the condition in which other processes replace fusion of gametes, as in some fungi, the macroalgae, and phanerogams; secondary pairing.
- Deuterolichenes** (obsol.). Introduced by Mameli-Calvino (*Nuovo G. bot. ital.* n.s. 27: 379, 1930) for *Pyrenotrichum* (q.v.). Also later used for sterile leprose and filamentous lichens as well as lichenized anamorphic fungi.
- Deuteromycotina**, see Anamorphic fungi, Kendrick (*Sydowia* 41: 6, 1989; abandonment of term).
- Deuterophoma** Petri (1929) = *Phoma* Sacc. fide Kanciveli & Ghikascvili (*Lav. Ist. prot. piante Georgia* 5: 1, 1948), Sutton (*Mycol. Pap.* 141, 1977).
- devalidated** (of names), names which would have been validly published under the *Code* except for the operation of Art. 13 (see Nomenclature). Such names may be 'revalidated' or 'taken up' by post-starting point authors. Formerly widely used in mycology prior to changes made in this Art. in 1983.
- devil's cigar**, *Urnula geaster* (see Seaver, *Mycol.* 29: 60, 1937); - **snuffboxes**, puffballs.
- Devriesia** Seifert & N.L. Nick. (2004), anamorphic *Teratosphaeriaceae*. 5, widespread (temperate). See Seifert *et al.* (*CJB* 82: 919, 2004), Crous *et al.* (*Stud. Mycol.* 58: 1, 2007).
- Dexhowardia** J.J. Taylor (1970), anamorphic *Pezizomycotina*, Hso.0eH.6. 1, USA. See Taylor (*Mycopathologia* 40: 306, 1970).
- Dexteria** F. Stevens (1917) = *Hyalosphaera* fide Rossman (*Mycol. Pap.* 157, 1987).
- Dextrinocystidium** Sheng H. Wu (1996), ? *Stereaceae*. 2, New Zealand; Ivory Coast. See Wu (*Mycol.* 87: 888, 1995).
- Dextrinocystis** Gilb. & M. Blackw. (1988), ? *Hydnodontaceae*. 1, USA. See Gilbertson & Blackwell (*Mycotaxon* 33: 376, 1988).
- Dextrinodontia** Hjortstam & Ryvar den (1980), ? *Hydnodontaceae*. 1, Tanzania. See Larsson (*in litt.*), Hjortstam & Ryvar den (*Mycotaxon* 12: 172, 1980) = *Trechispora* (Sistotremat.) fide.
- dextrinoid** (of spores, etc.), stained yellowish-brown or reddish-brown by Melzer's iodine (see Iodine); pseudoamyloid (Singer); cf. amyloid.
- Dextrinosporium** Bondartsev (1972) nom. dub. ? = *Perenniporia* fide Ryvar den (*Syn. Fung.* 5, 1991).
- dhose**, a Malaysian fermented food produced by means of yeasts and peas.
- Diabole** Arthur (1922), *Raveneliaceae*. 1 (on *Mimosa* (0, III) (*Leguminosae*)), C. America; West Indies; Mexico; Brazil.
- Diabolidium** Berndt (1995), *Raveneliaceae*. 1 (on *Calliandra* (*Leguminosae*)), S. America. See Berndt (*Mycotaxon* 54: 263, 1995), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003; syn. of *Allotelium*).
- Diaboliumbilicus** I. Hino & Katum. (1955), *Pezizomycotina*. 1, Japan. See Hino & Katumoto (*Bulletin of the Faculty of Agriculture, Yamaguchi University* 6: 40, 1955).
- Diacanthodes** Singer (1945), *Meruliaceae*. Anamorph *Bornetina*. 1, widespread. (+ mealy bugs) causes phthiriosis (root disease) of coffee. See Tomaszewski *et al.* (*Int. J. Syst. Evol. Microbiol.* 53: 1204, 2003).
- Diachanthodaceae** Jülich (1982) = *Meripilaceae*.
- Diachora** Müll. Arg. (1893), *Phyllachoraceae*. Anamorph *Diachorella*. 5 (on *Leguminosae*), widespread (temperate). See Müller (*Trans. Bot. Soc. Edinb., Suppl.*: 69, 1986; key), Cannon (*Mycol. Pap.* 163, 1991).
- Diachorella** Höhn. (1918), anamorphic *Diachora*, St.0fH.15. 5 (on *Leguminosae*), widespread. See Sutton (*The Coelomycetes*, 1980), Wang & Yuan (*Cryptog. bot.* 5: 360, 1995; China).
- Diacrochordon** Petr. (1955), *Pezizomycotina*. 1, Germany. See Petrak (*Sydowia* 9: 591, 1955).
- Diadema** Shoemaker & C.E. Babcock (1989), *Diademaceae*. 8 (esp. on *Poaceae*), widespread. See Shoemaker & Babcock (*CJB* 67: 1349, 1989).
- Diademaceae** Shoemaker & C.E. Babcock (1992), *Pleosporales*. 3 gen. (+ 1 syn.), 30 spp.
Lit.: Shoemaker & Babcock (*CJB* 67: 1349, 1989), Shoemaker & Babcock (*CJB* 70: 1617, 1992), Barr (*SA* 12: 27, 1993), Ahn & Shearer (*CJB* 76: 258, 1998), Dong *et al.* (*MR* 102: 151, 1998), Barreto & Torres (*Australas. Pl. Path.* 28: 103, 1999), Simmons (*Mycotaxon* 75: 1, 2000), Pryor & Bigelow (*Mycol.* 95: 1141, 2003).
- Diademosa** Shoemaker & C.E. Babcock (1992), *Diademaceae*. 1, USA. See Shoemaker & Babcock (*CJB* 70: 1617, 1992).
- Diademospora** B.E. Söderstr. & Bååth (1979), anamorphic *Pezizomycotina*, Hso.≡ eH.1. 1 (from soil), Sweden. See Söderström & Bååth (*TBMS* 72: 340, 1979).
- diageotropism**, tendency to horizontal growth in relation to the earth surface.
- diagnosis** (1) an account, esp. the first (see Nomenclature), of the distinguishing characteristics of a taxonomic group; (2) determining a fungus or disease; **diagnostic**, characteristic; of use for identification.
- Dialaceniopsis** Bat. (1959), anamorphic *Pezizomycotina*, Cpd.1eH.15. 1, Uganda. See Batista (*An. Soc. Biol. Pernambuco* 16: 141, 1959).
- Dialacenum** Syd. (1930) = *Rhytidenglerula* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Dialhypocrea** Speg. (1919), *Hypocreaceae*. 1 (from dead branches), Brazil. See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Dialonectria** (Sacc.) Cooke (1884) = *Cosmospora* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Dialytes** Nitschke (1867) nom. nud. = *Diaporthe* fide Wehmeyer (*University of Michigan Studies, Science Series* 9: 1, 1933).
- Diamantina** A.N. Mill., Laessøe & Huhndorf (2003), ? *Xylariaceae*. 1, Brazil. See Miller *et al.* (*Sydowia* 55: 94, 2003), Huhndorf *et al.* (*Mycol.* 96: 368, 2004; phylogeny).
- Diamphora** Mart. (1821) nom. dub., ? Fungi.
- Diandromyces** Thaxt. (1918), *Laboulbeniaceae*. 1, Chile. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- Dianesea** Inácio & P.F. Cannon (2002), *Coccoideaceae*. 1, Costa Rica. See Inácio & Cannon (*Fungal Diversity* 9: 72, 2002).
- Diaphanium** Fr. (1836), anamorphic *Pezizomycotina*, Hsp.0eH.?. 2, Europe.

Diaphanopellis P.E. Crane (2005), Coleosporiaceae. 1 (on *Rhododendron* (Ericaceae)), Himalaya. See Crane (*Mycol.* 97: 539, 2005).

diaphanous, transparent or nearly so.

Diaphoromyces Thaxt. (1926), Laboulbeniaceae. 3, widespread. See Weir & Rossi (*CJB* 75: 791, 1997; NZ), Rossi & Weir (*Mycol.* 90: 282, 1998).

Diapleella Munk (1953) = *Kalmusia* fide Eriksson (*SA* 9: 8, 1990).

Diaporthaceae Höhn. ex Wehm. (1926), Diaporthales. 5 gen. (+ 30 syn.), 335 spp.

Lit.: Uecker (*Mem. N. Y. bot. Gdn* 49: 38, 1989), Zhang *et al.* (*Phytopathology* 89: 796, 1999), Mostert *et al.* (*Mycol.* 93: 146, 2001), Castlebury *et al.* (*Mycol.* 94: 1017, 2002), Says-Lesage *et al.* (*Phytopathology* 92: 308, 2002), Castlebury *et al.* (*Mycoscience* 44: 203, 2003), Myburg *et al.* (*Mycol.* 96: 990, 2004), Rekab *et al.* (*MR* 108: 393, 2004), Rossman *et al.* (*Mycoscience* 48: 135, 2007; phylogeny).

Diaporthales Nannf. (1932). Sordariomycetidae. 10 fam., 144 gen., 1196 spp. Ascomata perithecial, usually aggregated into a pseudostroma, usually long-necked. Interascal tissue absent or of thin-walled unspecialized cells, deliquescing early. Asci usually thick-walled but not fissitunicate, with a conspicuous J- refractive apical ring, detached at maturity. Ascospores varied. Anamorphs varied, coelomycetous. Saprobes and plant parasites, mainly on bark and wood, cosmop. Fams:

- (1) **Cryphonectriaceae**
- (2) **Diaporthaceae**
- (3) **Gnomoniaceae**
- (4) **Melanconidaceae**
- (5) **Melogrammataceae**
- (6) **Pseudovalsaceae**
- (7) **Schizoparmaceae**
- (8) **Sydowiellaceae**
- (9) **Togniniaceae**
- (10) **Valsaceae**

Lit.: Barr (*Mycol. Mem.* 7, 1978), Castlebury *et al.* (*Mycol.* 94: 1017, 2002), Kobayashi (*Bull. Govt For. Exp. Stn Meguro* 226, 1972; keys), Malloch (*in* Kendrick (Ed.), *The whole fungus* 1: 153, 1979; *in* Reynolds (Ed.), *Ascomycete systematics*, 1981; wide concept), Merezko & Smyk (*Flora Gribov Ukrainy, Diaportal'nye Griby*, 1991; Ukraine, keys), Müller & von Arx (1962, 1973; keys gen.), Rossman *et al.* (*Mycoscience* 48: 135, 2007), Smyk *et al.* (*Ukr. bot. Zh.* 46: 46, 1989; SEM), Wehmeyer (*The genus Diaporthe*, 1933; *Univ. Michigan Stud. sci. ser.* 14, 1942), Zhang & Blackwell (*Mycol.* 93: 355, 2001; molecular phylogeny).

Diaporthe Nitschke (1870), Diaporthaceae. Anamorph *Phomopsis*. 92, widespread (esp. north temperate). Some are parasites, at least in the *Phomopsis* state, e.g. *D. phaseolorum* var. *batatatis* (storage rot of sweet potato, *Ipomoea*), *D. citri* (*Phomopsis* stem-end rot of citrus fruits), *D. perniciosa* (a connexion with die-back of fruit trees), *D. phaseolorum* (pod blight of lima bean, *Phaseolus lunatus*), *D. woodii* (lupinosis of sheep). See Wehmeyer (*The genus Diaporthe*, 1933; revision), Uecker (*Mem. N. Y. bot. Gdn* 49: 38, 1989; ontogeny), Williamson *et al.* (*MR* 98: 1364, 1994; toxins), Linders & Van de Aa (*MR* 99: 1409, 1995; mating types), Zhang *et al.* (*Pl. Dis.* 81: 1143, 1997; PCR detection), Phillips (*Mycol.* 91: 1001, 1999; on *Vitis*), Scheper (*MR* 104: 226, 2000;

on *Vitis*), Mostert *et al.* (*Mycol.* 93: 146, 2001; on *Vitis*), Castlebury *et al.* (*Mycol.* 94: 1017, 2002; phylogeny), Moleleki *et al.* (*Eur. J. Pl. Path.* 108: 909, 2002; S Africa), Says-Lesage *et al.* (*Phytopathology* 92: 308, 2002; on *Helianthus*), Castlebury *et al.* (*Mycoscience* 44: 203, 2003; phylogeny, generic limits), Pecchia *et al.* (*Mycopathologia* 157: 317, 2004; on *Helianthus*), Rekab *et al.* (*MR* 108: 393, 2004; phylogeny, on *Helianthus*), Vergara *et al.* (*Mycopathologia* 158: 123, 2004; on *Helianthus*), Niekerk *et al.* (*Australas. Pl. Path.* 34: 27, 2005; on *Vitis*), Janse van Rensburg *et al.* (*Stud. Mycol.* 55: 65, 2006; on *Aspalathus*), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).

Diaporthella Petr. (1924), ? Valsaceae. 3, Europe; N. America. See Barr (*Mycol. Mem.* 7, 1978).

diaporthin, a wilt toxin from *Endothia parasitica* (Boller *et al.*, *Helv. chim. Acta* 40: 875, 1957); antibacterial.

Diaporthopsis Fabre (1883) = *Diaporthe* fide Castlebury *et al.* (*Mycoscience* 44: 203, 2003).

Diarimella B. Sutton (1980), anamorphic *Pezizomycotina*, St.0eH.15. 1, India. See Sutton (*The Coelomycetes*: 452, 1980), Vujanovic *et al.* (*CJB* 76: 2037, 1998).

Diarthonis Clem. (1909) = *Arthonia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

diaspore (1) any unit of dissemination, e.g. a spore, fragment of mycelium, sclerotium (Sernander, 1927); (2) (of lichens), particularly applied to vegetative propagules. See hormocyst, isidium, soredium, etc. (Fig. 22).

Diathrypton Syd. (1922) = *Schiffnerula* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).

Diatractium Syd. & P. Syd. (1921), Diaporthales. 2 (biotrophic on leaves), C. & S. America. See Cannon (*SA* 7: 23, 1988; possible rel. with *Phyllachoraceae*), Cannon (*MR* 92: 327, 1989).

Diatrypaceae Nitschke (1869), Xylariales. 13 gen. (+ 20 syn.), 229 spp.

Lit.: Schrantz (*BSMF* 76: 305, 1961; 27 gen., keys), Glawe & Rogers (*Mycotaxon* 20: 401, 1984; Pacific NW, keys), Vasil'eva (*Mikol. Fitopatol.* 19: 3, 1985; gen. relationships), Chlebicki (*TBMS* 86: 441, 1986), Glawe & Rogers (*CJB* 64: 1493, 1986), Rappaz (*Mycol. Helv.* 2: 285, 1987; monogr., keys), Chacón & Medel (*Revta Mex. Micol.* 4: 323, 1988), Eriksson & Hawksworth (*SA* 7: 67, 1988; status), Dargan & Bhatia (*Nova Hedwigia* 48: 405, 1989), Glawe (*Sydowia* 41: 122, 1989; anamorphs), Ju *et al.* (*Mycotaxon* 41: 311, 1991), Carmarán & Romero (*Boln Soc. argent. Bot.* 28: 139, 1992; gen. concepts), Rogers *in* Hawksworth (Ed.) (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. 269 269: 321, 1994), DeScenzo *et al.* (*Phytopathology* 89: 884, 1999), Peros *et al.* (*MR* 103: 1385, 1999), Acero *et al.* (*Mycol.* 96: 249, 2004), Trouillas & Gubler (*MR* 108: 1195, 2004), Lardner *et al.* (*MR* 109: 799, 2005), Carmarán *et al.* (*Fungal Diversity* 23: 67, 2006).

Diatrypales Chadeff. ex D. Hawksw. & O.E. Erikss. (1986) = Xylariales.

Diatrype Fr. (1849), Diatrypaceae. Anamorphs *Libertella*, *Cytosporina*. 59, widespread. See Janex-Favre (*Revue Mycol. Paris* 42: 265, 1978; spore formation), Glawe & Rogers (*Mycotaxon* 20: 401, 1984), Patil & Patil (*Indian J. Mycol. Pl. Path.* 13: 134, 1985; 22 spp. India), Rappaz (*Mycol. Helv.* 2:

- 285, 1987; key), Rappaz (*Mycotaxon* 30: 209, 1987; *D. stigma* group), Romero & Minter (*TBMS* 90: 457, 1988; asci), Dargan & Bhatia (*Nova Hedwigia* 48: 405, 1989; key 11 spp. Himalayas), Chacón (*Docums Mycol.* 32 nos 127-128: 95, 2003; Mexico), Acero *et al.* (*Mycol.* 96: 249, 2004; phylogeny), Vasilyeva & Stephenson (*Fungal Diversity* 17: 191, 2004; USA), Chlebicki (*Czech Mycol.* 57: 117, 2005; Czech Republic), Carmarán *et al.* (*Fungal Diversity* 23: 67, 2006), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Diatrypella** (Ces. & De Not.) De Not. (1863), Diatrypaceae. Anamorph *Libertella*. 33, widespread. See Croxall (*TBMS* 33: 45, 1950), Glawe & Rogers (*Mycotaxon* 20: 401, 1984), Glawe (*Mem. N. Y. bot. Gdn* 49: 51, 1989; anamorph), Prášil (*Česká Mykol.* 45: 37, 1991; stroma), Chacón (*Docums Mycol.* 32 nos 127-128: 95, 2003; Mexico), Acero *et al.* (*Mycol.* 96: 249, 2004; phylogeny, polyphyly), Vasilyeva & Stephenson (*Fungal Diversity* 19: 189, 2005; USA).
- Diatrypeopsis** Speg. (1884) = *Camillea* fide Læssøe *et al.* (*MR* 93: 121, 1989), Læssøe (*SA* 13: 43, 1994; ? synonym of *Xylaria*).
- Diatrypoidiella** Manoharachary, Kunwar & Agarwal (2005) ? = *Jattaea* fide Manoharachary *et al.* (*Indian Phytopath.* 58: 205, 2005).
- Dibaeis** Clem. (1909), Icmadophilaceae (L). 13, widespread (tropical). See Gierl & Kalb (*Herzogia* 9: 593, 1993), Platt & Spatafora (*Lichenologist* 31: 409, 1999; phylogeny), Stenroos *et al.* (*Mycol. Progr.* 1: 267, 2002; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Wang *et al.* (*Mol. Phylog. Evol.* 41: 295, 2006; phylogeny).
- Dibeloniella** Nannf. (1932), Dermateaceae. Anamorph *Phialophora*-like. 1, Europe. See Nauta & Spooner (*Mycologist* 14: 21, 2000; UK).
- Dibelonis** Clem. (1909) = *Leptotrochila* fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).
- Dibelonis** Clem. & Shear (1931) = *Leptotrochila* fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).
- Diblastia** Trevis. (1857) = *Xanthoria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Diblastospermella** Speg. (1918) = *Cicinnobella* fide Petrak (*Sydowia* 5: 328, 1951), Sutton (*Mycol. Pap.* 141, 1977).
- Diblepharis** Lagerh. (1900) = *Monoblepharis* fide Fitzpatrick (*The lower fungi. Phycomycetes*, 1930).
- Dibotryon** Theiss. & Syd. (1915), Venturiaceae. Anamorph *Fusicladium*. 1, N. America. *D. morbosum* (syn. *Apiosporina morbosa*; black knot of *Prunus*). See Barr (*Prodr. Cl. Loculoasc.*, 1987), Barr (*Sydowia* 41: 25, 1989), Fernando *et al.* (*Can. J. Pl. Path.* 27: 364, 2005; diagnosis), Zhang *et al.* (*Phytopathology* 95: 859, 2005; population biology), Zhang *et al.* (*Pl. Dis.* 89: 815, 2005; detection), Winton *et al.* (*Mycol.* 99: 240, 2007; phylogeny).
- Dicaeoma** Gray (1821) = *Puccinia* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- Dicantharellaceae** Jülich (1982) = Lachnocladiaceae.
- Dicarpella** Syd. & P. Syd. (1921), ? Melanconidaceae. Anamorph *Tubakia*. 4, N. America. See Reid & Dowsett (*CJB* 68: 398, 1990), Barr (*Mycotaxon* 41: 287, 1991), Belisario (*Mycotaxon* 41: 147, 1991).
- Dicarphus** Raf. (1808) nom. nud. ? = *Hydnum* fide Donk (*Taxon* 5: 75, 1956).
- Dicaryomycota** Raf. (1808) nom. nud. ? = *Hydnum* fide Donk (*Taxon* 5: 75, 1956).
- dicaryon**, see dikaryon.
- Dicellaeporisporites** Kalgutkar (1997), Fossil Fungi. 2, Canada; Australia. See Kalgutkar (*Review of Palaeobotany and Palynology* 97: 210, 1997).
- Dicellaesporites** Elsik (1968), Fossil Fungi. 22 (Tertiary), widespread.
- Dicellispora** Sawada (1944), anamorphic *Pezizomycotina*, Hso.0eP.73. 1, Taiwan.
- Dicellomyces** L.S. Olive (1945), Brachybasidiaceae. 3 (on *Poaceae*, *Scirpus* and *Calamus*), Europe; India; N. America. See Parmasto (*Consp. System. Corticiac.*, 1968), McNabb & Talbot in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 317, 1973), Reid (*TBMS* 66: 537, 1976), Berndt & Sharma (*MR* 102: 1484, 1998; key).
- Dicellomycetaceae** Parmasto (1968) = Brachybasidiaceae.
- Dicephalospora** Spooner (1987), Rutstroemiaceae. 4, widespread. See Spooner (*Biblthca Mycol.* 116, 1987), Zhuang (*Fungal Diversity* 3: 187, 1999; spp. trop. China), Verkley (*Sydowia* 56: 343, 2004).
- Dichaena** Fr. (1849) = *Polymorphum* fide Hawksworth & Punithalingam (*TBMS* 60: 501, 1973).
- Dichaenaceae** Fr. (1849) = Ascodichaenaceae.
- Dichaenopsella** Petr. (1952) ? = *Polymorphum* fide Sutton (*Mycol. Pap.* 141, 1977).
- Dichaenopsis** Paoli (1905) = *Stagonospora* fide Butin (*Phytopath. Z.* 100: 186, 1981).
- Dichaetis** Clem. (1931) = *Wentomyces*.
- Dichantharellus** Corner (1966), Lachnocladiaceae. 2, Malaysia. See Corner (*Monogr. Cantharelloid Fungi*: 99, 1966).
- Dicheirinia** Arthur (1907), Raveneliaceae. 12 (on *Leguminosae*), America (tropical); Mauritius; New Caledonia; Canary Islands; Madeira. See Cummins (*Mycol.* 27: 151, 1935), Cummins (*Bull. Torrey bot. Club* 64: 39, 1937), Walker *et al.* (*Australas. Pl. Pathol.* 35: 1, 2006).
- Dichelostroma** Bat. & Peres (1963), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, USA. See Batista & Peres (*Publções Inst. Micol. Recife* 395: 5, 1963).
- Dichitonium** Berk. & M.A. Curtis (1875) ? = *Dendrodochium*. See also *Oichitonium*. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Dichlaena** Durieu & Mont. (1849), Trichocomaceae. Anamorph *Aspergillus*. 1, N. Africa.
- Dichlamys** Syd. & P. Syd. (1920) = *Uromyces* fide Thirumalachar (*Sydowia* 5: 23, 1951).
- Dichobotrys** Hennebert (1973), anamorphic *Trichophaea*, Hso.0eH.7. 4, widespread. See Hennebert (*Persoonia* 7: 193, 1973), Kendrick (*CJB* 81: 75, 2003; morphogenesis).
- Dichochaete** Parmasto (2001), Hymenochaetaceae. 2, widespread. See Parmasto (*Folia cryptog. Estonica* 37: 56, 2000).
- Dichocladosporium** K. Schub., U. Braun & Crous (2007) = *Graphiopsis* Trail fide Schubert *et al.* (*Stud. Mycol.* 58: 95, 2007), Braun *et al.* (*Mycotaxon* 103: 207, 2008).
- Dichodium** Nyl. (1888) = *Physma* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- dichohyphidium**, see hyphidium.
- Dicholobodigitus** G.P. White & Illman (1988), anamorphic *Pezizomycotina*, Hso.≡ bP.28. 1, Canada. See White & Illman (*CJB* 66: 2149, 1988).
- Dichomera** Cooke (1878), anamorphic *Botryosphaeriaceae*, St.#eP.1/19. 41, widespread. See Butin (*Sydowia* 45: 161, 1993; pleomorphy), Yuan (*Nova Hedwigia* 70: 139, 2000; on *Eucalyptus*), Gehlot &

- Purohit (*Journal of Mycology and Plant Pathology* 34: 1, 2004; ultrastr.), Barber *et al.* (*MR* 109: 1347, 2005; pleomorphy), Burgess *et al.* (*Australas. Pl. Path.* 34: 557, 2005; Australia), Crous *et al.* (*Stud. Mycol.* 55: 235, 2006; phylogeny).
- Dichomitus** D.A. Reid (1965), Polyporaceae. 7, Europe; N. America. See Reid (*Revta Biol. Lisb.* 5: 149, 1964-5), Ipulet & Ryvarden (*Syn. Fung.* 20: 87, 2005; Uganda).
- Dichomyces** Thaxt. (1893) = Peyritsiella fide Tavares (*Mycol. Mem.* 9, 1985).
- Dichonema** Blume & T. Nees (1826) = Dictyonema C. Agardh ex Kunth fide Parmasto (*Nova Hedwigia* 29: 99, 1978).
- dichophysis**, see hyphidium.
- Dichopleuropus** D.A. Reid (1965), Lachnocladiaceae. 1, Malaysia. See Reid (*Nova Hedwigia Beih.* 18: 329, 1965).
- Dichoporis** Clem. (1909) = Strigula fide Hafellner & Kalb (*Biblthca Lichenol.* 57: 161, 1995).
- Dichosporidium** Pat. (1903), Roccellaceae (L). 6, widespread (tropical). See Thor (*Op. Bot.* 103, 1990), Henssen & Thor (*Nordic Jl Bot.* 18: 95, 1998; ontogeny), Thor (*J. Jap. Bot.* 77: 47, 2002; Japan, Taiwan), Thor (*Biblthca Lichenol.* 95: 543, 2007; Malaysia).
- Dichosporium** Pat. (1899) = Dichosporidium.
- Dichostereaceae** Jülich (1982) = Lachnocladiaceae.
- Dichostereum** Pilát (1926), Lachnocladiaceae. Anamorph *Spiniger*. 11, widespread. See Boidin & Lanquetin (*Mycotaxon* 6: 277, 1977), Boidin & Lanquetin (*BSMF* 96: 381, 1980; key), Kotkova (*Mikol. Fitopatol.* 38: 40, 2004; Russia).
- Dichothrix** Theiss. (1912) [non *Dichothrix* Zanardini ex Bornet & Flahault. 1886, *Cyanobacteria*] = Schistodes.
- Dichotomella** Sacc. (1914) = Nigrospora fide Hughes (*CJB* 36: 727, 1958).
- Dichotomocladium** Benny & R.K. Benj. (1975), Syncephalastraceae. 5, widespread. See Benny & Benjamin (*Aliso* 8: 338, 1975), Benny & Benjamin (*Mycol.* 85: 660, 1993), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny).
- Dichotomomyces** Saito ex D.B. Scott (1970), Trichocomaceae. Anamorph *Polypaecilum*. 1, Japan. See Malloch (*SA* 6: 124, 1987; posn), Fort *et al.* (*Boln Soc. Micol. Madrid* 14: 61, 1990).
- Dichotomophthora** Mehrl. & Fitzp. ex P.N. Rao (1966), anamorphic *Pezizomycotina*, Hso. = eP.26. 2, widespread (esp. tropical). See de Hoog & van Oorschot (*Proc. K. ned. Akad. Wet. Ser. C, Biol. Med. Sci.* 86: 55, 1983), Hosoe *et al.* (*Phytochem.* 29: 997, 1990; anthraquinone derivative from *D. lutea*), Eken (*Mycotaxon* 87: 153, 2003; Turkey), Kendrick (*CJB* 81: 75, 2003; morphogenesis).
- Dichotomophthoropsis** M.B. Ellis (1971), anamorphic *Pezizomycotina*, Hso.0 = hP.26. 2, India; USA. See Ellis (*Mycol. Pap.* 125: 20, 1971), Rasheed *et al.* (*Mycol.* 82: 390, 1990; India).
- dichotomous**, branching, frequently successively, into two more or less equal arms.
- Dictadium** Ces. (1852) = Colletotrichum fide Sutton (*CJB* 44: 887, 1966).
- Dictasmia** Trevis. (1869) = Sticta fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- diclinous**, having the oogonium and its antheridium on different hyphae. Cf. androgynous.
- Diclomyces** Thaxt. (1931), Laboulbeniaceae. 3, pantropical. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- Dicoccum** Corda (1829) nom. ambig., anamorphic *Pezizomycotina*. See Hughes & Pirozynski (*CJB* 50: 2521, 1972).
- Dicollema** Clem. (1909) = Collema F.H. Wigg. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Dicrandromyces** Thaxt. (1931) = Tetrandromyces fide Tavares (*Mycol. Mem.* 9, 1985).
- Dicranidion** Harkn. (1885), anamorphic *Orbilina*, Hsp.1bH.10. 3, America. See Peek & Solheim (*Mycol.* 50: 844, 1958), Pfister (*Mycol.* 89: 1, 1997; review), Kendrick (*CJB* 81: 75, 2003; morphogenesis).
- Dicranocladium** Sousa da Câmara (1931) nom. provis., anamorphic *Pezizomycotina*.
- Dicranophora** J. Schröt. (1886), ? Mucoraceae. 1 (on decaying agarics), widespread (north temperate). See Vuillemin (*Annls mycol.* 5: 33, 1907), Dobbs (*TBMS* 21: 167, 1938), Volgmayr & Krisai-Greilhuber (*MR* 100: 583, 1996; development, ultrastr.), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny).
- Dicranophoraceae** J.H. Mirza (1979) = Mucoraceae. *Lit.*: Kirk (*in litt.*).
- Dicranotropis** Breddin [not traced] nom. dub., Fungi. ? Based on fungi on an insect.
- Dictericidium** Raf. (1815) nom. dub., Fungi. No spp. included.
- dictydine granules**, see plasmodic granules.
- Dictyoarthrinium** S. Hughes (1952), anamorphic *Pezizomycotina*, Hso.#eP.37. 2 or 4, widespread (tropical). See Hughes (*Mycol. Pap.* 48: 29, 1952), Mena Portales *et al.* (*Revta Iberoamer. Micol.* 12: 31, 1995; Cuba), Somrithipol (*Mycol.* 99: 792, 2007; key).
- Dictyoarthrinopsis** Bat. & Cif. (1958), anamorphic *Pezizomycotina*, Hso.#eH.?. 1, Costa Rica. See Batista & Ciferri (*Atti Ist. bot. Univ. Lab. crittog. Pavia sér. 5* 15: 57, 1958).
- Dictyoasterina** Hansf. (1947), Microthyriaceae. 1, Africa. See Hughes *in* Sugiyama (Ed.) (*Pleomorphic Fungi: The Diversity and its Taxonomic Implications*: 103, 1987).
- Dictyobole** G.F. Atk. & Long (1902) = Lysurus fide Dring (*Kew Bull.* 35: 1, 1980).
- Dictyocatenulata** Finley & E.F. Morris (1967), anamorphic *Pezizomycotina*, Hsy.#eH.23. 1, widespread. See Seifert *et al.* (*Mycol.* 79: 459, 1987; gen. re-descr.).
- Dictyocephala** A.G. Medeiros (1962) = Pantospora fide Deighton (*Mycol. Pap.* 140, 1976).
- Dictyocephalos** Underw. ex V.S. White (1901), Phelloriniaceae. 1, widespread. See Long & Plunkett (*Mycol.* 32: 696, 1940), Dios *et al.* (*Mycotaxon* 84: 265, 2002), Fan & Liu (*Mycosystema* 23: 306, 2004; China), Sarasini (*Gasteromiceti Epigei*: 406 pp., 2005).
- Dictyochaeta** Speg. (1923), anamorphic *Chaetosphaeria*, *Ascocodinaea*, Hso/Hsy.0eH/1eH.16. c. 65, widespread. See Hughes & Kendrick (*N.Z. Jl Bot.* 6: 331, 1968), Gamundi *et al.* (*Darwiniana* 21: 95, 1977), Kuthubutheen & Nawawi (*MR* 95: 1211, 1991; Malaysian spp.), Kuthubutheen & Nawawi (*MR* 95: 1220, 1991; Malaysian spp.), Kuthubutheen & Nawawi (*MR* 95: 1224, 1991; key 59 spp.), Réblová *et al.* (*Sydowia* 51: 49, 1999; teleomorph), Whitton *et al.* (*Fungal Diversity* 4: 133, 2000; on *Pandanaceae*), Markovskaja & Treigiene (*Botanica Lithuanica* 7: 93, 2001; Lithuania), Tsui *et al.* (*Cryp-*

- tog. Mycol.* 22: 139, 2001; Hong Kong), Fernández *et al.* (*Mycol.* 98: 121, 2006; phylogeny).
- Dictyochaetopsis** Aramb. & Cabello (1990), anamorphic *Chaetosphaeriaceae*, Hso.1-≡ eH.16. 12, widespread. See Arambarri & Cabello (*Mycotaxon* 38: 12, 1990), Whitton *et al.* (*Fungal Diversity* 4: 133, 2000; on *Pandanaceae*), Caldusch *et al.* (*Mycol.* 94: 1071, 2002; Brazil).
- dictyochlamydospore**, a non-deciduous multicelled chlamydospore composed of an outer wall separable from the walls of the component cells which are rather easily separated from each other, as in some *Phoma* spp. formerly ascribed to *Peyronellaea* (Luedemann, *Mycol.* 51: 778, 1961).
- Dictyochora** Theiss. & Syd. (1914) nom. dub., Fungi.
- Dictyochorella** Theiss. & Syd. (1915) nom. dub., Fungi. See von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Dictyochorina** Chardón (1932) nom. dub., *Pezizomycotina*. See Petrak (*Sydowia* 5: 343, 1951).
- Dictyocoprotus** J.C. Krug & R.S. Khan (1991), *Pyronemataceae*. 1 (coprophilous), Mexico; USA. See Krug & Khan (*Mycol.* 83: 103, 1991).
- Dictyocyclus** Sivan., W.H. Hsieh & Chi Y. Chen (1998), *Parmulariaceae* (L). 1, Taiwan. See Sivanesan *et al.* (*J. Linn. Soc. Bot.* 126: 323, 1998).
- Dictyodesmium** S. Hughes (1951), anamorphic *Pezizomycotina*, Hsp.#eP.1. 3, USA; France. See Hughes (*Mycol. Pap.* 36: 29, 1951), Zhao & Zhang (*Mycosystema* 24: 12, 2005; China).
- Dictyodochium** Sivan. (1984), anamorphic *Gibbera*, Hsp.#eP.1/10. 1, India. See Sivanesan (*TBMS* 82: 517, 1984).
- Dictyodothis** Theiss. & Syd. (1915), *Dothideaceae*. 2, America. See Eriksson (*Myconet* 5: 2969, 2000).
- Dictyographa** Darb. (1897) = *Darbshirella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Dictyographa** Müll. Arg. (1893) = *Opegrapha* Ach. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Grube (*Bryologist* 101: 377, 1998; phylogeny), Ertz & Diederich (*Lichenologist* 39: 143, 2007; synonymy).
- Dictyolaceae** Gäum. (1926) = *Tricholomataceae*. The *Dictyolaceae* have not yet been proposed as nom. rej. against *Tricholomataceae*.
- Dictyolus** Qué. (1886) = *Arrhenia* fide Kuyper (*in litt.*).
- Dictyomollisia** Rehm (1909) = *Uleomyces* fide von Arx (*Persoonia* 2: 421, 1963).
- Dictyomorpha** Mullins (1961), *Chytridiales*. 2 (on *Oomycetes*), N. America. See Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Dictyonella** Höhn. (1909), *Saccardiaceae*. 7, widespread (tropical). See von Arx (*Persoonia* 2: 421, 1963), Hsieh *et al.* (*MR* 101: 897, 1997; Taiwan), Inácio & Dianese (*MR* 102: 695, 1998; Brazil).
- Dictyonema** C. Agardh ex Kunth (1822), *Agaricomycetidae* (L). 7, widespread (esp. tropical). See Parmasto (*Nova Hedwigia* 29: 99, 1978), Chaves *et al.* (*Bryologist* 107: 242, 2004; Costa Rica).
- Dictyonema** Reinsch (1875) nom. dub., ? Fungi.
- Dictyonemataceae** Tomas. ex Tomas. (1950) = *Atheliaceae*.
- Dictyonematomyces** Cif. & Tomas. (1954) = *Dictyonema* C. Agardh ex Kunth fide Parmasto (*Nova Hedw.* 29: 108, 1972).
- Dictyonia** Syd. (1904), *Helotiaceae*. 2, widespread (tropical).
- Dictyopanus** Pat. (1900) = *Panellus* fide Burdsall & Miller (*Beih. Nova Hedwigia* 51, 1975).
- Dictyopeltella** Bat. & I.H. Lima (1959), *Micropeltidaceae*. 2, widespread (tropical). See Batista (*Publções Inst. Micol. Recife* 56, 1959).
- Dictyopeltis** Theiss. (1913), *Micropeltidaceae*. 6, pan-tropical. See Batista (*Publções Inst. Micol. Recife* 56, 1959), Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Dictyopeplos** Kuhl & Hasselt (1824) = *Phallus* fide Stalpers (*in litt.*).
- Dictyophallus** Corda (1842) = *Phallus* fide Stalpers (*in litt.*).
- Dictyophora** Desv. (1809) = *Phallus* fide Dring (*Mycol. Pap.* 98, 1964).
- Dictyophrynella** Bat. & Cavalc. (1964), anamorphic *Pezizomycotina*, Hso.≡ eP.?. 1, Brazil. See Batista & Cavalcanti (*Portugaliae Acta Biologica Série B* 7: 356, 1964).
- Dictyoploca** Mont. ex Pat. (1890) = *Gymnopus* (Pers.) Roussel fide Kuyper (*in litt.*).
- Dictyopolyschema** M.B. Ellis (1976), anamorphic *Pezizomycotina*, Hso.#eP.24. 1, British Isles. See Ellis (*More Dematiaceous Hyphomycetes*: 373, 1976).
- dictyoporospore**, a deciduous, multicelled porospore the component cells of which are firmly united and not enclosed by an outer wall, as in *Alternaria* (Luedemann, *Mycol.* 51: 778, 1961).
- Dictyoportha** Petr. (1955), *Melanconidaceae*. Anamorphs *Hendersonula*, *Coryneum*. 3, Pakistan; Taiwan. See Hsieh *et al.* (*MR* 101: 1092, 1997; Taiwan), Jaklitsch & Barr (*Öst. Z. Pilzk.* 6: 45, 1997; key).
- Dictyopus** Qué. (1886) = *Boletus* Fr. fide Singer (*Farlowia* 2: 223, 1945).
- Dictyorinis** Clem. (1909) = *Rinodina* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Dictyorostrella** U. Braun (1999), anamorphic *Pezizomycotina*. 1, Canada. See Braun (*Schlechtendalia* 3: 35, 1999).
- dictyoseptate**, having transverse and longitudinal cross walls (septa), like layers of cement between bricks; muriform.
- dictyosomes**, ± spherical vesicles associated with the edges of the membrane-bound sacs (cisternae) which constitute the golgi apparatus in *Oomycota* and other fungi as shown by electron microscopy.
- Dictyospiropes** M.B. Ellis (1976), anamorphic *Pezizomycotina*, Hso.#eP.10. 1, India. See Ellis (*More Dematiaceous Hyphomycetes*: 214, 1976).
- dictyosporangium**, a septate sporangium, as in *Dictyuchus*.
- dictyospore**, differs from an amero-spore (q.v.) by being divided by intersecting septa in more than one plane; muriform spore. See Anamorphic fungi.
- Dictyosporites** Félix (1894), *Fossil Fungi*. 2 (Paleocene), widespread.
- Dictyosporium** Corda (1836), anamorphic *Pleosporales*, Hso.0bP.1. 28, widespread. See Sutton (*Proc. Indian Acad. Sci. Pl. Sci.* 94: 229, 1985; disposition of names), Tzean & Chen (*MR* 92: 497, 1989; 2 n.spp.), Chen & Tzean (*Fungal Science Taipei* 14: 105, 1999; Taiwan), Goh *et al.* (*Fungal Diversity* 2: 65, 1999), Arambarri *et al.* (*Mycotaxon* 78: 185, 2001; Argentina), Photita *et al.* (*Mycotaxon* 82: 415, 2002; Thailand), Cai *et al.* (*Sydowia* 55: 129, 2003; Yunnan), Cai *et al.* (*Cryptog. Mycol.* 24: 3, 2003; China, definition), Kodsueb *et al.* (*Cryptog. Mycol.* 27: 111, 2006; Thailand), Tsui *et al.* (*Fungal Diver-*

- sity 21: 157, 2006; phylogeny), Cai *et al.* (*Persoonia* 20: 53, 2008; phylogeny).
- Dictyostomiopelta** Viégas (1944), Micropeltidaceae. 1, Brazil.
- Dictyothyriella** Rehm (1914) = *Micropeltis* fide Clements & Shear (*Gen. Fung.*, 1931).
- Dictyothyriella** Speg. (1924), Micropeltidaceae. 1, Cape Horn.
- Dictyothyriina** Theiss. (1913), Micropeltidaceae. 2, America.
- Dictyothyrium** Grove (1932) ? = *Mycoporum* Flot. ex Nyl. fide Sutton (*Mycol. Pap.* 141, 1977).
- Dictyothyrium** Theiss. (1912), Micropeltidaceae. c. 15, widespread (tropical).
- Dictyotopileos** Dilcher (1965), Fossil Fungi, Micropeltidaceae. 1 (Eocene), USA.
- Dictyotremella** Kobayasi (1971), Tremellaceae. 1, Papua New Guinea. See Kobayasi (*Bull. natn. Sci. Mus. Tokyo*, B 14: 481, 1971).
- Dictyotrichiella** Munk (1953) = *Capronia* fide Müller *et al.* (*TBMS* 88: 63, 1987), Janex-Favre (*Cryptog. Mycol.* 9: 133, 1988; ontogeny), Untereiner (*Mycol.* 89: 120, 1997; morphology), Untereiner & Naveau (*Mycol.* 91: 67, 1999; phylogeny).
- Dicyma** Boulanger (1897), anamorphic *Ascotricha*, Hsy.0eP.10. 11, widespread. See Hawksworth (*Mycol. Pap.* 126, 1971), von Arx (*Proc. k. ned. Akad. Wet. Ser. C, Biol. Med. Sci.* 85: 21, 1982), Udagawa & Uchiyama (*Mycotaxon* 70: 177, 1999; teleomorph), Davis *et al.* (*Am. J. Bot.* 90: 1661, 2003; endophytic taxa), Watanabe *et al.* (*Mycoscience* 44: 411, 2003; from *Basidiomycota*, Japan), Tavares *et al.* (*Fitopatol. Brasil* 29: 148, 2004; Brazil).
- Didonia** Velen. (1934), ? Helotiales. 5, Europe. Perhaps part of the *Hyaloscyphaceae*. See Svrček (*Česká Mykol.* 46: 41, 1992; status).
- Didothis** Clem. (1931) = *Uleodothis*.
- Didymaria** Corda (1842) = *Ramularia* Unger fide Hughes (*CJB* 36: 727, 1958), Braun (*Nova Hedwigia Beih.* 53: 291, 1991).
- Didymariopsis** Speg. (1910) = *Colletotrichum* fide Deighton (*TBMS* 59: 185, 1972).
- Didymascella** Maire & Sacc. (1903), ? Hemiphacidiaceae. 3 (on conifers), Europe; N. America. *D. thujina* damages *Thuja*. See Minter (*IMI Descr. Fungi Bact.*: no. 1334, 1998).
- Didymascina** Höhn. (1905) = *Didymosphaeria* fide Aptroot (*Nova Hedwigia* 60, 1995).
- Didymascus** Sacc. (1896), ? Rhytismatales. 1, Siberia. See Korf (*Mycol.* 54: 24, 1962).
- Didymaster** Bat. & H. Maia (1967) = *Strigula* fide Lücking *et al.* (*Lichenologist* 30: 121, 1998).
- Didymella** Sacc. (1880), Pleosporales. Anamorphs *Ascochyta*, *Phoma*. c. 88, widespread. *D. applanata* (raspberry spur blight), *D. citrullina* (on cucurbits), *D. lycopersici* (tomato stem and fruit rots). See Corbaz (*Phytopath. Z.* 28: 375, 1956), Holm (*Taxon* 24: 475, 1975; nomencl.), Corlett (*CJB* 59: 2016, 1981), Kaiser *et al.* (*Pl. Dis.* 81: 809, 1997), Navas-Cortés *et al.* (*Phytoparasitica* 26: 199, 1998; genetics), Silva-Hanlin & Hanlin (*MR* 103: 153, 1999; phylogeny), Liew *et al.* (*Mol. Phylogen. Evol.* 16: 392, 2000; phylogeny), Armstrong *et al.* (*Can. J. Pl. Path.* 23: 110, 2001; mating types), Somai *et al.* (*Phytopathology* 92: 997, 2002; molecular variation), Barve *et al.* (*Fungal Genetics Biol.* 39: 151, 2003; mating types), Fatehi *et al.* (*Mycopathologia* 156: 317, 2003; *A. pinodes* complex), Kothera *et al.* (*MR* 107: 297, 2003; AFLP analysis), Lindqvist-Kreuze *et al.* (*Pl. Path.* 52: 567, 2003; on *Rubus*), Boerema *et al.* (*Phoma Identification Manual* Differentiation of Specific and Infra-Specific Taxa in Culture: 470 pp., 2004), Chongo *et al.* (*Pl. Dis.* 88: 4, 2004; genetic diversity, Canada), Koch & Utkhede (*Can. J. Pl. Path.* 26: 291, 2004; molecular detection), Peever *et al.* (*Mol. Ecol.* 13: 291, 2004; population structure), Lichtenzweig *et al.* (*Eur. J. Pl. Path.* 113: 15, 2005; Israel), Aptroot (*CBS Diversity Ser.* 5, 2006), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Didymellina** Höhn. (1918) = *Mycosphaerella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975), Braun *et al.* (*Mycol. Progr.* 2: 3, 2003).
- Didymellopsis** (Sacc.) Clem. & Shear (1931), Xanthopyreniaceae. 4 (on lichens), Europe. See Grube & Hafellner (*Nova Hedwigia* 51: 283, 1990).
- Didymobotryaceae** Nann. (1934) = *Ophiocordycipitaceae*.
- Didymobotryopsis** Henn. (1902) = *Hirsutella* fide Samson & Evans (*MR* 95: 887, 1991).
- Didymobotrys** Clem. & Shear (1931) = *Didymobotryopsis*.
- Didymobotryum** Sacc. (1886), anamorphic *Pezizomycotina*, Hsy.1eP.28. 7, N. America; Asia. See Seifert (*Mem. N. Y. bot. Gdn* 59: 109, 1990; Indonesia), D'Souza & Bhat (*Mycol.* 94: 535, 2002; India).
- Didymochaeta** Sacc. & Ellis (1898), anamorphic *Pezizomycotina*, Cpd.1 = eH.15. 1, N. America.
- Didymochaetina** Bat. & J.L. Bezerra (1965), anamorphic *Pezizomycotina*, Cpd.1eH.?. 1, Jamaica. See Batista & Bezerra (*Riv. Patol. veg., Pavia Sér.* 4 1: 44, 1965).
- Didymochlamys** Henn. (1897) [non *Didymochlamys* Hook. 1872, *Rubiaceae*] = *Kuntzeomyces*.
- Didymochora** Höhn. (1918), anamorphic *Euryachora*, St.0eH.?. 1, Europe.
- Didymocladiaceae** Nann. (1934) = *Hypocreaceae*.
- Didymocladium** Sacc. (1886) = *Cladobotryum* fide Hughes (*CJB* 36: 727, 1958).
- Didymocoryne** Sacc. & Trotter (1913), Helotiales. 2, widespread (north temperate).
- Didymocrater** Mart. (1821) nom. dub., ? Fungi.
- Didymocrea** Kowalski (1965), Pleosporales. 1, India. See Kowalski (*Mycol.* 57: 404, 1965; devel.), Luttrell (*Am. J. Bot.* 62: 186, 1975; development), Aptroot (*Stud. Mycol.* 37, 1995; posn), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Kruys *et al.* (*MR* 110: 527, 2006; phylogeny).
- Didymocyrtidium** Vain. (1921), Dothideomycetes. 2, Europe.
- Didymocyrtis** Vain. (1921), Dothideomycetes. 1 (on *Caloplaca*), Finland.
- Didymolepta** Munk (1953), Leptosphaeriaceae. 2, Europe. See Eriksson & Hawksworth (*SA* 7: 68, 1988), Barr (*Mycotaxon* 43: 371, 1992).
- Didymopeltis** Bat. & I.H. Lima (1959) = *Schizothyrium* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Didymoplella** Munk (1953), Dothideomycetes. 4, Europe. See Munk (*Dansk bot. Ark.* 15: 109, 1953).
- Didymoporisoronites** Sheffy & Dilcher (1971), Fossil Fungi. 10 (Eocene, Tertiary), China; USA.
- Didymopsamma** Petr. (1925) = *Chaetosphaeria* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Didymopsis** Sacc. & Marchal (1885), anamorphic *Pezizomycotina*, Hsy.1eH.1. 5, widespread.

- Didymopsora** Dietel (1899), Pucciniosiraceae. 6 (on dicots (0, III)), S. America; Africa. See Cunningham (*Mycol.* 60: 769, 1968), Buriticá (*Rev. Acad. Colomb. Cienc.* 18: 131, 1991).
- Didymopsorella** Thirum. (1950), Uropyxidaceae. 2 (on *Toddalia* (Rutaceae)), Africa; China; India; Sri Lanka. See Thirumalachar (*Sci. Cult.* 16: 210, 1950).
- Didymopycnomycetes** Cavalc. & A.A. Silva (1972) = *Coenogonium* Ehrenb. fide Lücking *et al.* (*Lichenologist* 30: 121, 1998), Rivas Platas *et al.* (*Fungal Diversity* 23: 255, 2006).
- Didymosamarospora** T.W. Johnson & H.S. Gold (1957) nom. dub., Fungi. See Kohlmeyer & Kohlmeyer (*Marine Mycology*, 1979).
- Didymosamarosporella**, see *Didymosamarospora*.
- Didymosira** Clem. (1909) = *Pucciniosira*.
- Didymosphaerella** Cooke (1889), Montagnulaceae. See Aptroot (*Stud. Mycol.* 37, 1995), Ramaley (*Mycotaxon* 78: 435, 2001; on *Yucca*).
- Didymosphaeria** Fuckel (1870) nom. cons., Didymosphaeriaceae. Anamorphs *Fusicladiella*-like, *Phoma*-like. 23, widespread. See Kohlmeyer & Volkmann-Kohlmeyer (*MR* 94: 685, 1990; redisp. marine spp.), Hyde (*Sydowia* 46: 29, 1994), Aptroot (*Stud. Mycol.* 37, 1995; key), Aptroot (*Nova Hedwigia* 60: 325, 1995; excl. names), Hyde *et al.* (*Nova Hedwigia* 69: 449, 1999; on palms).
- Didymosphaeriaceae** Munk (1953), Pleosporales. 4 gen. (+ 6 syn.), 50 spp.
Lit.: Scheinpflug (*Ber. schweiz. bot. Ges.* 68: 325, 1958), Kohlmeyer & Volkmann-Kohlmeyer (*MR* 94: 685, 1990), Aptroot (*Nova Hedwigia* 60: 325, 1995), Aptroot (*Stud. Mycol.* 37: 160 pp., 1995), Aptroot (*Stud. Mycol.* 37, 1995), Hyde *et al.* (*Nova Hedwigia* 69: 449, 1999).
- Didymosphaerites** Fiore (1932), Fossil Fungi. 1 (Eocene), Italy.
- Didymosphaerites** Pia (1927), Fossil Fungi. 1.
- didymospore**, differs from an amerspore (q.v.) in having one transverse septum. See Anamorphic fungi.
- Didymosporiella** Traverso & Migliardi (1911) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Didymosporina** Höhn. (1916), anamorphic *Pezizomycotina*, Cac.1eP.19. 1, Europe. See Szabó (*Acta phytopath. entom. Hung.* 32: 69, 1997).
- Didymosporis** Clem. & Shear (1931) = *Didymosporiella*.
- Didymosporium** Nees (1816) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Didymosporium** Sacc. (1880) nom. illegit., anamorphic *Pezizomycotina*, Cac.0eP.?. 1, Italy. See Sutton (*Mycol. Pap.* 141, 1977).
- Didymosporonites** Sheffy & Dilcher (1971), Fossil Fungi. 4, USA.
- Didymostilbe** Bres. & Sacc. (1902) nom. dub., Fungi. See Sydow & Sydow (*Annl. mycol.* 1: 176, 1903).
- Didymostilbe** Henn. (1902), anamorphic *Peethambara*, Hsp.1eH.15. 8, Asia. See Seifert (*Stud. Mycol.* 27: 130, 1985; 6 spp. Indonesia), Rossman *et al.* (*Mycol.* 93: 100, 2001; phylogeny), Samuels *et al.* (*Tropical Mycology* 2: 13, 2002; key).
- Didymothozetia** Rangel (1915), anamorphic *Pezizomycotina*, Hsp.1 = eH.?. 1, Brazil.
- Didymothyriella** Bat. & I.H. Lima (1959) = *Plochmopeltis* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Didymotrichella** Arnaud (1954), anamorphic *Pezizomycotina*, Hso.1eP.?. 27. 1, France. See Arnaud (*BSMF* 69: 284, 1953).
- Didymotrichia** Berl. (1893) = *Neopeckia* fide von Arx & Müller (*Stud. Mycol.* 9, 1975), von Arx & Müller (*Sydowia* 37: 6, 1984).
- Didymotrichiella** Munk (1953) = *Capronia* fide Müller *et al.* (*TBMS* 88: 63, 1987).
- Didymotrichum** Bonord. (1851) = *Cladosporium* fide Hughes (*CJB* 36: 727, 1958).
- Didymotrichum** Höhn. (1914) = *Dactylaria* fide Bhatt & Kendrick (*CJB* 46, 1968).
- Didymozoophaga** Soprunov & Galiulina (1951) = *Arthrobotrys* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Diederichia** D. Hawksw. (2003), anamorphic *Dothideomycetes*. 1 (on lichens), Spain. See Etayo & Diederich (*Mycotaxon* 60: 415, 1996), Hawksworth (*Lichenologist* 35: 206, 2003).
- Diederimyces** Etayo (1995), Verrucariaceae. Anamorph *Phaeosporobolus*. 1, Spain. See Etayo (*Nova Hedwigia* 61: 190, 1995), Calatayud & Barreno (*Lichenologist* 35: 279, 2003; teleomorph-anamorph connection).
- Diedickeia** Syd. & P. Syd. (1913), anamorphic *Pezizomycotina*, Cpt.0eH.?. 3, widespread (tropical).
- Diedickella** Petr. (1922) = *Stagonospora* fide Clements & Shear (*Gen. Fung.*, 1931).
- Diehliia** Petr. (1951) ? = *Phaeangellina* fide Korf in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 249, 1973).
- Diehliomyces** Gilkey (1955), ? *Pezizales*. 1, widespread. *D. microsporus*; truffle-like fungus invading mushroom beds. See Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- diel**, a 24-hr periodicity. Cf. circadian, diurnal.
- Dielsiella** Henn. (1903) = *Cycloschizon* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Dietel** (Paul; 1860-1947; Germany). High school teacher, Leipzig. A life-long student of the *Pucciniales*, from 1887 to 1943 he published more than 150 papers on rusts. At the time, his work was generally accepted as the most authoritative on rust classification. *Publ.* Hemibasidii und Uredinales. Engler & Prantl, *Die Natürlichen Pflanzenfamilien* (1898); Unterklasse Hemibasidii (Ustilaginales und Uredinales). Engler & Prantl, *Die Natürlichen Pflanzenfamilien* (1928). *Biogs, obits etc.* Poevlele (Sydowia 4: 1, 1950) [bibliography, portrait]; Stafleu & Cowan (*TL-2* 1: 649, 1976).
- Dietelia** Henn. (1897), Pucciniosiraceae. 12 (on dicots (0, III)), America ($\pm$ tropical); Africa; Japan; Philippines; New Guinea. See Buriticá (*Rev. Acad. Colomb. Cienc.* 18: 131, 1991), Gjerum *et al.* (*Lidia* 5: 18, 2000; Uganda), Evans & Ellison (*Mycol.* 97: 935, 2005; sp. on *Mikania*), Maier *et al.* (*MR* 111: 176, 2007).
- Dievernina** M. Choisy (1931) = *Ramalina* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- differential hosts**, the special species or cultivars of host plants the reactions of which are used for determining physiologic races.
- diffluent**, breaking up in water.
- diffract** (of a pileus surface), cracked into small areas; areolate.
- Diffractella** Guarro, P.F. Cannon & Aa (1991), Lasiosphaeriaceae. 1 (from wood), Europe; Japan. See Guarro *et al.* (*SA* 10: 79, 1991), Huhndorf *et al.* (*Mycol.* 96: 368, 2004).

- diffuse**, widely or loosely spreading and having no distinct margin; - **wall building**, see wall building.
- digitate**, with deep radiating divisions, finger-like.
- Digitatispora** Doguet (1962), Atheliaceae. 2 (marine), Europe; N. America. See Doguet (*Compte rendu hebdomadaire des Sciences de l'Academie des sciences* Paris **254**: 4338, 1962).
- Digitatisporaceae** Jülich (1982) = Atheliaceae.
- Digitellus** Paulet (1791), anamorphic *Lentinus*. 1. See Donk (*Taxon* **11**: 82, 1962).
- Digitodesmium** P.M. Kirk (1981), anamorphic *Pleosporales*, Hsp.0bP.1. 4, widespread. See Sutton (*Proc. Indian Acad. Sci. Pl. Sci.* **94**: 229, 1985), Ho *et al.* (*Mycol.* **91**: 900, 1999; Hong Kong), Cai *et al.* (*Nova Hedwigia* **75**: 525, 2002; Philippines), Cai *et al.* (*Sydowia* **55**: 129, 2003; Yunnan), Tsui *et al.* (*Fungal Diversity* **21**: 157, 2006; phylogeny), Cai *et al.* (*Persoonia* **20**: 53, 2008; phylogeny).
- Digitodochium** Tubaki & Kubono (1989), anamorphic *Pezizomycotina*, Hsp.1bH.1. 1, Japan. See Tubaki & Kubono (*Sydowia* **41**: 344, 1989).
- Digitomyces** Mercado, Caldach & Gené (2003), anamorphic *Pezizomycotina*, H??.?. 1, Taiwan. See Mercado Sierra *et al.* (*Mycol.* **95**: 860, 2003).
- Digitopodium** U. Braun, Heuchert & K. Schub. (2006), anamorphic *Pezizomycotina*, H??.?. 1 (on *Hemileia*), Zaire. See Braun *et al.* (*Schlechtendalia* **13**: 66, 2006).
- Digitoramispora** R.F. Castañeda & W.B. Kendr. (1990), anamorphic *Pezizomycotina*, Hso.0bP.19. 2, widespread. See Castañeda Ruiz & Kendrick (*Univ. Waterloo Biol. Ser.* **33**: 18, 1990), Somrithipol & Jones (*Nova Hedwigia* **77**: 373, 2003; Thailand).
- Digitosarcinella** S. Hughes (1984), anamorphic *Pezizomycotina*, Hso.1bH.1. 1, Brazil. See Hughes (*CJB* **62**: 2208, 1984).
- Digitosporium** Gremmen (1953), anamorphic *Crumenulopsis*, St.0bP.1. 1, Finland. See Gremmen (*Acta Bot. Neerl.* **2**: 233, 1953).
- Digitothyrea** P.P. Moreno & Egea (1992), Lichinaceae (L). 3, Africa; C. America. See Moreno & Egea (*Lichenologist* **24**: 215, 1992), Schultz & Büdel (*Lichenologist* **34**: 39, 2002; key), Schultz & Büdel (*Lichenologist* **35**: 151, 2003; phylogeny).
- Digraphis** Clem. (1909) = *Graphis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Diheterospora** Kamyschko ex G.L. Barron & Onions (1966) = *Pochonia* fide Barron & Onions (*CJB* **44**: 861, 1966), Barron (*CJB* **63**: 211, 1985; 12 spp. from parasitized rotifers), Barron (*CJB* **69**: 494, 1991; segregation of *Rotipherophthora*), Gams & Zare (*Mycology Series* **19**: 17, 2003; review).
- Dihyphis** Locq. (1985), Fossil Fungi. 1, Estonia.
- Dikarya**, Fungi. (*Neomycota* Caval.-Sm.). A subkingdom for the (least inclusive clade that contains) *Ascomycota* and *Basidiomycota* (Hibbett *et al.*, *MR* **111**: 509, 2007).
- dikaryon** (adj. **dikaryotic**), a cell having two genetically distinct haploid nuclei.
- dikaryoparaphysis**, see hyphidium.
- dikaryotization**, the conversion of a homokaryon into a dikaryon typically by the fusion of 2 compatible homokaryons, but see Buller phenomenon; **illegitimate** -, the sporadic occurrence of a dikaryon in non-compatible di-mon matings.
- dilacerate**, torn asunder.
- Dillenius** (Johann Jacob; 1684-1747; Germany, later England). First Sherardian Professor of Botany, Oxford University (1728). Paid special attention to fungi (incl. lichen-forming species), and mosses. *Publs. Historia Muscorum* (1742) [includes all the then known lichen-forming fungi, many of which are supported by specimens in the fungal reference collection in Oxford (OXF)]. *Biogs, obits etc.* Anon. (*Oxford Dictionary of National Biography* concise edn **1**: 796, 1993); Grumann (1974: 9); Jørgensen *et al.* (*Botanical Journal of the Linnean Society* **115**: 261, 1994 [typification of many names of lichen-forming fungi]); Petersen (*Mycotaxon* **5**: 415, 1977 [discussion of mycological work]); Stafleu & Cowan (*TL-2* **1**: 655, 1976).
- Dilophia** Sacc. (1883) [non *Dilophia* Thomson 1853, *Cruciferae*] = *Lidophia*.
- Dilophospora** Desm. (1840), anamorphic *Lidophia*, St. = eH.15. 1, widespread. See Walker & Sutton (*TBMS* **62**: 231, 1974; teleomorph), Riley *et al.* (*MR* **102**: 301, 1998; allozyme analysis).
- Diluviicola** K.D. Hyde, S.W. Wong & E.B.G. Jones (1998), Annulatascaceae. 1 (from freshwater), Brunei. See Hyde *et al.* (*Fungal Diversity* **1**: 141, 1998), Ho & Hyde (*Fungal Diversity* **4**: 21, 2000), Raja *et al.* (*Mycotaxon* **88**: 1, 2003).
- Dimargaris** Tiegh. (1875), Dimargaritaceae. 7 (mycoparasites of *Mucorales*), widespread. See Benjamin (*Aliso* **6**: 1, 1965; key), Mandelbrot & Erb (*Mycol.* **64**: 1124, 1972; hosts of *D. verticillata*), Saikawa (*J. Jap. Bot.* **52**: 200, 1977; septal ultrastr.), Jeffries & Young (*Ann. Bot.* **47**: 107, 1981; haustoria), Jeffries & Cuthbert (*Protoplasma* **121**: 129, 1984; ultrastr.), Jeffries & Young (*TBMS* **83**: 223, 1984; spore ultrastr.), Kirk & Kirk (*TBMS* **82**: 551, 1984), Tanabe *et al.* (*J. gen. appl. Microbiol.* Tokyo **51**: 267, 2005; phylogeny), James *et al.* (*Nature* **443**: 818, 2006; phylogeny), White *et al.* (*Mycol.* **98**: 872, 2006; phylogeny).
- Dimargaritaceae** R.K. Benj. (1959), Dimargaritales. 3 gen., 13 spp.
Lit.: Benjamin (*Aliso* **4**: 321, 1959), Benjamin (*Aliso* **5**: 11, 1961), Benjamin (*Aliso* **5**: 273, 1963), Benjamin (*Aliso* **6**: 1, 1965), Beblowska (*Acta Mycologica Warszawa* **27**: 271, 1991), Wrzosek & Gajowniczek (*Acta Mycologica Warszawa* **33**: 265, 1998), Tanabe *et al.* (*Mol. Phylogen. Evol.* **30**: 438, 2004).
- Dimargaritales** R.K. Benj. (1979). Kickxellomycotina. 1 fam., 4 gen., 14 spp. Fam.:
Dimargaritaceae
Lit.: Benjamin (*Aliso* **4**: 321, **5**: 273, **6**: 1, 1959-1965, in Kendrick (Ed.), *The whole fungus* **2**: 573, 1979), Tanabe *et al.* (*Mol. Phylogen. Evol.* **16**: 253, 2000; phylogeny), White *et al.* (*Mycol.* **98**: 860, 2006; molecular phylogeny), Hibbett *et al.* (*MR* **111**: 109, 2007), and see under Family.
- Dimastigosporium** Faurel & Schotter (1965), anamorphic *Pezizomycotina*, Ccu.0eH.?. 1 (coprophilous), Sahara. See Faurel & Schotter (*Revue Mycol. Paris* **30**: 156, 1964).
- Dimaurea** Norman (1853) = *Catolechia* fide Hafellner (*Nova Hedwigia* **30**: 673, 1978).
- Dimelaena** Norman (1853), Caliciaceae (L). 8, widespread. See Sheard (*Bryologist* **80**: 100, 1977; palaeogeography, chemotaxonomy), Leuckert *et al.* (*Nova Hedwigia* **34**: 623, 1981; chemotypes), Mayrhofer *et al.* (*Mycotaxon* **58**: 293, 1996; S. hemisphere), Calatayud & Rico (*Bryologist* **102**: 39, 1999; chemotypes), Nordin & Mattsson (*Lichenologist* **33**:

- 3, 2001; phylogeny), Elvebakk & Moberg (*Lichenologist* 34: 311, 2002; Chile), Rico *et al.* (*Lichenologist* 35: 117, 2003; link with *Buellia*), Obermayer *et al.* (*Symb. bot. upsal.* 34 no. 1: 327, 2004; Tibet), Rico *et al.* (*Cryptog. Mycol.* 27: 149, 2006; Iberian peninsula).
- Dimera** Fr. (1825) = *Oedemium* fide Hughes (*CJB* 36: 727, 1958).
- Dimerella** Trevis. (1880) = *Coenogonium* Ehrenb. fide Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952) but see Vězda & Farkas (*Folia geobot. phytotax.* 23: 187, 1988; key 12 spp. Afr.), Alvarez Andrés & Carballal Durán (*Nova Hedwigia* 73: 409, 2001; Iberian peninsula), Kauff & Lutzoni (*Mol. Phylogen. Evol.* 25: 138, 2002; phylogeny), Grube *et al.* (*MR* 108: 1111, 2004; phylogeny), Malcolm (*Australasian Lichenology* 54: 19, 2004; New Zealand), Malcolm (*Australasian Lichenology* 56: 25, 2005; Australasia), Rivas Platas *et al.* (*Fungal Diversity* 23: 255, 2006; Costa Rica, reln with *Coenogonium*).
- Dimeriaceae** E. Müll. & Arx ex Arx & E. Müll. (1975) = *Pseudoperisporiaceae*.
- Dimeriella** Speg. (1908), *Parodiopsidaceae*. 2, Brazil. See Farr (*Mycol.* 71: 243, 1979), Barr (*Prodr. Cl. Loculoasc.*, 1987; posn).
- Dimeriellina** Chardón (1939) = *Auerswaldiella* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Dimeriellopsis** F. Stevens (1927) = *Nematostoma* fide Sivanesan (*SA* 6: 201, 1987).
- Dimerina** Theiss. (1912), *Pseudoperisporiaceae*. Anamorph *Ectosticta*. c. 10 (on *Meliolaceae*, *Asterinaceae*), widespread (tropical). See Hansford (*Mycol. Pap.* 15, 1946), Farr *et al.* (*CJB* 63: 1983, 1985), Reynolds & Gilbert (*Aust. Syst. Bot.* 18: 265, 2005; Australia).
- Dimerinopsis** Syd. & P. Syd. (1917) = *Dimerina* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Dimeriopsis** F. Stevens (1917) = *Dimerina* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Dimerisma** Clem. (1909) = *Speconisca* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Dimerium** (Sacc. & P. Syd.) Sacc. & D. Sacc. (1905) nom. dub., *Dothideomycetes*. See also *Phaeostigme*. See Hughes (*Mycol. Pap.* 166, 1993).
- Dimerium** (Sacc. & P. Syd.) Sacc. & D. Sacc. (1905), *Parodiopsidaceae*. Anamorph *Cicinnobella*. 1, Chile. See Hughes (*Mycol. Pap.* 166, 1993).
- Dimeromyces** Thaxt. (1896), *Laboulbeniaceae*. 109 (on beetles), widespread. See Santamaria (*Nova Hedwigia* 58: 177, 1994), Kaur & Mukerji (*Mycoscience* 37: 61, 1996), Weir & Hammond (*Biodiv. Cons.* 6: 701, 1997; on beetles), Terada (*Mycoscience* 41: 39, 2000; Japan), Santamaria (*Fl. Mycol. Iberica* 5, 2003; Iberian peninsula), Majewski (*Acta Mycologica Warszawa* 41: 65, 2006; Poland).
- Dimerospora** Th. Fr. (1860) = *Lecania* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Dimerosporiella** Höhn. (1909) = *Dimerosporina*.
- Dimerosporiella** Speg. (1908), *Bionectriaceae*. Anamorph *Acremonium*-like. 1 (on hyphae of *Meliola*), Brazil. See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Dimerosporina** Höhn. (1910) = *Dysrhynchis* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Dimerosporiopsis** Henn. (1901) = *Antennularia* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Dimerosporium** Fuckel (1870) = *Asterina* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- dimerous** (of basidia), having a constriction between the probasidium and the metabasidium, as in *Brachybasidium*.
- dimidiate** (1) shield-like; appearing to lack one half, or having one half very much smaller than the other; (2) (of a pileus), without a stalk and semi-circular; (3) (of lamellae), stretching only halfway to the stipe; (4) (of an ascomatal wall), having the outer wall covering only the top part.
- dimitic**, see hyphal analysis.
- dimixis**, see heterothallism.
- di-mon**, see Buller phenomenon.
- dimorphic**, having two forms; esp. of *Histoplasma*, *Sporothrix*, and other pathogens of humans and animals which have yeast and mycelial habits. See Romano (*in* Ainsworth & Sussman (Eds), *The Fungi* 2: 181, 1966; review), Szanislo (Ed.) (*Fungal dimorphism.*, 1985), San-Blas (*Handb. Appl. Mycol.* 2. *Humans, animals and insects*: 459, 1991; molec. aspects).
- Dimorphocystidaceae** Jülich (1982) = *Pterulaceae*.
- Dimorphocystis** Corner (1950) = *Actiniceps* fide Boedijn (*Persoonia* 1: 11, 1959).
- Dimorphomyces** Omoifo (1997) nom. illegit., anamorphic *Pezizomycotina*, Hso.?.?. 1, Nigeria. See Omoifo (*Hindustan Antibiot. Bull.* 38: 8, 1996).
- Dimorphomyces** Thaxt. (1893), *Laboulbeniaceae*. 27, widespread. See Weir & Rossi (*Mycol.* 93: 171, 2001; Bolivia), Santamaria (*Fl. Mycol. Iberica* 5, 2003; Iberian peninsula).
- Dimorphomycetaceae** S. Colla (1934) = *Laboulbeniaceae*.
- Dimorphospora** Tubaki (1958), anamorphic *Hymenoscyphus*, Hso.0eH.3+15. 1, widespread. See Tubaki (*J. Hattori bot. Lab.* 20: 156, 1958), Belliveau & Bärlocher (*MR* 109: 1407, 2005; phylogeny).
- Dimorphotricha** Spooner (1987), *Hyaloscyphaceae*. 1, Australia. See Spooner (*Bibliotheca Mycol.* 116, 1987).
- Dinemasporiella** Bubák & Kabát (1912) = *Pseudolachnea* Ranoj. fide Sutton (*Mycol. Pap.* 141, 1977).
- Dinemasporiella** Speg. (1910) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Dinemasporiopsis** Bubák & Kabát (1914) = *Pseudolachnea* Ranoj. fide Sutton (*Mycol. Pap.* 141, 1977).
- Dinemasporis** Clem. & Shear (1931) = *Dinemasporiella* Speg.
- Dinemasporium** Lév. (1846), anamorphic *Phomatospora*, Ccu.0eH.15. 18, widespread. See Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993), Yamaguchi *et al.* (*Mycoscience* 46: 367, 2005; Japan), Duan *et al.* (*Fungal Diversity* 26: 205, 2007; key).
- Dingleya** Trappe (1979), *Tuberaceae*. 7 (hypogeous), Australia. See Trappe *et al.* (*Aust. Syst. Bot.* 5: 597, 1992), O'Donnell *et al.* (*Mycol.* 89: 48, 1997; phylogeny), Percudani *et al.* (*Mol. Phylogen. Evol.* 13: 169, 1999; DNA), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- dioecism** (adj. **dioecious**), the condition in which the male and female sex structures are on different thalli, e.g. in certain *Laboulbeniales*; also reported in *Lecidea verruca* where the 'male' thalli are mostly

- smaller (Poelt, *Pl. Syst. Evol.* **135**: 81, 1980). cf. monoecism, heterothallism.
- Diocomyces** Thaxt. (1901), Laboulbeniaceae. 32, widespread. See Rossi (*Mycol.* **85**: 125, 1993), Kaur & Mukerji (*Mycoscience* **37**: 61, 1996), Santamaria (*MR* **106**: 615, 2002; revision).
- Diomedella** Hertel (1984), Lecanoraceae (L). 2, New Zealand; sub-Antarctic islands. See Hertel (*Nova Hedwigia Beih.* **79**: 445, 1984).
- Dionysia** Arnaud (1952) = *Candelabrum* fide Bottomley (*TBMS* **37**: 234, 1954).
- Diorchidiella** J.C. Lindq. (1957), Raveneliaceae. 2 (on *Mimosa* (*Leguminosae*)), S. America. See Lindquist (*Darwiniana* **11**: 416, 1957).
- diorchidioid** (of teliospores), 2-celled and with septum longitudinal.
- Diorchidium** Kalchbr. (1882), Raveneliaceae. c. 15 (on *Leguminosae*, 1 on *Rubiaceae*), widespread (esp. tropical). See Hennen *et al.* (*Mycol.* **90**: 1079, 1998), Wood (*South African Journal of Botany* **72**: 534, 2006; southern Africa).
- Diorygma** Eschw. (1824), Graphidaceae (L). 1, widespread. See Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Kalb *et al.* (*Symb. bot. upsal.* **34** no. 1: 133, 2004; monogr.), Archer (*Australasian Lichenology* **56**: 10, 2005; Australia), Archer (*Bibliotheca Lichenol.* **94**, 2006; Australia), Miadlikowska *et al.* (*Mycol.* **98**: 1088, 2006; phylogeny), Watanuki (*Lichenology* **5**: 69, 2006; distribution), Archer (*Systematics & Biodiversity* **5**: 9, 2007; Solomon Is).
- Diosporangium**, see *Diasporangium*.
- Dioszegia** Zsolt (1957), anamorphic *Tremellaceae*. 13, widespread. See Wang *et al.* (*Antonie van Leeuwenhoek* **93**: 391, 2008).
- Diphaeis** Clem. (1909) = *Rhizocarpon* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Diphaeosticta** Clem. (1909) = *Pseudocyphellaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Diphanis** Clem. (1909) = *Rhizocarpon* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Diphanosticta** Clem. (1909) = *Pseudocyphellaria* fide Galloway (*Bull. Br. Mus. nat. hist. Bot.* **17**, 1988).
- Diphloeis** Clem. (1909) = *Toninia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Diphragmium** Boedijn (1960) = *Diorchidium* fide Berndt (*Mycotaxon* **59**: 253, 1996).
- Diphrotora** Trevis. ex Jatta (1900) = *Solenopsora* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- diphycophilous**, fungi lichenized with both a green and a blue-green photobiont (Pike & Carroll, in Alexopoulos & Mims, *Introductory mycology*, edn 3, 1980).
- Diphymyces** I.I. Tav. (1985), Laboulbeniaceae. 7, widespread. See Santamaria (*MR* **97**: 791, 1993; Spain), Weir & Rossi (*CJB* **75**: 791, 1997; NZ).
- Diplacella** Syd. (1930), Diaporthales. 1, America (tropical).
- diplanetism** (adj. **diplanetic**) (of zoospores of *Oomycota*), a sequence of two motile flagellate phases with an interspersed mobile aplanosporic phase in the zoosporic part of the life-history; the aplanosporic phase as a walled cyst; motile phases may be monomorphic or dimorphic.
- diplo-** (prefix), two; twice; double.
- diplobiontic**, see *Diplobionticae*.
- Diplobionticae**. Subclass introduced by Nannfeldt (1932) for *Ascomycota* in which the life cycle consists of two thalli (bionts), like the gametophyte and sporophyte of many algae, e.g. *Spermophthora* is diplobiontic, because of its two generations, free from each other; cf. *Haplobionticae*.
- Diplocarpa** Masee (1895), Helotiales. 1, Europe. See Nauta & Spooner (*Mycologist* **14**: 21, 2000; UK).
- Diplocarpon** F.A. Wolf (1912), Helotiales. Anamorphs *Entomosporium*, *Marssonina*. 6, widespread. *D. rosae* (anamorph *Marssonina rosae*; black spot of rose), *D. earlianum* (anamorph *M. fragariae*; strawberry leaf scorch). See Ali *et al.* (*Proceedings, BCPC Conference Pests & Diseases* 2000: 251, 2000).
- Diplocarponella** Bat. (1957) = *Stomiopeltis* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* **11** no. 2, 1962).
- Diploceras** (Sacc.) Died. (1915) = *Seimatosporium* fide Sutton (*TBMS* **64**: 483, 1975).
- Diplochora** Höhn. (1906) = *Pseudophacidium* fide Petrak (*Sydowia* **5**: 193, 1951).
- Diplochora** P. Syd. (1913) = *Diplochorella*.
- Diplochorella** P. Syd. (1913), Dothideomycetes. 3, S. Africa; New Zealand. See von Arx & Müller (*Stud. Mycol.* **9**, 1975), Wagner & Wilkinson (*Pl. Dis.* **76**: 212, 1992), Johnston & Cannon (*N.Z. J. Bot.* **42**: 921, 2004; New Zealand).
- Diplochorina** Gutner (1933), Dothideomycetes. 1, former USSR.
- Diplochytridium** Karling (1971) nom. inval., Chytridiaceae. 21. See Desjardin (*Sydowia* **42**: 17, 1990; culture).
- Diplochytrium** Tomaschek (1878) = *Olpidium* fide Karling (*Chytriomyc. Iconogr.*, 1977).
- Diplocladiaceae** Nann. (1934) = *Hypocreaceae*.
- Diplocladiella** G. Arnaud ex M.B. Ellis (1976), anamorphic *Pezizomycotina*, Hso.0bP.10. 7, widespread (esp. tropical). See Nawawi (*Mycotaxon* **28**: 297, 1987), Lee *et al.* (*Fungal Diversity* **1**: 165, 1998), Kendrick (*CJB* **81**: 75, 2003; morphogenesis), Cooper (*N.Z. J. Bot.* **43**: 323, 2005; New Zealand).
- Diplocladium** Bonord. (1851) = *Cladobotryum* fide Hughes (*CJB* **36**: 727, 1958), Kirschner & Oberwinkler (*MR* **103**: 1152, 1999; exclusion of *D. gregarium*).
- Diplococcium** Grove (1885), anamorphic *Helminthosphaeria*, Hso.1eP.28. 20, widespread. See Sinclair *et al.* (*TBMS* **85**: 736, 1985), Subramanian & Sekar (*Kavaka* **15**: 87, 1987; teleomorph), Goh & Hyde (*Fungal Diversity* **1**: 65., 1998; key), Wang & Sutton (*CJB* **76**: 1608, 1998; *Selenosporella* synanamorph), Réblová (*Sydowia* **51**: 223, 1999; teleomorph), Braun *et al.* (*J. Econ. Taxon. Bot.* **25**: 284, 2001; India).
- diploconidium**, a binucleate conidium.
- Diplocryptis** Clem. (1909) = *Cryptodiscus* fide Sherwood (*Mycotaxon* **6**: 215, 1977).
- Diplocystidiaceae** Kreisel (1974), Boletales. 4 gen. (+ 1 syn.), 5 spp.
Lit.: Kreisel (*Feddes Repert.* **85**: 325, 1974), Miller & Miller (*Gasteromycetes. Morphological and Development Features with Keys to the Orders, Families, and Genera*: 157 pp., 1988), Pegler *et al.* (*British Puffballs, Earthstars and Stinkhorns An Account of the British Gasteroid Fungi*: 255 pp., 1995; as *Astraeaceae*), Hughey *et al.* (*Mycol.* **92**: 94, 2000; as *Astraeaceae*), Binder & Bresinsky (*Mycol.* **94**: 85, 2002; as *Astraeaceae*).

- Diplocystis** Berk. & M.A. Curtis (1869), Diplocystidiaceae. 1, West Indies. See Kreisel (*Feddes Repert.* **85**: 325, 1974).
- Diploderma** Link (1816) ? = *Astraeus* fide Stalpers (*in litt.*).
- Diplodermaceae** Fr. (1849) = *Astraeaceae*.
- Diplodia** Fr. (1834), anamorphic *Botryosphaeriaceae*, Cpd.1eP.1. 960, widespread. See Shear (*Mycol.* **25**: 274, 1933; teleomorphs), Zambettakis (*BSMF* **70**: 219, 1954; species concepts, 24 spp. accepted), Vajna (*Eur. J. For. Path.* **16**: 223, 1986; on *Quercus*), Wang *et al.* (*Mycol.* **78**: 960, 1986; TEM), Luque & Girbal (*Eur. J. For. Path.* **19**: 7, 1989; on *Quercus*), Swart *et al.* (*Phytopathol.* **81**: 489, 1991; variation), Swart *et al.* (*MR* **97**: 832, 1993; biometrics), Smith & Stanosz (*Phytopathol.* **85**: 699, 1995; population biology, USA), Ragazzi *et al.* (*Eur. J. For. Path.* **27**: 391, 1997; VCGs), Jacobs & Rehner (*Mycol.* **90**: 601, 1998; morphology, phylogeny), Crous & Palm (*Sydowia* **51**: 167, 1999; generic limits), Stanosz *et al.* (*MR* **103**: 1193, 1999; DNA, isoenzymes), Denman *et al.* (*Stud. Mycol.* **45**: 129, 2000; teleomorph), Wet *et al.* (*Pl. Dis.* **84**: 151, 2000; biogeography), Burgess *et al.* (*MR* **105**: 1331, 2001; genetic diversity), Zhou & Stanosz (*Mycol.* **93**: 516, 2001; phylogeny), Phillips (*Phytopath. Mediterr.* **41**: 3, 2002; on *Vitis*), Alves *et al.* (*Mycol.* **96**: 598, 2004; on *Quercus*), Burgess *et al.* (*MR* **108**: 1399, 2004; on *Pinus*), Van Niekerk *et al.* (*Mycol.* **96**: 781, 2004; on *Vitis*), Wingfield *et al.* (*Australas. Pl. Path.* **33**: 513, 2004; on *Pinus*), Luchi *et al.* (*J. Phytopath.* **153**: 37, 2005; molecular diagnostics), Alves *et al.* (*Fungal Diversity* **23**: 1, 2006; *D. cupressi*), Crous *et al.* (*Stud. Mycol.* **55**: 235, 2006; phylogeny), Smith & Stanosz (*Pl. Dis.* **90**: 307, 2006; molecular detection), Damm *et al.* (*Mycol.* **99**: 664, 2007; S Africa, on *Prunus*), Phillips *et al.* (*Mycol.* **97**: 513, 2007; genus concept, phylogeny).
- Diplodiella** (P. Karst.) Sacc. (1884) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* **141**, 1977).
- Diplodiella** Petr. (1953) nom. illegit., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* **141**, 1977).
- Diplodina** Westend. (1857), anamorphic *Cryptodiaporthe*, Cac.1= eH.15. 5, widespread. See Sutton (*The Coelomycetes*, 1980), Wulf (*Nachricht. Deutsch. Pflanzenschutz.* **42**: 97, 1990; *D. acerina* endophytic and antagonistic to leaf-feeding insects), Bathgate *et al.* (*MR* **100**: 159, 1996; on *Banksia*, Australia).
- Diplodinis** Clem. (1931), anamorphic *Pezizomycotina*, Cpd.1eH.?. 1, Scandinavia.
- Diplodinula** Tassi (1902), anamorphic *Pezizomycotina*, Cpd.1eH.?. 68, widespread.
- diploidioecious**, see heterophytic.
- Diplodiopsis** Henn. (1904) = *Parodiella* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* **11** no. 2, 1962).
- diploiosis**, in cattle and sheep, a neuromuscular parietic syndrome caused by *Stenocarpella maydis* (syn. *Diplodia maydis*) infected maize in South Africa.
- Diplodites** Babajan & Tasl. (1970), Fossil Fungi. 1 (Tertiary), former USSR.
- Diplodothiorella** Bubák (1916) = *Sphaerellopsis* Cooke fide Sutton (*Mycol. Pap.* **141**, 1977).
- Diplogelasinospora** Cain (1961), Sordariales. 2, Asia; N. America. See Udagawa & Horie (*J. Jap. Bot.* **47**: 297, 1972), Udagawa *in* Subramanian (Ed.) (*Taxonomy of fungi* **1**: 225, 1978; anamorph), Novotný (Czech *Mycol.* **53**: 203, 2001; Czech Republic), Cai *et al.* (*MR* **110**: 359, 2006; phylogeny), Cai *et al.* (*MR* **110**: 137, 2006; phylogeny).
- Diplogramma** Müll. Arg. (1891), Roccellaceae (L). 1. See Staiger (*Biblthca Lichenol.* **85**, 2002), Archer (*Telopea* **10**: 589, 2004; Australia, comparison with *Opegrapha*).
- Diplogrammatomyces** Cif. & Tomas. (1953) = *Diplogramma*.
- Diplographis** Kremp. ex A. Massal. (1860) = *Fissurina* fide Staiger (*Biblthca Lichenol.* **85**, 2002).
- diploheteroecious**, see heterophytic.
- Diploicia** A. Massal. (1852), Caliciaceae (L). c. 4, widespread (temperate). See Elix *et al.* (*Mycotaxon* **33**: 457, 1988; chemistry), Matzer *et al.* (*Nordic J Bot.* **17**: 433, 1997; South Africa), Nordin (*Symb. bot. upsal.* **32** no. 1: 195, 1997; ultrastr.), Harada *et al.* (*J. Nat. Hist. Mus. Inst. Chiba* **5**: 97, 1999; Japan), Grube & Arup (*Lichenologist* **33**: 63, 2001; evolution), Molina *et al.* (*Lichenologist* **34**: 509, 2002; phylogeny, synonymy with *Diplotomma*), Helms *et al.* (*Mycol.* **95**: 1078, 2003; phylogeny).
- diploid** (1) (of a nucleus), having the $2n$ number of chromosomes; (2) (of a cell), having the $2n$ number of chromosomes in one (synkaryotic, $2n$) or two (dikaryotic, $n + n$) nuclei; (3) (of a mycelium), made up of dikaryotic diploid cells.
- Diploidium** G. Arnaud (1923) = *Septoidium* fide Ellis (*Dematiaceous Hyphomycetes*, 1971).
- diploidization**, the process by which a haploid cell (or mycelium) becomes a diploid (dikaryotic) cell (mycelium) having conjugate nuclei (Buller, 1941); cf. heterokaryotise.
- diplokaryon**, see synkaryon.
- Diplolabia** A. Massal. (1854) orth. var. = *Dyplolabia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Diplolaeviopsis** Giralt & D. Hawksw. (1991), anamorphic *Pezizomycotina*, Cpd.1eH.19. 1 (on lichens), Spain; USA. See Giralt & Hawksworth (*MR* **95**: 759, 1991), Diederich (*Herzogia* **16**: 41, 2003; USA).
- Diplomitoporus** Domański (1970), Polyporaceae. 11, widespread. See Gilbertson & Ryvarden (*N. Amer. Polyp.* **1**: 240, 1986).
- diplomitotic nuclear cycle**, occurrence of two mitotic phases of different ploidy in the nuclear cycle (Dick, 1987); karyogamy - mitosis - meiosis - mitosis - karyogamy -.
- diplomonoecious**, see homophytic.
- Diplomyces** Thaxt. (1895), ? Laboulbeniaceae. 3, widespread. See Rossi & Cesari Rossi (*G. bot. ital.* n.s. **112**: 63, 1978), Benjamin (*Aliso* **10**: 345, 1983), Majewski (*Acta Mycologica* Warszawa **19**: 183, 1983; Poland), Tavares (*Mycol. Mem.* **9**: 627 pp., 1985), Santamaría (*Fl. Mycol. Iberica* **5**, 2003; Iberian peninsula).
- Diplonaevia** Sacc. (1889), Helotiales. 23, widespread (north temperate). See Hein (*Sydowia* **36**: 78, 1983; key), Nannfeldt (*Nordic J Bot.* **4**: 791, 1985; key 10 spp. *Juncaceae*), Scheuer (*MR* **95**: 634, 1991), Nauta & Spooner (*Mycologist* **14**: 21, 2000; UK), Raitviir (*Mycotaxon* **87**: 359, 2003; Greenland), Raitviir (*Folia cryptog. Estonica* **40**: 43, 2003), Suková (*Czech Mycol.* **56**: 63, 2004; Czech Republic).
- Diplonema** P. Karst. (1889) [non *Diplonema* Kjellm. 1855, *Algae*] = *Amphinema*.
- Diploneurospora** K.P. Jain & R.C. Gupta (1970), Fossil Fungi, Xylariales. 1 (Miocene), India.

- diploont**, the thallus of the diploid stage; the sporophyte.
- Diploöspora** Grove (1916), anamorphic *Pezizomycotina*, Hs.1eH.?. 3, Europe. See Sreekala & Bhat (*Mycotaxon* 80: 101, 2001; India).
- Diplopeltis** Pass. (1889) [non *Diplopeltis* Endl. 1837, *Sapindaceae*] = *Pycnoseynesia* fide Sutton (*Mycol. Pap.* 141, 1977).
- Diplopeltopsis** Henn. ex Höhn. (1911) = *Asterothyrium* Müll. Arg. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- diplophase**, the part of a life-history in which the cells are diploid.
- Diplophlyctis** J. Schröt. (1892), Endochytriaceae. 12, widespread. See Sparrow (*Aquatic Phycomycetes* Edn 2: 386, 1960; key), Dogma (*TBMS* 67: 255, 1976; key chitinophilic spp.).
- Diplophragmia** Vain. (1934) = *Lecidella* fide Santesson (*The lichens and lichenicolous fungi of Sweden and Norway*, 1993).
- Diploplacis** Clem. & Shear (1931) = *Sphaerellopsis* Cooke fide Sutton (*Mycol. Pap.* 141, 1977).
- Diploplacosphaeria** Petr. (1921) = *Sphaerellopsis* Cooke fide Sutton (*Mycol. Pap.* 141, 1977).
- Diploplenodomopsis** Petr. (1923) = *Diplodina* fide Clements & Shear (*Gen. Fung.*, 1931).
- Diploplenodomus** Died. (1912), anamorphic *Pezizomycotina*, St.1eH.?. 2 or 3, Europe. See Boerema *et al.* (*Persoonia* 16: 141, 1996).
- Diplopodomycetes** W. Rossi & Balazuc (1977), Laboulbeniaceae. 1, Europe. See Rossi & Balazuc (*Revue Mycol. Paris* 41: 528, 1977), Tavares (*Mycol. Mem.* 9: 627 pp., 1985).
- Diplorhinotrichum** Höhn. (1902) = *Dactylaria* fide Bhatt & Kendrick (*CJB* 46, 1968).
- Diplorhynchus** Arnaud (1952) nom. inval., anamorphic *Pezizomycotina*, Hs.0.0 = hH.1. 1, France. See Goos (*Mycol.* 79: 1, 1987).
- Diploschistaceae** Zahlbr. (1905) = *Thelotrema*aceae.
- Diploschistella** Vain. (1926) nom. rej., Gomphillaceae (L). 1, pantropical. See Lumbsch & Hawksworth (*Taxon* 36: 764, 1987; nomencl.), Lücking *et al.* (*Lichenologist* 37: 123, 2005; phylogeny), Lücking *et al.* (*Lichenologist* 38: 131, 2006; key, Costa Rica).
- Diploschistes** Norman (1853), *Thelotrema*aceae (L). c. 43, widespread. See Lumbsch (*J. Hattori bot. Lab.* 66: 133, 1989; key 14 holarctic spp.), Lumbsch (*Nova Hedwigia* 56: 227, 1993), Pant & Upreti (*Lichenologist* 25: 33, 1993; key 14 spp. India & Nepal), Lumbsch & Tehler (*Bryologist* 101: 398, 1998; cladistic analysis), Winka *et al.* (*Lichenologist* 30: 455, 1998; DNA), Martín *et al.* (*Pl. Biol.* 2: 571, 2000; morphology), Kauff & Lutzoni (*Mol. Phylogen. Evol.* 25: 138, 2002; phylogeny), Lumbsch & Elix (*Bibliotheca Lichenol.* 86: 119, 2003; Australia), Martín *et al.* (*Lichenologist* 35: 27, 2003; phylogeny), Frisch *et al.* (*Bibliotheca Lichenol.* 92: 517, 2006; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny).
- Diploschistomyces** Werner (1976) nom. inval. = *Diploschistes*.
- Diplosclerophoma** Petr. (1923) = *Diplodina* fide Sutton (*Mycol. Pap.* 141, 1977).
- Diplosis** Clem. (1909) = *Toninia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Diplosphaerella** Grove (1912) = *Delphinella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Diplosporites** Pia (1927), *Fossil Fungi*. 1 (Oligocene), France.
- Diplosporium** Link (1824) = *Oedemium* fide Hughes (*CJB* 36: 727, 1958).
- Diplosporonema** Höhn. (1917), anamorphic *Pezizomycotina*, Cac. = eH.10. 1, widespread.
- diplospory**, when a diploid nucleus is incorporated into cytoplasm influenced by adjacent meioses in the coenocytic gametangium, subsequently giving rise to oospores (in *Oomycetes*; Dick, *New Phytol.* 71: 1151, 1972).
- Diplostephanus** Langeron (1922) = *Emericella* fide von Arx (*Gen. Fungi Sporul. Cult.* Edn 3, 1981).
- diplostichous**, in two lines or groups.
- Diplostoma**, see *Diploderma*.
- diplostromatic**, see stroma.
- diplosynoeccious**, see homophytic.
- Diplothea** (Zahlbr.) Räsänen (1943) [non *Diplothea* Hochst. 1846, *Leguminosae*] = *Lecidea* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Diplothea** Starbäck (1893), *Myriangiaceae*. 1 (on *Cactaceae*), America.
- Diplothrix** Vain. (1921) = *Calloriopsis* fide Santesson (*Svensk bot. Tidskr.* 45: 300, 1951).
- Diplotomma** A. Massal. (1852) = *Diploicia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Diplotomma** Flot. (1849), *Caliciaceae* ($\pm$ L). c. 29, widespread. See Singh & Awasthi (*Geophytology* 19: 173, 1990; key 11 Indian spp.), Nordin (*Symb. bot. upsal.* 32 no. 1: 195, 1997; ultrastr.), Molina *et al.* (*Lichenologist* 34: 509, 2002; phylogeny), Helms *et al.* (*Mycol.* 95: 1078, 2003; phylogeny), Simon *et al.* (*J. Mol. Evol.* 60: 434, 2005; introns).
- Diplozythia** Bubák (1904) nom. conf., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Diplozythiella** Died. (1916), anamorphic *Pezizomycotina*, St.1eH.15. 1, India.
- Dipodascaceae** Engl. & E. Gilg (1924), *Saccharomycetales*. 6 gen. (+ 6 syn.), 71 spp.
Lit.: Hoog *et al.* (*Stud. Mycol.* 29: 131 pp., 1986), Hoog *et al.* in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 181, 1998), Hoog *et al.* in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 209, 1998), Hoog *et al.* in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 574, 1998), Smith *et al.* (*Antonie van Leeuwenhoek* 77: 71, 2000), Ueda-Nishimura & Mikata (*Microbiology Reading* 146: 1045, 2000), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Dipodascales** = *Saccharomycetales*.
- Dipodascopsis** L.R. Batra & Millner (1978), *Lipomycetaceae*. 2, Europe; N. America. See Jansen van Rensburg *et al.* (*Syst. Appl. Microbiol.* 18: 410, 1995; lipids, DNA), Smith & de Hoog in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 178, 1998), Smith *et al.* (*S. Afr. J. Sci.* 96: 247, 2000; chemistry), Suh & Blackwell (*Insect-Fungal Associations Ecology and Evolution*: 244, 2005; ecology), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny), Kurtzman *et al.* (*FEMS Yeast Res.* 7: 1027, 2007; phylogeny).
- Dipodascus** Lagerh. (1892), *Dipodascaceae*. Anamorph *Geotrichum*. 16, widespread. See de Hoog *et al.* (*Stud. Mycol.* 29, 1986; key), de Hoog *et al.* in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 181, 1998), Smith & Poot (*Antonie van Leeuwenhoek* 74: 229, 1998; DNA), Ueda-Nishimura & Mikata (*Microbiology Reading* 146: 1045, 2000; rDNA secondary structures), Spatafora (*Cellular*

- Origin and Life in Extreme Habitats* 4: 591, 2002; ecology), Smith & Poot (*FEMS Yeast Res.* 3: 301, 2003; phylogeny), Smith *et al.* (*Antonie van Leeuwenhoek* 83: 317, 2003; chemistry, morphology), Baretseng *et al.* (*Antonie van Leeuwenhoek* 85: 187, 2004; ascospores), Hoog & Smith (*Stud. Mycol.* 50: 489, 2004; phylogeny, key, polyphyly), Suh *et al.* (*MR* 109: 261, 2005; ecology), Suh & Blackwell (*MR* 110: 220, 2006; in insect guts), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny), van Heerden *et al.* (*FEMS Yeast Res.* 7: 173, 2007; morphology).
- Dipodomyces** Thaxt. (1931), Laboulbeniaceae. 2, W. Africa; Poland. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- Diporicellaesporites** Elsik (1968), Fossil Fungi. 15 (Paleocene), widespread.
- Diporidicellaesporites** Frunzescu & Bacaran (1990), Fossil Fungi. 1. See Frunzescu & Bacaran (*Revue roum. Géol., Géophys. Géogr. Géol.* 34: 12, 1990).
- Diporimonocellaesporites** Frunzescu & Bacaran (1990), Fossil Fungi. 1. See Frunzescu & Bacaran (*Revue roum. Géol., Géophys. Géogr. Géol.* 34: table 1, 1990).
- Diporimonodicellaesporites** Frunzescu & Bacaran (1990), Fossil Fungi. 1. See Frunzescu & Bacaran (*Revue roum. Géol., Géophys. Géogr. Géol.* 34: table 1, 1990).
- Diporimulticellaesporites** Frunzescu & Bacaran (1990), Fossil Fungi. 1. See Frunzescu & Bacaran (*Revue roum. Géol., Géophys. Géogr. Géol.* 34: table 1, 1990).
- Diporina** Clem. (1909) = *Strigula* fide Harris in Hafellner & Kalb (*Bibliotheca Lichenol.* 57: 161, 1995).
- Diporipollis** Kalgutkar & Janson. (2000), Fossil Fungi. 1, USA.
- Diporisporites** Hammen (1954), Fossil Fungi. 20 (Cretaceous, Tertiary), widespread.
- Diporitetracellaesporites** Frunzescu & Bacaran (1990), Fossil Fungi. 1. See Frunzescu & Bacaran (*Revue roum. Géol., Géophys. Géogr. Géol.* 34: table 1, 1990).
- Diporitricellaesporites** Frunzescu & Bacaran (1990), Fossil Fungi. 1. See Frunzescu & Bacaran (*Revue roum. Géol., Géophys. Géogr. Géol.* 34: table 1, 1990).
- Diporopollis** S. Dutta & Sah (1970), Fossil Fungi. 1 (Eocene), India.
- Diporotheca** C.C. Gordon & C.G. Shaw (1961), Diporothecaceae. 1 (on roots), USA. See Mibey & Hawksworth (*SA* 14: 25, 1995).
- Diporothecaceae** Mibey & D. Hawksw. (1995), Pezizomycotina (inc. sed.). 1 gen., 1 spp.
Lit.: Mibey & Hawksworth (*SA* 14: 25, 1995).
- Dipsacomyces** R.K. Benj. (1961), Kickxellaceae. 1, Honduras. See Benjamin (*Aliso* 5: 15, 1961).
- Dipyrenis** Clem. (1909) nom. dub., Pyrenulaceae. See Hawksworth (*Nova Hedwigia* 43: 1, 1986).
- Dipyrgis** Clem. (1909), Dothideomycetes. 1, Australia. See Tibell (*Beih. Nova Hedwigia* 79: 597, 1984).
- Dipyxis** Cummins & J.W. Baxter (1967), Uropyxidaceae. 2 (on *Bignoniaceae*), Costa Rica; Mexico; Brazil. See Cummins & Baxter (*Mycol.* 59: 368, 1967).
- direct** (of fruit-body development), cell enlargement occurring at the same time as cell division; in **indirect** development cell enlargement mainly occurs after the period of cell division (Corner, 1950).
- Dirimosperma** Preuss (1855) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Dirina** Fr. (1825), Roccellaceae (L.). 11, widespread. See Tehler (*Op. Bot.* 70, 1983), Tehler (*Lichenologist* 18: 295, 1986), Tehler (*Lichenologist* 20: 398, 1988; anamorph), Tehler (*CJB* 68: 2458, 1990; phylogeny), Letrouit-Galinou *et al.* (*Bull. Soc. linn. Provence* 45: 389, 1994; ultrastr.), Tehler *et al.* (*Lichenologist* 27: 255, 1995; Mexico), Grube (*Bryologist* 101: 377, 1998; phylogeny), Myllys *et al.* (*Bryologist* 101: 70, 1998; phylogeny, morphology), Myllys *et al.* (*Lichenologist* 31: 461, 1999; phylogeny), Follmann (*J. Hattori bot. Lab.* 90: 251, 2001; S America, key), Follmann (*Mitteilungen aus dem Institut für Allgemeine Botanik Hamburg* 30-32: 61, 2002; biogeography), Tehler & Irestedt (*Cladistics* 23: 432, 2007).
- Dirinaceae** Zahlbr. (1905) = Roccellaceae.
- Dirinaria** (Tuck.) Clem. (1909), Caliciaceae (L.). 29, widespread (esp. tropical). See Awasthi (*Bibliotheca Lichenol.* 2, 1975; monogr.), Swinscow & Krog (*Norw. J. Bot.* 25: 157, 1978; E. Afr.), Huneck *et al.* (*J. Hattori bot. Lab.* 62: 331, 1987; chemistry, S America), Risbud & Patwardhan (*Biovigyanam* 15: 57, 1989; Andaman Is), Scutari (*Darwiniana* 33: 149, 1995; Argentina), Nordin (*Symb. bot. upsal.* 32 no. 1: 195, 1997; ultrastr.), Czeuczuga *et al.* (*Feddes Repert.* 112: 81, 2001; carotenoids), Nordin & Mattsson (*Lichenologist* 33: 3, 2001; phylogeny, morphology), Helms *et al.* (*Mycol.* 95: 1078, 2003; phylogeny), Moberg (*Symb. bot. upsal.* 34 no. 1: 257, 2004; southern Africa), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Dirinastrum** Cif. & Tomas. (1953) = *Dirinastrum*.
- Dirinastrum** Müll. Arg. (1893) ? = *Buellia* See Tehler (*Op. Bot.* 70, 1983).
- Dirinella** M. Choisy (1931) = *Lecanora* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Dirinopsis** De Not. (1846) = *Dirina* fide Tehler (*Op. Bot.* 70, 1983).
- Disaeta** Bonar (1928) = *Seimatosporium* fide Shoemaker (*CJB* 42: 411, 1964).
- Disarticulatus** G.F. Orr (1977) = *Arachniotus* fide von Arx (*Persoonia* 9: 393, 1977).
- disc** (1) (**disk**) (of discomycetes), the round, plate-like or curved spore-producing part of the ascoma; (2) (of a pileus), the central part of the top surface.
- Discales**. Used by Le Gal (1953) for discomycetes.
- Discaria** (Sacc.) Sacc. (1889) [non *Discaria* Hook. 1830, *Rhamnaceae*] = *Plicaria*.
- Discella** Berk. & Broome (1850) ? = *Rhabdospora* fide Sutton (*Mycol. Pap.* 141, 1977).
- Discellaceae** Clem. & Shear (1931) = *Mycosphaerellaceae*.
- Dischloridium** B. Sutton (1977), anamorphic *Australiasca*, Hso.0eH.15. 9, widespread. See Seifert & Gams (*Mycotaxon* 24: 459, 1985), Holubová-Jechová (*Česká Mykol.* 41: 107, 1987), Srivastava (*Sydowia* 39: 217, 1986).
- disciform**, round and flat.
- Discina** (Fr.) Fr. (1849), Discinaceae. 20, widespread (north temperate). See Donadini (*Bull. Soc. linn. Provence* 38: 161, 1987; 17 spp.), Kimbrough *et al.* (*CJB* 68: 317, 1990; similarity to *Gyromitra*), O'Donnell *et al.* (*Mycol.* 89: 48, 1997; phylogeny), Harrington *et al.* (*Mycol.* 91: 41, 1999; phylogeny), Vizzini (*Boll. Gruppo Micol. 'G. Bresadola'* 46: 53, 2003; cytology).
- Discina** Bonord. (1851) nom. dub., Fungi. See Eckblad (*Nytt Mag. Bot.* 15: 170, 1968).
- Discinaceae** Benedix (1961), Pezizales. 5 gen. (+ 12

syn.), 58 spp.

Lit.: Gibson & Kimbrough (*CJB* 66: 1743, 1988), Kimbrough *et al.* (*CJB* 68: 317, 1990), Kimbrough (*MR* 95: 421, 1991), Abbott & Currah (*Mycotaxon* 62: 1, 1997), Landvik *et al.* (*Nordic Jl Bot.* 17: 403, 1997), O'Donnell *et al.* (*Mycol.* 89: 48, 1997; phylogeny), Harrington *et al.* (*Mycol.* 91: 41, 1999; phylogeny), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).

Discinella Boud. (1885), Helotiaceae. *c.* 12, widespread. See Dennis (*Mycol. Pap.* 62, 1956), Anderson *et al.* (*Mycologist* 15: 132, 2001).

Discinella P. Karst. (1891), ? Pezizales. 1, Europe.

Disciotis Boud. (1885), Morchellaceae. *c.* 4, widespread (north temperate). See O'Donnell *et al.* (*Mycol.* 89: 48, 1997; phylogeny), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny).

Disciseda Czern. (1845), Agaricaceae. 15, widespread. See Moravec (*Sydowia* 8: 278, 1954), Grgurinovic (*Larger Fungi of South Australia*: 725 pp. + 34 [m, 1997]), Jeppson (*Windahlia* 22: 33, 1995; peridial morphology), Moreno *et al.* (*Persoonia* 18: 215, 2003).

Discoascina Beneš (1961), Fossil Fungi. 1 (Carboniferous), former Czechoslovakia.

Discocainia J. Reid & A. Funk (1966), Rhytismataceae. 3, widespread. Some authors place this in the *Helotiaceae*. See Sherwood (*Occ. Pap. Farlow Herb. Crypt. Bot.* 15, 1980), Livsey & Minter (*CJB* 72: 549, 1994).

discocarp, an ascoma in which the hymenium is uncovered when the asci and spores are mature; an apothecium.

Discocera A.L. Sm. & Ramsb. (1917) nom. rej. ? = *Trapelia* fide Hawksworth & David (*Taxon* 38: 493, 1989), Rambold & Triebel (*Notes R. bot. Gdn Edinb.* 46: 375, 1990; status).

Discochora Höhn. (1918) = *Guignardia* fide Bissett (*CJB* 64: 1720, 1986), Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Discocistella Svrček (1962) = *Cistella*.

Discocolla Prill. & Delacr. (1894), anamorphic *Pezizomycotina*, Hsp. = eH.?. 1 or 2, widespread (north temperate).

Discocurtisia Nannf. (1983), Dermateaceae. 1 (on grasses), N. America. See Nannfeldt (*TBMS* 75: 292, 1983).

Discocyphella Henn. (1900) = *Marasmius* fide Kuyper (*in litt.*).

Discodiaportha Petr. (1921) = *Melanconis* fide Wehmeyer (*Revision of Melanconis*, 1941).

Discodothis Höhn. (1909) = *Rhagadolobium* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).

Discofusarium Petch (1921) = *Fusarium* fide Wollenweber & Reinking (*Die Fusarien*, 1935).

Discogloeum Petr. (1923), anamorphic *Pezizomycotina*, Cac.0eH.15. 2, Europe. See von Arx (*Biblthca Mycol.* 24, 1970).

Discohainesia Nannf. (1932), ? Leotiomyces. Anamorphs *Hainesia*, *Pilidium*. 1, N. America; Europe. The anamorph connection requires further research. See Shear & Dodge (*Mycol.* 13: 135, 1921), Palm (*Mycol.* 83: 787, 1991), Rossman *et al.* (*Mycol. Progr.* 3: 275, 2004; phylogeny, anamorph).

discoid, flat and circular; resembling a disk (Fig. 23.5a, b).

discolourous, of a different colour, as of the two surfaces of a foliose lichen thallus.

Discomycella Höhn. (1912), ? Helotiales. 1, Java.

discomycete, one of the *Discomycetes*.

Discomycetella Sanwal (1953) ? = *Miladina*. The type cannot be located. fide Kimbrough (*Bot. Rev.* 36: 91, 1970), Pfister (*Am. J. Bot.* 60: 355, 1973).

Discomycetes. **Cup fungi**; class of *Ascomycota* formerly used for taxa with ascomata which are sessile, open, ± saucer-shaped or cup-shaped apothecia, but these may be covered by a membrane at first or be permanently closed and hypogeous, or have the hymenium borne on stipitate convoluted structures; the apothecia are generally ascohymenial in ontogeny, with unitunicate asci (inoperculate or operculate). The *Helotiales*, *Ostropales*, *Pezizales* and *Rhytismatales* are regularly included, but the name has also been applied to some *Dothideales*, *Patellariales* and *Lecanorales*. The class is not accepted in modern classification but 'discomycetes' still has value as a colloquial descriptive term.

Lit.: **General**: Boudier (1907, 1905-10; see Boudier), Nannfeldt (1932), Dennis (1978), Bellèmere (*BSMF* 83: 393, 753, 1968; inoperc. ontogeny; *Revue mycol.* 41: 233, 1977; ascus ultrastr.), Kimbrough (*Bot. Rev.* 36: 91, 1970; classification; fam. key; in Parker, 1982, 1: 232), Korf (1973), Kamaletdinova & Vassilyeva (*Cytology of discomycetes*, 1982; ultrastr.). See also Le Gal (1953), Seaver (1928) cited below, and under *Ascomycota*, ascus, Lichens and Macromycetes.

Regional: **America, North**, Seaver (*North American cup-fungi. (Operculates)*, 1928; suppl. 1942; nomenclatural revision, Pfister, *Occ. Pap. Farlow Herb. Cryptog. Bot.* 17, 1982); *North American cup-fungi. (Inoperculates)*, 1951). **Argentina**, Gamundí (*Darwiniana* 12: 386, 1962, *Leotiales*; 13: 568, 1964, *Pezizales*; keys). **Australasia**, Rifai (*Verh. K. ned. Akad. wet. ser. 2* 57(3), 1968; *Operculates*); Spooner (1987; *Leotiales*) **British Isles**, Ramsbottom & Balfour-Browne (*TBMS* 34: 38, 1951; checklist), Dennis (1978), Cannon *et al.* (1981). **Canada**, Abbott & Currah (*The larger cup fungi and other ascomycetes of Alberta*, 1989; keys). **former Czechoslovakia**, Velenovský (*Monographia discomycetum Bohemiae*, 2 vols, 1934). **Europe**, see Boudier (1907, 1905-10). **France**, Gillet (*Champignons de France. Les Discomycetes*, 1879-83 [reprint 1979 (*Bull. Soc. bot., C.-o.*; num. spéc. 3)]). **Germany**, Baral & Krieglsteiner (*Z. Mykol., Beih.* 6, 1985; inoperculates). **India**, Batra & Batra (*Kansas Univ. Sci. Bull.* 44: 109, 1963; 185 spp. keys), Thind & Singh (*Res. Bull. Punjab Univ.* 22: 51, 1971). **Japan**, Otani (*Trans. mycol. Soc. Japan* 31: 117, 1990; keys gen.). **Madagascar**, Le Gal (*Les discomycètes de Madagascar [Prodr. Fl. mycol. Madagascar* 40], 1953). **Russia**, Naumov (*Flora gribov Leningradskovoblasti, Vypusk II. Diskomitsety*, 1964; keys). **Switzerland**, Breitenbach & Kränzlin (*Pilzäner Schweiz* 1, 1984).

Discomycetoidea Matsush. (1993), anamorphic *Pezizomycotina*, Hsy.0eP.22. 1, Ecuador. See Matsushima (*Matsush. Mycol. Mem.* 7: 49, 1993).

Discomycopsella Henn. (1902) = *Phyllachora* Nitschke ex Fuckel (1870) fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).

Discomycopsis Müll. Arg. (1893) ? = *Euryachora* fide Ferdinandsen & Rostrup (*Dansk bot. Ark.* 5 no. 20, 1928).

- Discorehmia** Kirschst. (1936), ? Helotiaceae. 5, Europe. See Nauta & Spooner (*Mycologist* 13: 3, 1999).
- Discosia** Lib. (1837), anamorphic *Amphisphaeriaceae*, St.≡ eP.19. 32, widespread (esp. temperate). See Subramanian & Reddy (*Kavaka* 2: 57, 1974; types), Reddy in Subramanian (Ed.) (*Taxonomy of fungi* 2: 493, 1984), Nag Raj (*CJB* 69: 1246, 1991; excluded spp.), Vanev (*Mycotaxon* 41: 387, 1991; sects.), Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993), Vanev (*Mycotaxon* 49: 199, 1993), Wu & Sutton (*MR* 100: 287, 1996), Jeewon *et al.* (*Mol. Phylogen. Evol.* 25: 378, 2002; phylogeny), Jeewon *et al.* (*MR* 107: 1392, 2003; phylogeny).
- Discosiella** Syd. & P. Syd. (1912), anamorphic *Pezizomycotina*. See Subramanian & Reddy (*Proc. Indian natn Sci. Acad. Part B. Biol. Sci.* 75: 111, 1972), Nag Raj (*CJB* 59: 2519, 1981), Eriksson & Hawksworth (*SA* 11: 56, 1992), Kobayashi *et al.* (*Mycoscience* 46: 78, 2005; Japan).
- Discosiellina** Subram. & K.R.C. Reddy (1972), anamorphic *Pezizomycotina*, Cpt.0fH.1. 1, India. See Nag Raj (*CJB* 59: 2531, 1981).
- Discosiopsis** Edward, Kr.P. Singh, S.C. Tripathi, M.K. Sinha & Ranade (1974) = *Pestalotiopsis* fide Sutton (*Mycol. Pap.* 141, 1977).
- Discosiospora** A.W. Ramaley (1989) = *Discosia* fide Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993).
- Discosphaera** Dumort. (1822) nom. rej. prop. = *Hypoxylon* Bull. See Læssøe (*SA* 13: 43, 1994; ? synonym of *Xylaria*).
- Discosphaerina** Höhn. (1917), *Dothioraceae*. Anamorphs *Kabatia*, *Kabatiella*, *Sarcophoma*, *Selenophoma*, *Hormonema*-like, *Aureobasidium*-like. 11, Europe; N. America. The genus has been confused with *Guignardia*. See Barr (*Contr. Univ. Mich. Herb.* 9: 523, 1972), Holm *et al.* (*Karstenia* 39: 59, 1999), Yurlova *et al.* (*Stud. Mycol.* 43: 63, 1999; DNA), Lumbsch & Lindemuth (*MR* 105: 901, 2001; phylogeny).
- Discospora** Arthur (1907) = *Pileolaria* fide Arthur (*Manual Rusts US & Canada*, 1934).
- Discosporella** Höhn. (1927) = *Conostroma* fide Petrak (*Annls mycol.* 27: 371, 1929).
- Discosporiella** Petr. (1923) = *Cryptosporiopsis* fide von Arx (*Verh. K. ned. Akad. Wet. Amst. C* 51: 22, 1957).
- Discosporina** Höhn. (1927), anamorphic *Pezizomycotina*, Cac.0eH.15. 4, widespread.
- Discosporiopsis** Petr. (1921) = *Phacidiopycnis* fide Sutton (*Mycol. Pap.* 141, 1977).
- Discosporium** Höhn. (1915), anamorphic *Cryptodiaporthes*, St.0eH.19. 3, widespread. See Sutton (*The Coelomycetes*, 1980).
- Discosporium** Sacc. & P. Syd. (1902), anamorphic *Pezizomycotina*, Hsp.0eP.?. 1, Italy.
- Discostroma** Clem. (1909), *Amphisphaeriaceae*. Anamorph *Seimatosporium*. 28, widespread. See Brockmann (*Sydowia* 28: 275, 1976; key), Sivanesan (*TBMS* 81: 325, 1983), Kang *et al.* (*Fungal Diversity* 1: 147, 1998; DNA), Kang *et al.* (*MR* 103: 53, 1999), Jeewon *et al.* (*Mol. Phylogen. Evol.* 25: 378, 2002; phylogeny), Kang *et al.* (*Mycotaxon* 81: 321, 2002), Jeewon *et al.* (*MR* 107: 1392, 2003; phylogeny), Hatakeyama & Harada (*Mycoscience* 45: 106, 2004; on *Paeonia*), Paulus *et al.* (*Sydowia* 58: 76, 2006; key).
- Discostromella** Petr. (1924) = *Leptostromella* fide Clements & Shear (*Gen. Fung.*, 1931).
- Discostromopsis** H.J. Swart (1979) = *Discostroma* fide Sivanesan (*TBMS* 81: 325, 1983).
- Discotheciella** Syd. & P. Syd. (1917), anamorphic *Pezizomycotina*, Cpt.1eH.?. 1, Philippines.
- discothecium**, an ascostroma resembling an apothecium but bearing cylindrical bitunicate asci and differing from a hysterothecium by the weathering away of the covering layer (Korf, *Mycol.* 54: 25, 1962).
- Discothecium** Syd. & P. Syd. (1916) = *Discotheciella*.
- Discothecium** Zopf (1897) = *Endococcus* fide Hawksworth (*Bot. Notiser* 132: 283, 1979).
- Discoxylaria** J.C. Lindq. & J.E. Wright (1964), *Xylariaceae*. Anamorph *Hypocreodendron*. 1, Argentina; Mexico. See Rogers *et al.* (*Mycol.* 87: 41, 1995).
- Discozythia** Petr. (1922), anamorphic *Pezizomycotina*, ?0eH.?. 3, Europe.
- discrete** (1) separate; not joining; (2) (of a conidiogenous cell), not subtended by a conidiophore; cf. integrated.
- discrete body**, a non-functional cleistothecial initial of a dermatophyte in culture; pseudocleistothecium.
- Discula** Sacc. (1884), anamorphic *Apiognomonina*, *Gnomonia*, *Gnomoniella*, *Plagiostoma*, Cac.0eH.15. 15, Europe; N. America. See von Arx (*Verh. K. ned. Akad. Wet. Amst. C* 51: 32, 1957), Petrak (*Sydowia* 15: 221, 1962), Petrak (*Sydowia* 24: 270, 1971), Swart *et al.* (*Phytophylactica* 22: 143, 1990; *D. platani* on plane trees in S. Afr.), Redlin (*Mycol.* 83: 633, 1991; *Cornus anthracnose*), Haemmerli *et al.* (*Mol. Plant-Microbe Interact.* 5: 479, 1992; differentiation by RAPDs), Toti *et al.* (*MR* 96: 420, 1992; morphometry), Pacumbaba & Beyl (*Phytopathology* 83: 467, 1993; physiology), Stanosz (*Pl. Dis.* 77: 1022, 1993; on *Acer*), Trigiano *et al.* (*Phytopathology* 83: 1338, 1993; DNA), McElreath *et al.* (*Curr. Microbiol.* 29: 57, 1994; double-stranded RNA in *D. destructiva*), Viret & Petrini (*MR* 98: 423, 1994; colonization), Viret *et al.* (*New Phytol.* 127: 123, 1994; infection process), Yao *et al.* (*Curr. Microbiol.* 29: 145, 1994; genetics), Trigiano *et al.* (*Mycol.* 87: 490, 1995; biogeography), Cohen (*Mycol.* 91: 917, 1999; isolation), Caetano-Anollés *et al.* (*Curr. Genet.* 39: 346, 2001; evolution), Rong *et al.* (*Curr. Microbiol.* 42: 144, 2001; phylogeny), Zhang & Blackwell (*Mycol.* 93: 355, 2001; phylogeny), Castlebury *et al.* (*Mycol.* 94: 1017, 2002; phylogeny), Zhang & Blackwell (*Phytopathology* 92: 1276, 2002; population structure), Green & Castlebury (*MR* 111: 62, 2007; phylogeny, anamorph).
- Disculina** Höhn. (1916), anamorphic *Dothideomycetes*, St.0eH.19. 1, Europe.
- disinfectant**, a substance for the destruction of pathogenic microorganisms.
- disjunct**, a cell or projection, sometimes having a short existence, developing through the pores of septal lamellae of adjoining conidia in a chain (e.g. in *Monilinia*); a connective. See Batra (*Mycol.* 80: 660, 1988).
- disk**, see disc.
- Disparidicellites** Kalgutkar & Janson. (2000), Fossil Fungi. 1, China. See Kalgutkar & Jansonius (*AASP Contributions Series* 39: 94, 2000).
- Disperma** Theiss. (1916) [non *Disperma* J.F. Gmel. 1792, *Rubiaceae*] = *Dicarpella*.
- dispersal spore**, a spore disseminated by wind, water, or other agent; diaspore.

- Dispira** Tiegh. (1875), Dimargaritaceae. 4 (mycoparasitic on *Mucorales* and *Chaetomium*), widespread. See Benjamin (*Aliso* 5: 248, 1963; key), Kurtzman (*Mycol.* 60: 915, 1968; parasitism & culture), Misra & Lata (*Mycotaxon* 8: 372, 1979), White *et al.* (*Mycol.* 98: 872, 2006; phylogeny).
- dispore**, one of the spores of a 2-spored basidium as opposed to a **tetraspore**, one of the spores of a 4-spored basidium (Corner, 1947). Cf. monospore.
- Disporotrichum** Stalpers (1984), anamorphic *Agaricales*, Hso.0eH.10. 1, Netherlands. See De Hoog & Gerrits (*Mycoses* 41: 183, 1998; molec. diagn. clinical isol.).
- dissepiment**, a partition, e.g. that between the pores of a polypore.
- Dissitimurus** E.G. Simmons, McGinnis & Rinaldi (1987), anamorphic *Pezizomycotina*, Hso.≡ eP.3/10. 1 (from humans), USA. See Simmons *et al.* (*Mycotaxon* 30: 247, 1987).
- Dissoacremoniella** Kiril. (1970), anamorphic *Pezizomycotina*, Hso.0eH.6. 1, former USSR. See Kirilenko (*Nov. sist. Niz. Rast.* 7: 235, 1970).
- dissociation**, Leonian's name for mutation or saltation.
- Dissoconium** de Hoog, Oorschot & Hijwegen (1983), anamorphic *Mycosphaerella*, Hso.0-1eH.10. 2, widespread. See de Hoog & Takeo (*Antonie van Leeuwenhoek* 59: 285, 1991; karyology), Crous *et al.* (*Sydowia* 51: 155, 1999), Crous *et al.* (*Stud. Mycol.* 45: 107, 2000; phylogeny), Crous *et al.* (*Mycol.* 93: 1081, 2001; phylogeny), Crous *et al.* (*Stud. Mycol.* 50: 195, 2004; on *Eucalyptus*), Hunter *et al.* (*Stud. Mycol.* 55: 147, 2006; on *Eucalyptus*), Arzanlou *et al.* (*Persoonia* 20: 24, 2008; phylogeny).
- Dissoderma** (A.H. Sm. & Singer) Singer (1974) = *Squamanita* fide Kuyper (*in litt.*).
- Dissophora** Thaxt. (1914), Mortierellaceae. 3, widespread (north temperate). See Carreiro & Koste (*CJB* 70: 2177, 1982; growth temperature), Gams & Carreiro (*Stud. Mycol.* 31: 85, 1985; taxonomy), Benny (*CJB* 73 Suppl. 1: S725, 1995), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny), White *et al.* (*Mycol.* 98: 872, 2006; phylogeny).
- distal**, situated away from either the centre of a body or the point of origin; terminal; cf. proximal.
- Distichomyces** Thaxt. (1905) = *Rickia* fide Thaxter (*Proc. Amer. Acad. Arts & Sci.* 48: 363, 1912).
- distichous**, in two lines.
- Distocercospora** N. Pons & B. Sutton (1988), anamorphic *Mycosphaerellaceae*, Hso.≡ eP.10. 1, widespread. See Pons & Sutton (*Mycol. Pap.* 160: 60, 1988), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003), Kirschner *et al.* (*Fungal Diversity* 17: 57, 2004; Taiwan).
- Distolomyces** Thaxt. (1931), Laboulbeniaceae. 3, Europe; Asia. See Santamaría (*Fl. Mycol. Iberica* 5, 2003; Iberian peninsula).
- Distopyrenis** Aptroot (1991), Pyrenulaceae. 8, widespread (tropical). See Harada (*Mycoscience* 41: 491, 2000).
- Distorimula** F. San Martín, P. Lavín, Esqueda (1999), Xylariales. 1, Mexico. See San Martín *et al.* (*Mycotaxon* 73: 263, 1999).
- distoseptate** (of septation), having the individual cells each surrounded by a sac-like wall distinct from the outer wall, as in *Drechslera* (Luttrell, *Mycol.* 55: 672, 1963) (Fig. 22A-B). Cf. euseptate.
- Distothelia** Aptroot (2005), ? Monoblastiaceae (L). 1, Hong Kong. See Seaward & Aptroot (*Bryologist* 108: 284, 2005).
- distribution**, see Geographical distribution.
- Ditangifibula** G.C. Adams (1996), anamorphic *Pezizomycotina*, Hso.???. 1, Alaska. See Adams *et al.* (*Mycol.* 87: 911, 1995), Kirschner & Chen (*Stud. Mycol.* 50: 337, 2004).
- Ditangium** P. Karst. (1867), anamorphic *Craterocola*. 1, Europe. See Donk (*Persoonia* 4: 165, 1966).
- Dithelopsis** Clem. (1909) = *Thelopsis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- dithiocarbamates**, organic fungicides; **dimethyl-** (DMDC): thiram, ferbam, ziram; **ethylene-bis-** (EBDC): maneb, mancozeb, zineb.
- Dithozetia** Clem. & Shear (1931) = *Didymothozetia*.
- Ditiola** Fr. (1822), Dacrymycetaceae. c. 10, widespread. See McNabb (*N.Z. J. Bot.* 4: 546, 1966), Gonorova (*Mikologiya i Fitopatologiya* 28: 1, 1994).
- Ditiola** P. Browne (1756) ? = *Schizophyllum* fide Donk (*Beih. Nova Hedwigia* 6: 89, 1962).
- Ditiola** Schulzer (1860) = *Holwaya*.
- Ditmaria** Lühnem. (1809) nom. dub., ? Fungi.
- Ditopella** De Not. (1863), Gnomoniaceae. 1 (on *Alnus* bark), Europe. See Reid & Booth (*CJB* 45: 1479, 1967), Barr (*Mycol. Mem.* 7: 232 pp., 1978), Castlebury *et al.* (*Mycol.* 94: 1017, 2002; phylogeny).
- Ditopellina** J. Reid & C. Booth (1967), Diaporthales. 1, Europe. See Reid & Booth (*CJB* 45: 1481, 1967), Stoykov & Denchev (*Mycol. Balcanica* 3: 179, 2006; Bulgaria).
- Ditopellopsis** J. Reid & C. Booth (1967), Diaporthales. 4, N. America. See Barr (*Mycol. Mem.* 7, 1978), Barr (*Mycotaxon* 41: 287, 1991), Monod (*Beih. Sydowia* 9: 1, 1993).
- Ditremis** Clem. (1909) nom. rej. = *Anisomeridium* fide McCarthy (*Aust. Syst. Bot.* 5: 125, 1992; Australia), McCarthy (*Muelleria* 8: 1, 1993), Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Ditylis** Clem. (1909) = *Tylophoron* fide Tibell (*Beih. Nova Hedwigia* 79: 597, 1984).
- diurnal**, in daylight hours. Cf. circadian, diel.
- divaricate**, divergent at right angles.
- Diversispora** C. Walker & Schüssler (2004), Diversisporaceae. 1, USA. See Walker & Schüssler (*MR* 108: 982, 2004), Redecker & Raab (*Mycol.* 98: 885, 2006; phylogeny).
- Diversisporaceae** C. Walker & A. Schüssler (2004), Diversisporales. 1 gen., 1 spp.
Lit.: Azcon-Aguilar & Barea (*Mycorrhiza* 6: 457, 1996), van der Heijden *et al.* (*Nature Lond.* 396: 69, 1998), Schüßler *et al.* (*MR* 105: 1413, 2001), Walker & Schüssler (*MR* 108: 982, 2004), Redecker (*Glomeromycota* Arbuscular mycorrhizal fungi and their relative(s). Version 01 July 2005. <http://tolweb.org/Glomeromycota/28715/2005.07.01> in The Tree of Life Web Project, <http://tolweb.org>: [unpaginated], 2005).
- Diversisporales** C. Walker & A. Schüssler (2004). *Glomeromycetes*. 4 fam., 6 gen., 74 spp. Fams:
- (1) **Acaulosporaceae**
 - (2) **Diversisporaceae**
 - (3) **Diversisporaceae**
 - (4) **Pacisporaceae**
- For *Lit.* see under fam.
- diverticulum**, a pocket-like side branch, as on mycelium of *Pythium*.
- Divinia** Cif. (1955), anamorphic *Pezizomycotina*, Hso.≡ eP.?. 1, Dominican Republic. See Ciferri (*Sydowia* 9: 326, 1955).

Dixidium R.A. Poiss. (1932) = *Smittium* fide Manier & Lichtwardt (*Annls Sci. Nat. Bot.*, sér. 12 9: 519, 1968).

Dixomyces I.I. Tav. (1985), Laboulbeniaceae. 14, widespread. See Tavares (*Mycol. Mem.* 9: 627 pp., 1985), Terada (*Mycoscience* 39: 77, 1998; Japan).

Dixophyllum Earle (1909) = *Russula* fide Singer (*Agaric. mod. Tax.*, 1951).

DNA, see Molecular biology.

DNA fingerprinting. This relies on repetitive sequences which are dispersed through the genome and which have a high variability; these are valuable in the manufacture of genotype-specific probes for species or pathogenic races, e.g. in mycology in *Magnaporthe grisea* (Hamer *et al.*, *Proc. Nat. Acad. Sci., USA* 86: 9981, 1989). DNA fingerprinting is of particular use in characterization of individual strains and populations, especially in medical mycology (e.g. Girordin *et al.*, *J. Infect. Dis.* 169: 683, 1994). Most methods use the polymerase chain reaction (PCR, see Molecular Biology). Some more widely-used methods are listed below. In some cases more than one name or acronym has been appropriated to describe essentially the same method but with subtle variations (e.g. AP-PCR [arbitrarily primed PCR] has been used as a synonym for both RAPD [q.v.] and SSR-PCR [q.v.] by separate researchers; strictly speaking it is more accurately applied to the former as SSR-PCR does not involve 'arbitrary' primers).

RAPD (random amplified polymorphic DNA) analysis uses PCR with short primers to produce sufficient amounts of particular parts of a target DNA or RNA sequence that can then be compared in agarose gels; this is especially useful in studies of closely allied fungi where species-specific patterns can be found (Schaad *et al.*, in Hawksworth, 1994: 461), and when dealing with small samples (e.g. a single spore or old type collection). Problems with lack of reproducibility have led to this method being largely superseded by other, more consistent, methods (see below).

SSR-PCR / VNTR-PCR (simple sequence repeat PCR / variable number tandem repeat PCR). In general this method may be viewed as a more stringent version of RAPD involving the use of longer oligonucleotide primers and higher annealing temperatures. The primers tend to be made of repeated double, triple or even quadruple units [e.g. (CA)₉, (CAG)₅, (GACA)₄] which are complementary to the flanking regions of variable number tandem repeats of the microsatellite DNA (see Bridge *et al.*, *Lett. Appl. Microbiol.* 24: 426, 1997).

ISSR-PCR (inter-simple sequence repeat PCR). This method is a modified form of the SSR-PCR method that incorporates higher annealing temperatures and oligonucleotide primers comprising simple sequence repeat units anchored with so-called degenerate ends [e.g. 5'-BDB(ACA)₅ where 'B' denotes 'not A' and 'D' denotes 'not C'; see Grünig *et al.*, *MR* 105: 24, 2001; use in dark septate endophytes]. This method is considered superior to many other fingerprinting methods owing to its genome-wide coverage (rather than being localised to particular 'hotspots') and the large number of fragments generated that result in complex banding patterns (see Taylor *et al.*, *Ann. Rev. Phytopathol.* 37: 197, 1999).

AFLP (amplified fragment length polymorphism) is a technique that combines the resolving power of

RAPD (q.v.) with the reproducibility of RFLP analyses (see *Molecular Biology*); first developed by Vos *et al.* (*Nuc. Acids Res.* 23: 4407, 1995). Has since been used extensively in fungi even from a single spore (e.g. see Rosendahl & Taylor, *Mol. Ecol.* 6: 821, 1997; use in arbuscular mycorrhizal fungi, Majer *et al.*, *MR* 100: 1107, 1996; use with *Cladosporium*, Duncan & Cooke, *Mycologist* 16: 59, 2002; use with *Phytophthora*).

SCARs (sequence-characterised amplified regions) are polymorphic bands (produced normally by one of the methods above and visualised on a polyacrylamide gel for optimal separation) which are found to be diagnostic for a particular population or individual. Such bands are excised from the gel and the DNA extracted and sequenced, allowing new specific primers to be created that may allow detection of the particular strain (e.g. Hermosa *et al.*, *Curr. Gen.* 38: 343, 2001; SCAR marker in *Trichoderma*).

SSCP (single-strand conformational polymorphism) allows the separation of isolates that produce fragments of identical size from a given amplification. This is achieved by the use of native polyacrylamide gels and, in theory, can allow separation of samples differing in as little as a single base difference (e.g. Bonello *et al.*, *New Phytologist* 138: 533, 1998; use with *Suillus*).

DGGE (denaturing gradient gel electrophoresis) is a sensitive method that enables the discrimination of similarly sized DNA fragments (obtained by PCR amplification of particular regions but using primers containing GC-rich clamps) on the basis of their actual sequence via the medium of an acrylamide gel containing a gradient of denaturing chemical (usually urea and/or formamide; alternatively temperature gradients may be used [i.e. TGGE]). DGGE has been employed widely in bacterial environmental studies where microbial consortia are present but has also been applied to fungal investigations (e.g. Vainio & Hantula, *MR* 104: 927, 2000; use with wood-inhabiting fungi).

DNA sequencing. This involves determination of individual consecutive bases within a given region of DNA. Most sequence analysis is undertaken using the Sanger chain termination method (Sanger & Coulson, *J. Mol. Biol.* 93: 441, 1975) although alternative methods are being developed. In practice the term DNA sequencing encompasses additional aspects of DNA analysis, including comparison of base sequences in particular parts of DNA (or RNA) molecules (for total genome sequencing see Genomics). Ribosomal gene clusters have been most used in phylogenetic studies by mycologists, particularly the genes coding for 5.8S, 18S and 28S rRNA (ribosomal RNA) genes and adjacent non-coding spacers (e.g. internal transcribed spacer [ITS] and intergenic spacer [IGS]) but also functional genes where appropriate (e.g. chitinase for *Trichoderma*, *tef* for *Fusarium* and *Trichoderma* and β -tubulin for *Botrytis* and *Penicillium*, etc.). The method involves the PCR method (see Molecular biology), and base sequences are determined either manually or by automated sequencing machines. Increasingly DNA sequencing is undertaken by capillary electrophoresis but so-called '(polyacrylamide) slab gel' DNA sequencers are still used. Sequences obtained can be subjected to phylogenetic analyses, including already available sequences accessible from on-line databanks. A basic

introduction to the method, which is now pivotal in fungal phylogenetic studies, is provided by Mitchell *et al.* (*Mycologist* 9: 67, 1995).

Voucher specimens. In all molecular studies it is advisable to deposit reference material of the fungi actually used in an appropriate Reference Collection (see Collection and preservation).

DNA sequence libraries: *EMBL Nucleotide Sequence Database* (<http://www.ebi.ac.uk/embl>), maintained at the European Molecular Biology Laboratory's European Bioinformatics Institute; *GenBank* (<http://www.ncbi.nlm.nih.gov/Genbank>), maintained at the National Center for Biotechnology Information, National Institutes of Health, Bethesda, Md, USA; *DDBJ* (<http://www.ddbj.nig.ac.jp>), maintained at the DNA Data Bank of Japan. All three databases exchange new sequence data accessions on a daily basis; see also *Nucleic Acid Res.* 36, 2008; database issue). Recent studies have raised concerns regarding the authenticity/validity of some identifications behind the holdings of these global databases, with suggestions that up to 20% are incorrectly named (see Bridge *et al.*, *New Phytologist* 160: 43, 2003) reinforcing the need for responsible vouchers of specimens (see Vilgalys, *New Phytologist* 160: 4, 2003). Validated sequence databases are available commercially which can allow users to make identifications with appropriate levels of confidence if the relevant databases are purchased. DNA sequencing is now being used to facilitate resolution of morphologically similar taxa (e.g. Pérez-Sierra & Henricot, *Mycologist* 16: 42, 2002).

DNA barcoding. Since the Convention on Biological Diversity (1993) and the resulting Bonn Guidelines (2002), the possibility has been raised of distinguishing taxa mechanically by analogy with the way supermarket products of similar types are distinguished with a hand-held scanner reading a black and white striped product code. The potential for this so-called 'barcoding' of all living organisms is being addressed by the *Consortium for the Barcoding of Life* (CBOL; see <http://barcoding.si.edu> and www.dnabarcodes.org). For each organism, an initial specimen must be collected, followed by laboratory DNA analysis, database generation and data analysis. The supposition is that there is a single region of DNA in all living organisms characteristic for each individual species. In Animalia a region of the mitochondrial cytochrome oxidase c 1 (*cox 1*) gene has been proposed for use. For Fungi this region does not seem to be universally suitable because multiple copies exist in some taxa and there may be large scale length variation (see Rossman, *Inoculum* 58: 1, 2007). The large volume of work already undertaken with the rDNA gene cluster, especially the ITS regions, has led to it being proposed for use in the Fungi, qualified with further work on an additional appropriate region (as the ITS is not appropriate in all taxa due to multiple non-orthologous copies of the region; e.g. see O'Donnell & Cigelnik, *Mol. Phyl. Evol.* 7: 103, 1997; for *Fusarium*).

Doassansia Cornu (1883), Doassansiaceae. 12 (on aquatic plants), widespread. Spore ball, immersed in host tissue, has cortex of sterile cells. See Vánky (*Sydowia* 34: 167, 1981).

Doassansiaceae R.T. Moore ex P.M. Kirk, P.F. Cannon & J.C. David (2001), Doassansiales. 12 gen. (+ 4 syn.), 39 spp.

Lit.: Vánky (*Cryptog. Stud.* 1: 159 pp., 1987), Begerow *et al.* (*CJB* 75: 2045, 1998), Piepenbring *et al.* (*Protoplasma* 204: 155, 1998), Vánky (*MR* 102: 513, 1998), Begerow *et al.* (*MR* 104: 53, 2000), Vánky (*Aust. Syst. Bot.* 14: 385, 2001), Piepenbring (*Bot. Jb.* 24: 241, 2003).

Doassansiales R. Bauer & Oberw. (1997). Exobasidiomycetes. 3 fam., 14 gen., 42 spp. Fams:

(1) **Doassansiaceae**

(2) **Melaniellaceae.**

(3) **Rhamphosporaceae**

For *Lit.* see under fam.

Doassansiella Zambett. (1970) nom. inval., anamorphic *Doassansiopsis*. 1. See Zambettakis (*Revue Mycol.* Paris 35: 164, 1970).

Doassansiopsidaceae Begerow, R. Bauer & Oberw. (1998), Urocystidales. 2 gen., 14 spp.

Lit.: Vánky (*Cryptog. Stud.* 1: 159 pp., 1987), Bauer *et al.* (*CJB* 75: 1273, 1997), Begerow *et al.* (*CJB* 75: 2045, 1998), Vánky (*Aust. Syst. Bot.* 14: 385, 2001), Piepenbring (*Bot. Jb.* 24: 241, 2003), Begerow *et al.* (*MR* 108: 1257, 2004).

Doassansiopsis (Setch.) Dietel (1897), Doassansiopsidaceae. Anamorph *Doassansiella*. 13 (on aquatic plants), widespread. See Vánky (*Mycotaxon* 79: 231, 2001), Vánky (*Mycotaxon* 95: 1, 2006).

Doassinga Vánky, R. Bauer & Begerow (1998), Doassansiaceae. 1 (aquatic on *Callitrichaceae*), Europe. See Hoog *et al.* in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 574, 1998; review).

Dochmiopus Pat. (1887) = *Crepidotus* fide Singer & Smith (*A monograph on the genus Galerina Earle*, 1964).

Dochmolopha Cooke (1878) = *Seimatosporium* fide Shoemaker (*CJB* 42: 411, 1964).

Dodge (Carroll William; 1895-1988; USA). Student, Middlebury College, Vermont (1912-1916); Fellow, Washington University, St Louis (1915-1918); Sergeant, US Army (1918-1920); Instructor in Botany (1921-1924) then Assistant Professor and Curator, Farlow Herbarium, Harvard University (1924-1931); Professor of Botany, Washington University and Mycologist, Missouri Botanic Garden (1931-1963). Noted for work on hypogeous fungi, medical mycology in Latin America, and on lichen-forming fungi, particularly from Antarctica; he also translated Gäumann's (q.v.) classic work *Comparative Morphology of the Fungi* into English. *Publs. Medical Mycology: Fungous Diseases of Men and other Mammals* (1935); Lichens and lichen parasites. *BANZ Antarctic Research Expedition 1929-1931. Reports Series B* 7 (1948); Some lichens of tropical Africa. I-V. *Beihefte zur Nova Hedwigia* (1953-1971). *Biogs, obits etc.* Randolph (*Mycol.* 82: 160, 1990) [portrait].

Dodgea Malençon (1939) = *Truncocolumella* fide Smith & Singer (*Brittonia* 11: 215, 1959).

Dodgella Zebrowski (1936), Fossil Fungi ? Chytridiomycetes. 3 (Eocene – ? Recent), widespread.

dog lichen, *Peltigera* spp., e.g. *P. canina*; used in folk lore for treatment of bites of a rabid dog.

dog stinkhorn, basidioma of *Mutinus caninus*.

Doguetia Bat. & J.A. Lima (1960) = *Trichasterina* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).

Doidge (Ethel Mary; 1887-1965; England, later South Africa). Assistant to Pole Evans, the plant pathologist and mycologist (1908-1912) then Professional Assistant (1912-1929) then Principal Plant Pathologist

- (1929-1942), Division of Botany and Mycology, Transvaal Department of Agriculture, Pretoria. Made contributions on South African fungi (especially rusts) and phytopathology, and compiled a monumental checklist of South African fungi. *Publs.* A preliminary study of the South African rust fungi. *Bothalia* (1927); South African rust fungi *Bothalia* (1928); The South African fungi and lichens to the end of 1945. *Bothalia* (1950). *Biogs, obits etc.* Grumann (1974: 396); Gunn (*Bothalia* 9: 251, 1967, bibliography, portrait).
- Dokmaia** Promp. (2003) ? = *Phaeoisaria* fide Prompttha *et al.* (*Sydowia* 55: 100, 2003).
- Dolabra** C. Booth & W.P. Ting (1964), Dothideomycetes. 1, Malaysia. See Booth & Ting (*TBMS* 47: 237, 1964).
- dolabrate (dolabriform)**, hatchet-like in form (Fig. 23.24).
- dolabriform**, having the shape of the head of an axe or cleaver (Fig. 23.24).
- dolicho-** (in Greek combinations), long.
- Dolichoascus** Thibaut & Ansel (1970), Saccharomycetales. 1 (in *Insecta*), widespread. See Batra in Subramanian (Ed.) (*Taxonomy of fungi* 1: 187, 1978; typification).
- Dolichocarpus** R. Sant. (1949), Roccellaceae (L). 1, Chile. See Tehler (*CJB* 68: 2458, 1990; cladistics), Grube (*Bryologist* 101: 377, 1998; phylogeny), Follmann (*Mitteilungen aus dem Institut für Allgemeine Botanik Hamburg* 30-32: 61, 2002; biogeography).
- dolichospore**, a long spore.
- Dolichousnea** (Y. Ohmura) Articus (2004), Parmeliaceae (L). 4, widespread. See Articus (*Taxon* 53: 932, 2004), Arup *et al.* (*Mycol.* 99: 42, 2007; phylogeny).
- doliiform**, barrel-like in form (Fig. 23.31).
- Doliomyces** Steyaert (1961), anamorphic *Amphisphaeriaceae*, Cpd.≡ eP.19. 2, India; S. America. See Nag Raj & Kendrick (*CJB* 50: 45, 1972).
- dolipore septum**, a septum of a dikaryotic basidiomycete hypha which flares out in the middle portion forming a barrel-shaped structure with open ends as shown by electron microscopy; see Markham (*MR* 98: 1089, 1994; review), Moore (in Hawksworth (Ed.), *Identification and characterization of pest organisms*: 249, 1994; summary diag., Fig. 13), Moore & McAlear (*Am. J. Bot.* 49: 86, 1962); septal pore swelling; cf. parentheses.
- dollar spot**, a turf disease caused by *Sclerotinia homoeocarpa*.
- Domain** (Empire, Superkingdom). A category in Classification (q.v.) above that of kingdom; all fungal phyla belong in kingdoms in the domain *Eukaryota*.
- Domingoella** Petr. & Cif. (1932), anamorphic *Pezizomycotina*, Hsy.0eP.?. 4, widespread (esp. tropical). See Deighton & Pirozynski (*Mycol. Pap.* 128, 1972).
- Domin-scale**, A 10-point scale used in ecological tables to indicate the approximate cover of a surface by different taxa: + = single individuals; 1 = a few individuals; 2 = sparsely distributed; 3 = frequent but cover less than 4%; 4 = cover 4-10%; 5 = cover 11-25%; 6 = cover 26-33%; 7 = cover 34-50%; 8 = cover 51-75%; 9 = 76-90%; 10 = cover 91-100%.
- Donadinia** Bellem. & Mel.-Howell (1990), Sarcosomataceae. 1, Europe; Asia. See Harrington *et al.* (*Mycol.* 91: 41, 1999; phylogeny), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny).
- Donk** (Marinus Anton; 1908-1972; Indonesia, later Netherlands). Student, later doctoral student, University of Utrecht (1927-1933); Mycologist, Buitenzorg Botanic Garden, Java (1934-1940); interned in prison camp (1942-1945) [saving many lives by culturing a yeast to produce much needed vitamins]; Head of Herbarium Bogoriense, Buitenzorg Botanic Garden, Java (1947-1955); Head of the Mycological Department, Rijksherbarium, Leiden (1956-1972); Corresponding Member (1954-1962) then Full Member (1962-1972), Royal Dutch Academy of Sciences. Outstanding taxonomist (especially of *Agaricomycetes*, q.v.), and nomenclaturalist. *Publs.* The generic names proposed for Hymenomycetes. I-XIII. *Reinwardtia* and *Taxon* various vols (1951-1963); The generic names proposed for *Agaricaceae*. *Beihefte zur Nova Hedwigia* (1962); A conspectus of the families of *Aphyllphorales*. *Persoonia* (1964). *Biogs, obits etc.* Maas Geesteranus (*Persoonia* 7: 119, 1973) [bibliography, portrait]; Singer (*Mycol.* 65: 503, 1973) [portrait]; Stafleu & Cowan (*TL-2* 1: 671, 1976).
- Donkella** Doty (1950) = *Clavulinopsis* fide Donk (*Persoonia* 1: 25, 1959) = *Ramariopsis* (Clavar.) fide, Petersen (*Mycol.* 70: 660, 1978).
- Donkia** Pilát (1937) = *Climacodon* fide Maas Geesteranus (*Hydnaceous fungi of the eastern old world*, 1971).
- Donkioporia** Kotl. & Pouzar (1973), Fomitopsidaceae. 1, north temperate. See Kotlaba & Pouzar (*Persoonia* 7: 214, 1973), Kleist & Seehann (*Z. Mykol.* 65: 23, 1999; in buildings).
- Dontuzia** L.D. Gómez (1973), *Pezizomycotina*. 1, widespread (tropical). See Gómez (*Brenesia* 2: 21, 1973).
- Doratomyces** Corda (1829), anamorphic *Microascaeae*. 1, widespread. See von Arx (*Gen. Fungi Sporul. Cult.* Edn 3, 1981; synonym of *Cephalotrichum*), Issakainen *et al.* (*Medical Mycology* 41: 31, 2003; phylogeny, polyphyly), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Doratospora** J.M. Mend. (1930) = *Rizalia* fide Pirozynski (*Kew Bull.* 31: 595, 1977).
- dorsal**, back or upper surface; the surface facing away from the axis, cf. ventral; sometimes used for the upper surface of foliose lichens.
- Dothichiza** Lib. ex Roum. (1880), anamorphic *Dothiora*, St.0eH.?. 15, widespread. See Petrak (*Sydowia* 10: 201, 1957), Sutton (*Mycol. Pap.* 141, 1977), Sutton & Livsey (*TBMS* 88: 271, 1987).
- Dothichloë** G.F. Atk. (1894) = *Balansia* fide Diehl (*USDA agric. Monogr.* 4, 1950), Reddy *et al.* (*Mycol.* 90: 108, 1998).
- Dothiclypeolum** Höhn. (1916) = *Thyriopsis* fide Clements & Shear (*Gen. Fung.*, 1931).
- Dothidasteris** Clem. & Shear (1931) ≡ *Dothidasteromella*.
- Dothidasteroma** Höhn. (1909), Parmulariaceae. Anamorph *Melanoplaca*. 2, Asia; Australasia. See Swart (*TBMS* 91: 581, 1988).
- Dothidasteromella** Höhn. (1910), Asterinaceae. 3, widespread. See Swart (*TBMS* 91: 453, 1988), Hosagoudar *et al.* (*Journal of Mycopathological Research* 39: 61, 2001).
- Dothidea** Fr. (1818) nom. cons., Dothideaceae. Anamorph *Asteromellopsis*. 20, widespread (temperate). See Silva-Hanlin & Hanlin (*MR* 103: 153, 1999; DNA), Liew *et al.* (*Mol. Phylogen. Evol.* 16: 392, 2000; phylogeny), Lumbsch & Lindemuth (*MR* 105: 901, 2001; phylogeny), Shoemaker *et al.* (*Taxon* 52:

623, 2003; nomencl.), Shoemaker & Hambleton (CJB 83: 484, 2005), Schoch *et al.* (Mycol. 98: 1041, 2006; phylogeny).

Dothideaceae Chevall. (1826), Dothideales. 13 gen. (+ 11 syn.), 79 spp.

Lit.: Butin (*Sydowia* 38: 20, 1985), Hyde & Cannon (Mycol. Pap. 175: 114 pp., 1999), Silva-Hanlin & Hanlin (MR 103: 153, 1999; DNA), Lindemuth *et al.* (MR 105: 1176, 2001), Schoch *et al.* (Mycol. 98: 1041, 2006; phylogeny).

dothideaceous, having the asci in locules in a stroma, as in *Dothidea*.

Dothideales Lindau (1897). Dothideomycetidae. 4 fam., 57 gen., 350 spp. Ascomata perithecial, usually formed as lysigenous locules within stromatic tissue, dark brown. Hymenium not blueing in iodine. Interascal tissue in most cases absent. Asci $\pm$ cylindrical, thick-walled, fissitunicate, usually with a clearly defined ocular chamber but lacking other apical structures. Ascospores usually septate, if septate longitudinally asymmetrical, constricted at the primary septum but not always at the others, hyaline or brown, rarely ornamented. Mostly saprobes or necrotrophic parasites of plants. Fams:

(1) **Dothideaceae**

(2) **Dothioraceae**

The *Coccoideaceae* and *Planistromellaceae* are placed here provisionally as molecular data are lacking. *Lit.*: von Arx & Müller (*Stud. Mycol.* 9, 1975, keys fams, gen.), Barr (*Prodromus to Class Loculoascomycetes*, 1987), Eriksson (*Opera Bot.* 60, 1981), Schoch *et al.* (Mycol. 98: 1041, 2006; phylogeny), Shoemaker *et al.* (*Taxon* 52: 623, 2003; nomencl.).

Dothideites Pat. (1893), Fossil Fungi. 1.

Dothidella Speg. (1880), Polystromellaceae. Anamorph *Stictochorella*. 3, widespread (tropical). See Wakefield (*TBMS* 24: 282, 1940), Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962), Swart (*TBMS* 89: 483, 1987).

Dothideodiplodia Murashk. (1927), anamorphic *Pezizomycotina*, St.1 = eP.19. 1, former USSR.

Dothideomycetes O.E. Erikss. & Winka (1997), *Pezizomycotina*. 11 ord., 90 fam., 1302 gen., 19010 spp. The largest and most varied class of the *Ascomycota*, including most ascolocular ascomycetes with J-bitunicate asci. Ascomata very varied, apothecial, perithecial or cleistothecial, at least nominally formed as lysigenous locules within stromatic tissue; hymenium sometimes gelatinous but not usually blueing in iodine. Interascal tissue frequently present, usually composed of branched or anastomosed paraphysoids or pseudoparaphyses, at least initially attached at both base and apex. Asci usually clavate or cylindrical, thick-walled, usually fissitunicate, rarely with apical structures. Ascospores almost always septate, longitudinally asymmetrical, constricted at the primary septum but not always at the others, sometimes muriform; hyaline or brown, not often ornamented. Saprobes, parasites, rarely lichen-forming, coprophilous, etc.

Subcl.:

(1) **Dothideomycetidae**

(2) **Pleosporomycetidae**

Several orders belong within the *Dothideomycetes* based on molecular data, but cannot be placed with confidence into a specific Subcl. These include the *Botryosphaeriales*, *Hysteriales*, *Jahnulales* and *Pa-*

tellariales. The *Microthyriales* are included here provisionally, as are a further 20 fams and a very large number of gen. without clear affinities, where molecular data are lacking. A number of orders and families placed within the *Dothideomycetidae* sensu *Dictionary* edn 9 are now included within an expanded *Eurotiomycetes*, notably the *Coryneliales* and *Pyrenulales*.

Lit.: von Arx & Müller (*Beitr. Kryptogfl. Schweiz* 11(1), 1954; *Stud. Mycol.* 9, 1975, keys fams, gen.), Barr (*Contr. Univ. Mich. Herb.* 9: 523, 1972, N. Am.; *Mycol.* 71: 935, 1979; *Prodromus to Class Loculoascomycetes*, 1987; orders, fams), Barr & Huhndorf (*in* McLaughlin *et al.* (Eds), *The Mycota* 7A: 283, 2001), Benny & Kimbrough (*Mycotaxon* 12: 1980; non-ostiolate gen.), Berbee (*Mol. Biol. Evol.* 13: 462, 1996; evolution), Eriksson (*Opera Bot.* 60, 1981), Hansford (*Mycol. Pap.* 15, 1946; foliicolous spp.), Harris (*Mich. Bot.* 12: 3, 1973; L.), Janex (*Revue bryol. lichén.* 37: 421, 1971; ontogeny, L.), Liew *et al.* (*Mol. Phylogenet. Evol.* 16: 392, 2000; hamathecium, phylogeny), Lindemuth *et al.* (MR 105: 1176, 2001; phylogeny), Lumbsch & Lindemuth (MR 105: 901, 2001; phylogeny), Luttrell (*Phytopathology* 55: 828, 1965, *in* Ainsworth *et al.* (Eds), *The Fungi* 4A: 135, 1973; keys, gen.), Müller & von Arx (*Beitr. Kryptogfl. Schweiz* 11(2), 1962), Parguey-Leduc (*Ann. Sci. nat., Bot. sér.* 12, 7: 33, 1966; ontogeny), Pirozynski (*Kew Bull.* 31: 595, 1977; trop. fungicolous spp.), Poelt (*in* Ahmadjian & Hale (Eds), *The Lichens*: 599, 1974 [1973]; fams, L.), Reynolds (*Ascomycete Systematics. The Luttrellian Concept*, 1981; centrum types), Schoch *et al.* (Mycol. 98: 1041, 2006; phylogeny), Theissen & Sydow (*Ann. Myc.* 13: 149, 1915; gen.), also under ascus, hamathecium.

Dothideomycetidae P.M. Kirk, P.F. Cannon, J.C. David & Stalpers ex C.L. Schoch, Spatafora, Crous & Shoemaker (2007), Dothideomycetes. Ascomata perithecial or formed as lysigenous locules within stromatic tissue, often developing from pigmented external mycelium. Interascal tissue absent. Asci usually clavate, sometimes almost orbicular, thick-walled and fissitunicate. Ascospores almost always septate, longitudinally asymmetrical, constricted at the primary septum but not always at the others, sometimes muriform; hyaline or brown, not often ornamented. Mostly saprobes or parasites of plants. Ords:

(1) **Capnodiales**

(2) **Dothideales**

(3) **Myriangiales**

The *Dothideomycetidae* is much reduced compared with its treatment in the *Dictionary* edn 9, which equates largely to the *Dothideomycetes* of this edn. See Schoch *et al.* (Mycol. 98: 1041, 2006).

Dothideopsella Höhn. (1915) = *Leptosphaeria* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).

Dothideovalsa Speg. (1909), Diatrypaceae. 3, widespread. See Petrak (*Sydowia* 5: 169, 1951), Rappaz (*Mycol. Helv.* 2: 285, 1987).

Dothidina Theiss. & Syd. (1915) = *Cocodiella* fide Müller & von Arx *in* Ainsworth *et al.* (Eds) (*The Fungi* 4A: 87, 1973).

Dothidites Mesch. (1892), Fossil Fungi. 8 (Tertiary), Europe.

Dothidotthia Höhn. (1918), Pleosporales. c. 10, widespread (temperate). See Barr (*Mycotaxon* 34: 517, 1989; key 7 N. Am. spp.), Aptroot (*Nova Hedwigia*

- 60: 325, 1995), Crous *et al.* (*Stud. Mycol.* 55: 235, 2006; phylogeny, generic limits), Ramaley (*Mycotaxon* 94: 127, 2005; anamorph).
- Dothiomyces** Bat. & J.L. Bezerra (1961) = *Byssolecania* fide Lücking *et al.* (*Lichenologist* 30: 121, 1998).
- Dothiopeltis** E. Müll. (1957), *Leptopeltidaceae*. Anamorph *Idriella*-like. 1, Switzerland. See Holm & Holm (*Bot. Notiser* 130: 115, 1977), Crivelli & Müller (*Bot. Helv.* 93: 33, 1983).
- Dothiopsis** P. Karst. (1884) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Dothiora** Fr. (1837) nom. rej. = *Melanogramma* fide Holm (*Taxon* 24: 475, 1975).
- Dothiora** Fr. (1849) nom. cons., *Dothioraceae*. Anamorphs *Dothichiza*, *Hormonema*. 19, widespread (esp. temperate). See Froidevaux (*Nova Hedwigia* 23: 679, 1973; key), Yurlova *et al.* (*Stud. Mycol.* 43: 63, 1999; DNA), Barr (*Harvard Pap. Bot.* 6: 25, 2001), Schweigkofler *et al.* (*Organ. Divers. Evol.* 2: 1, 2002; phylogeny).
- Dothioraceae** Theiss. & P. Syd. (1918), *Dothideales*. 20 gen. (+ 34 syn.), 153 spp.
Lit.: Froidevaux (*Nova Hedwigia* 23: 679, 1973), Simon *et al.* (*Can. J. Microbiol.* 41: 35, 1995), Sivanesan & Hsieh (*MR* 99: 1295, 1995), Dupont *et al.* (*MR* 102: 631, 1998), Hoog *et al.* (*Stud. Mycol.* 43: 31, 1999), Untereiner & Naveau (*Mycol.* 91: 67, 1999), Urzì *et al.* (*J. Microbiol. Meth.* 36: 95, 1999), Yurlova *et al.* (*Stud. Mycol.* 43: 63, 1999; DNA), Verkley *et al.* (*Mycol.* 96: 558, 2004).
- Dothiorales** = *Dothideales*.
- Dothiorella** Sacc. (1880), anamorphic *Botryosphaeriaceae*. Anamorph *Botryosphaeria*. 56, widespread. See Petrak & Sydow (*Rep. Spec. nov. regni veg.* 42: 214, 1927), Sutton (*Mycol. Pap.* 141, 1977; typification), Crous & Palm (*Sydowia* 51: 167, 1999), Luque *et al.* (*Mycol.* 97: 1111, 2006; on *Vitis*), Phillips *et al.* (*Mycol.* 97: 513, 2005; review, phylogeny), Crous *et al.* (*Stud. Mycol.* 55: 235, 2006; review, phylogeny), Phillips *et al.* (*Persoonia* 21: in press, 2008; phylogeny).
- Dothiorellina** Bubák (1911) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Dothiorina** Höhn. (1911), anamorphic *Chlorociboria*, St.0eH.15. 3, Europe. See Dixon (*Mycotaxon* 1: 193, 1975; teleomorph), Riedl (*Sydowia* 29: 146, 1977; key), Sánchez & Bianchinotti (*Mycotaxon* 102: 395, 2007; ontogeny).
- Dothioropsis** Riedl (1974), anamorphic *Pezizomycotina*, St.0eH.?38. 1, Europe. See Riedl (*Phyton Horn* 16: 222, 1974), Mel'nik & Minter (*Mycologist* 20: 109, 2006; UK).
- Dothisphaeropsis** Höhn. (1919) = *Microsphaeropsis* Höhn. fide Sutton (*Mycol. Pap.* 141, 1977).
- Dothistroma** Hulbary (1941), anamorphic *Mycosphaerella*, St.0fH.1/10. 1, widespread. *D. septospora* causes defoliation of *Pinus*. See Gibson (*Ann. Rev. Phytopath.* 10: 51, 1972), Evans (*Mycol. Pap.* 153, 1984), Wingfield *et al.* (*BioScience* 51: 134, 2001; biogeography), Barnes *et al.* (*Stud. Mycol.* 50: 551, 2004; phylogeny, review), Groenewald *et al.* (*Phytopathology* 97: 825, 2007; mating type genes).
- Dothithyrella** Höhn. (1918) = *Leptopeltis* fide Holm & Holm (*Bot. Notiser* 130: 215, 1977).
- Dothivalsaria** Petr. (1966), *Massariaceae*. 1, Europe. See Barr (*N. Amer. Fl. ser.* 2 13: 129 pp., 1990).
- Dothophaeis** Clem. (1931) = *Englerodothis*.
- Dozya** P. Karst. (1873) [non *Dozya* Sande Lac. 1866, *Musci*] = *Hypocreopsis* P. Karst. fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- DR curve**, a log-probit dosage-response curve (Horsfall, *Principles of fungicidal action*, 1956).
- Drechmeria** W. Gams & H.-B. Jansson (1985), anamorphic *Clavicipitaceae*, Hso.0eH.15. 2 (from nematodes and protozoans), widespread. See Gernandt & Stone (*Mycol.* 91: 993, 1999; phylogeny), Gams & Zare (*Mycology Series* 19: 17, 2003; review).
- Drechslera** S. Ito (1930) nom. cons., anamorphic *Pyrenophora*, Hso. = eP.26. c. 29 (graminicolous), widespread. See Shoemaker (*CJB* 37: 880, 1959), Shoemaker (*CJB* 40: 809, 1962; key 14 spp.), Pandey & Gupta (*Acta Mycologica Warszawa* 20: 209, 1986; as a mycoparasite), Sivanesan (*Mycol. Pap.* 158: 1, 1987; keys), Alcorn (*Ann. Rev. Phytopath.* 26: 27, 1988; gen. taxonomy), Muchovej *et al.* (*Fitopatol. Brasil* 13: 211, 1988; keys), Strobel *et al.* (*Phytoparasitica* 16: 145, 1988; phytotoxins), Ondrej (*Česká Mykol.* 43: 45, 1989; key 20 Czech spp.), Khazanov (*Opredelitel' Gribov-Vozbul. 'Gel'mintosporiozov' Rast. iz Rodov Bipolaris, Drechslera i Exserohilum*, 1992), Goh *et al.* (*Fungal Diversity* 1: 85, 1998; ribosomal RNA analysis), Maraite (*Helminthosporium Blights of Wheat: Spot Blotch and Tan Spot Proceedings of an International Workshop Held at CIMMYT, El Batan, Mexico, 9-14 February 1997*: 6, 1998; nomencl.), Turgeon & Berbee (*Molecular Genetics of Host-Specific Toxins in Plant Disease*: 153, 1998; evolution), Jawhar *et al.* (*Cereal Research Communications* 28: 87, 2000; *D. graminea* group), Mehta (*Fitopatol. Brasil* 26: 590, 2001; on *Avena*), Zhang & Berbee (*Mycol.* 93: 1048, 2001; phylogeny), Ondrej & Minariková (*Petria* 12: 267, 2002; morphology), Friesen *et al.* (*Phytopathology* 95: 1144, 2005; on *Triticum*), Serenius *et al.* (*MR* 109: 809, 2005; on *Hordeum*).
- Drechslerella** Subram. (1964), anamorphic *Orbilia*, Hso. = eH.1/10. 1, USA. See Scholler *et al.* (*Sydowia* 51: 89, 1999; gen. concept & n. combs), Li *et al.* (*Mycol.* 97: 1034, 2006; phylogeny), Yu *et al.* (*Mycotaxon* 96: 163, 2006; teleomorph).
- Drechsleromyces** Subram. (1978), anamorphic *Pezizomycotina*, Hso.0fH.10. 1, USA. See Subramanian (*Kavaka* 5: 93, 1977), Rubner (*Stud. Mycol.* 39, 1996).
- Dremuspora** Sal.-Cheb. & Locq. (1980), *Fossil Fungi*. 1, Cameroon.
- Drepanoconis** J. Schröt. & Henn. (1896), *Cryptobasidiaceae*. 3, S. America. See Linder (*Ann. Mo. bot. Gdn* 16: 343, 1929), Gómez & Kisimova-Horovitz (*Revta Biol. trop.* 45: 1293, 1998; Costa Rica), Bege-row *et al.* (*Mycol. Progr.* 1: 187, 2002), Hendrichs (*Sydowia* 55: 33, 2003; Central & South America).
- Drepanomyces** Thaxt. (1931), *Ceratomycetaceae*. 1, Sumatra; Sarawak. See Tavares (*Mycol. Mem.* 9: 627 pp., 1985), Bameul (*Nouv. Rev. Entomol. Nouv. sér.* 10: 19, 1993).
- Drepanopeziza** (Kleb.) Höhn. (1917), *Dermateaceae*. Anamorphs *Gloeosporidiella*, *Marssonina*, *Monostichella*. 14, widespread (temperate). See Rimpau (*Phytopath. Z.* 43: 257, 1962; on *Ribes*, *Populus*, *Salix*; keys), Spiers (*Eur. J. For. Path.* 28: 233, 1998; on *Populus*, New Zealand), Spiers & Hopcroft (*MR* 102: 1025, 1998), Nauta & Spooner (*Mycologist* 14: 21, 2000; UK).
- Drepanospora** Berk. & M.A. Curtis (1875), anamor-

- phic *Pezizomycotina*, Hso.0≡ hP.1/10. 2, widespread. See Goos (*Mycol.* 81: 356, 1989).
- DRIPs**, An assemblage of protistans named from the initial letters of the original constituent organisms (*Dermocystidium*, Rosette Agent, *Ichthyophonus*, *Psorospermium*). In phylogenetic trees derived from 18S rRNA, the DRIPs clade appears as a sister group to animals, fungi and choanozoans and usually basal to all three. Members of the group typically possess vesicular mitochondrial cristae and a walled trophic phase. All appear to be parasitic. More recently other taxa have been added: *Rhinosporidium* (See Herr *et al.*, 1999), *Anurofeca* (See Baker *et al.*, 1999) and *Amoebidium parasiticum* (See Ustinova *et al.*, *Protist* 151: 253, 2000). See also Ragan *et al.* (*Proc. Natl. Acad. Sci. USA* 93: 11907, 1996), Cavalier-Smith (*Biol. Rev.* 73: 203, 1998).
- Drosella** Maire (1935) = *Chamaemyces* fide Singer (*Agaric. mod. Tax.*, 1951).
- Drosophila** Qué. (1886) = *Psathyrella* fide Singer (*Agaric. mod. Tax.*, 1951) the name is used by, Romagnesi (*BSMF* 91: 137, 1975).
- Drudeola** Kuntze (1891), anamorphic *Pezizomycotina*. 2, USA. See Sutton (*Mycol. Pap.* 141, 1977).
- Drummondia** Bat. & H. Maia (1963) [non *Drummondia* Hook. 1828, *Musci*] = *Mycoasteria* fide Farr (*Mycol.* 78: 280, 1986).
- Drumopama** Subram. (1957), anamorphic *Pezizomycotina*, Hsy.0eP.10. 1, India; Cuba. See Subramanian (*Proc. Indian Acad. Sci. series B* 46: 333, 1957), Castañeda Ruiz & Kendrick (*Univ. Waterloo Biol. Ser.* 32, 1990; Cuba).
- Druparia** Raf. (1808) nom. dub., Agaricomycetes. ? 'gasteromycetes'.
- Drupasias** Raf. (1809) = *Druparia*.
- druse**, a stellate cluster of large crystals in a lichen thallus.
- dry rot fungus** (or house fungus), *Serpula lacrymans*; see Seehann & Hegarty (*Docs. Internat. Res. Group Wood Preserv. IRG/WP/1337*, 1988; bibliogr.), Watkinson (*Biodet. Abstr.* 8: 161, 1994; review).
- dry spore**, a spore that becomes separated without slime from the cell producing it (Mason, 1937); cf. slime spore. See *Xerosporae*.
- Dryadomyces** Gebhardt (2005), anamorphic *Ophiostomataceae*, H??.?. 1 (from ambrosia beetles), Taiwan. See Gebhardt *et al.* (*MR* 109: 693, 2005).
- dryad's club**, basidioma of *Clavaria pistillaris*.
- dryad's saddle**, basidioma of *Polyporus squamosus*.
- Dryinosphaera** Dumort. (1822) nom. dub., *Pezizomycotina*. Used for diverse perithecioid fungi.
- Dryodon** Qué. ex P. Karst. (1881) = *Hericium* Pers. fide Donk (*Taxon* 5: 69, 1956).
- Dryophila** Qué. (1886) = *Pholiota* fide Patouillard (*Essai taxonomique sur les familles et les genres des Hyménomycètes*, 1900).
- Dryophilum** Schwein. (1834) nom. dub., Fungi. ? Based on insect galls.
- Dryosphaera** Jørg. Koch & E.B.G. Jones (1989), anamorphic *Pezizomycotina*, T. 2 (marine), widespread. See Kohlmeyer & Volkmann-Kohlmeyer (*CJB* 71: 992, 1993).
- dual phenomenon** (in anamorphic fungi), the condition in which a fungus is made up of two culturally different elements or individuals (Hansen, *Mycol.* 30: 442, 1938; Hansen & Snyder, *Am. J. Bot.* 30: 419, 1943).
- dual propagule** (in a lichen), one comprising elements of both the fungal and the photosynthetic partner (e.g. isidium, soredium; see Lichens).
- Dualomyces** Matsush. (1987), anamorphic *Pezizomycotina*, Hso.0fH-P.10/11. 2, Taiwan. See Matsushima (*Matsush. Mycol. Mem.* 5: 13, 1987).
- Dubiocarpon** S.A. Hutch. (1955), Fossil Fungi ? Ascomycota. 5 (Carboniferous), Europe; USA. See Baxter (*Paleont. Contrib. Univ. Kansas* 77, 1975), Pirozynski (*Ann. Rev. Phytopath.* 14: 237, 1976).
- Dubiomyces** Lloyd (1921) = *Ustilaginoidea* fide Diehl (*in litt.*) See, Stevenson & Cash (*Lloyd, The new fungus names*, 1936).
- Dubitatio** Speg. (1882), Massariaceae. Anamorph *Aplosporella*-like. 1 (on rotten wood), S. America (temperate). See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Duboscqia** Pérez (1908), Microsporidia. 3.
- Dubujiana** D.R. Reynolds & G.S. Gilbert (2005), Microthyriaceae. 1, Australia. See Reynolds & Gilbert (*Aust. Syst. Bot.* 18: 282, 2005).
- Duchesne** (Ernest; 1874-1912; France). École du Service de Santé Militaire de Lyon (1894). Physician who noted, 32 years before Fleming (q.v.), that certain moulds kill bacteria. *Publs. Contribution à l'étude de la concurrence vitale chez les micro-organismes: antagonisme entre les moisissures et les microbes*, doctoral thesis (1897). *Biogs, obits etc.* Pouillard (*Médecine et armées* 31: 527, 2003).
- Ductifera** Lloyd (1917), Auriculariales. c. 11, widespread (esp. tropical). See Wells (*Mycol.* 50: 407, 1958), Weiss & Oberwinkler (*MR* 105: 403, 2001).
- Duddingtonia** R.C. Cooke (1969), anamorphic *Orbiliaceae*. See Schenk *et al.* (*CJB* 55: 977, 1977), Liou & Tzean (*Mycol.* 89: 876, 1997; phylogeny), Ahrén *et al.* (*FEMS Microbiol. Lett.* 158: 179, 1998; phylogeny), Ahren *et al.* (*MR* 108: 1205, 2004; genetic diversity).
- Duebenia** Fr. (1849), Helotiales. 2, Europe. See Hein (*Willdenowia Beih.* 9, 1976; key), Nauta & Spooner (*Mycologist* 13: 65, 1999).
- Dufourea** Ach. (1809) nom. rej. = *Xanthoria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Kärnefelt & Thell (*Nova Hedwigia* 62: 487, 1996; nomencl.).
- Dufoureomyces** Cif. & Tomas. (1953) = *Dactylina* Nyl. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Dufouria** Trevis. (1861) = *Xanthoria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Dumontinia** L.M. Kohn (1979), Sclerotiniaceae. 1 (on *Anemone* rhizomes), Europe. See Holst-Jensen *et al.* (*Mycol.* 89: 885, 1997; phylogeny), Holst-Jensen *et al.* (*Nordic J. Bot.* 18: 705, 1999; phylogeny).
- Dumortieria** Westend. (1857), anamorphic *Pezizomycotina*, St.0eH.?. 2, Belgium. See Sutton (*Mycol. Pap.* 141, 1977).
- Dumoulinia** Stein (1883) = *Megalospora* Meyen fide Sipman (*Biblhca Lichenol.* 18, 1983).
- Duosporium** K.S. Thind & Rawla (1961), anamorphic *Pezizomycotina*, Hso.≡ eP.26. 1, India; China. See Thind & Rawla (*Am. J. Bot.* 48: 862, 1961).
- duplex** (of the context), in two layers, that adjacent to the lamellae or tubes being harder than the one over it.
- Duplicaria** Fuckel (1870), Rhytismataceae. Anamorph *Crandallia*. 3, widespread (boreal; alpine). See Powell (*Mycol.* 65: 1362, 1973), Johnston (*Mycol. Pap.* 176: 239 pp., 2001).
- Duplicariella** B. Erikss. (1970), Rhytismataceae. 1,

- Scandinavia. See Eriksson (*Symb. bot. upsal.* 19: 20, 1970).
- Duportella** Pat. (1915), Peniophoraceae. 12, widespread. See Cunningham (*Trans. roy. Soc. N.Z. Bot.* 85: 91, 1957), Hjortstam & Ryvarden (*Syn. Fung.* 4: 19, 1990; key), Boidin *et al.* (*BSMF* 107: 91, 1991; key trop. spp.) = *Peniophora* fide, Boidin *et al.* (*Mycotaxon* 56: 445, 1998).
- Duportellaceae** Jülich (1982) = Peniophoraceae.
- Duradens** Samuels & Rogerson (1990), Sordariomycetidae. 1 (from wood), Guyana. See Samuels & Rogerson (*Mem. N. Y. bot. Gdn* 64: 165, 1990), Kang *et al.* (*Mycoscience* 40: 151, 1999), Huhndorf *et al.* (*Fungal Diversity* 20: 59, 2005; phylogeny).
- Durandia** Rehm (1913) [non *Durandia* Boeck. 1896, *Cyperaceae*] = *Durandiella*.
- Durandiella** Seaver (1932), Dermateaceae. Anamorphs *Corniculariella*, *Gelatinosporium*. 10, Europe; N. America. See Groves (*CJB* 32: 116, 1954), Krieglsteiner (*Z. Mykol.* 44: 277, 1978; key 5 spp. Europ.).
- Durandiomyces** Seaver (1928) = *Peziza* Fr. fide Korf (*Mycol.* 48: 711, 1956).
- Durella** Tul. & C. Tul. (1865) = *Xylogramma* fide Sherwood (*Mycotaxon* 5: 1, 1977), Magnes (*Biblthca Mycol.* 165: 177 pp., 1997), Medardi (*Docums Mycol.* 33 no. 131: 29, 2004).
- Durietzia** (C.W. Dodge) Yoshim. (1998), Lobariaceae (L). 5, S. America. See Yoshimura (*Recollecting Edward August Vainio*: 90, 1998), Stenroos *et al.* (*CJB* 81: 232, 2003; photomorphs).
- Durietzia** Gyeln. (1935) = *Ionaspis* fide Pettersson (*Bot. Notiser*: 100, 1946).
- Durispora** K.D. Hyde (1994), Diaporthales. 2, Malaysia; Hong Kong. See Hyde (*Sydowia* 46: 315, 1994), Photita *et al.* (*Nova Hedwigia* 71: 101, 2000).
- Durogaster** Lloyd (1919) nom. dub., Fungi. Based on *Helosis brasiliensis* (*Balanophoraceae*) fide Stevenson & Cash (*Bull. Lloyd Libr.* 35: 178, 1936).
- Durosaccum** Lloyd (1924) = *Pisolithus* fide Stalpers (*in litt.*).
- Dussiella** Pat. (1890), Clavicipitaceae. 2, America. See White (*Am. J. Bot.* 80: 1465, 1993), Bischoff *et al.* (*Mycol.* 96: 1088, 2004).
- Dutch elm disease**, see elm disease.
- duvet** (of dermatophytes), a soft, thick layer of hyphae like brushed-up cloth.
- Dwayaangam** Subram. (1978), anamorphic *Orbilina*, Hso.1bH.1. 7, N. America; Malaysia. See Barron (*CJB* 69: 1402, 1991), Kohlmeyer & Volkmann-Kohlmeyer (*MR* 105: 500, 2001), Sokolski *et al.* (*Mycol.* 98: 628, 2006).
- Dwayabeeja** Subram. (1958), anamorphic *Pezizomycotina*, Hso.≡ fP.1/10. 4, widespread (esp. tropical).
- Dwayaloma** Subram. (1957), anamorphic *Pezizomycotina*, Hsp.1eP.?. 1, India. See Subramanian (*J. Indian bot. Soc.* 36: 62, 1957).
- Dwayalomella** Brisson, Piroz. & Pauzé (1975), anamorphic *Pezizomycotina*, Cac/Ccu.1eH.15. 2, N. America. See Carris (*Mycol.* 81: 638, 1989).
- Dwayamala** Subram. (1956) = *Dendryphiella* fide Kendrick & Carmichae *in* Ainsworth *et al.* (Eds) (*The Fungi* 4A: 390, 1973).
- Dwibahubeeja** N. Srivast., A.K. Srivast. & Kamal (1995), anamorphic *Pezizomycotina*, Hso.0bP.1. 1, India. See Srivastava *et al.* (*MR* 99: 395, 1995).
- Dwibeeja** Subram. (1995), anamorphic *Pezizomycotina*. 1, Singapore. See Subramanian (*Kavaka* 20/21: 57, 1992/1993).
- Dwiroopa** Subram. & Muthumary (1986), anamorphic *Diaporthales*, St.0eP.1. 1, widespread. See Farr & Rossman (*Mycoscience* 44: 443, 2003; morphology).
- Dwiroopella** Subram. & Muthumary (1986), anamorphic *Pezizomycotina*, St.1eP.15/19. 1, India. See Subramanian & Muthumary (*Proc. Indian Acad. Sci. Pl. Sci.* 96: 202, 1986).
- Dyadosporites** Hammen (1954), Fossil Fungi. 2 (Cretaceous, Paleocene, Tertiary), China; Colombia.
- Dyadosporonites** Elsik (1968), Fossil Fungi. 11 (Cretaceous, Tertiary), India; N. America.
- Dycticia** Raf. (1808) ? = *Clathrus* fide Stalpers (*in litt.*).
- Dyctionella**, see *Dictyonella*.
- Dyctiostomiopelta**, see *Dictyostomiopelta*.
- Dyctyoblastus** Kremp. (1869) = *Phlyctis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Dyeing**. Some lichens were formerly used (esp. in N. Europe and N. America) as dyes of animal fibres (e.g. wool). **Orchil** (from *Rocella* spp.) is one of the best known giving a reddish purple as did **cudbear** (*Ochrolechia tartarea*), both being direct dyes. These colours, which are fugitive to light, are a complex series of orcein derivatives formed from microaerophilic oxidation of orcinol-type secondary metabolites in the presence of ammonia. Other spp. such as **crottle** (*Parmelia saxatilis* and *P. omphalodes*) give yellowish buff to brown shades and are reactive dyes. These colours are light-fast and are produced by colourless lichen substances which have an aldehyde group such as the depsidone salazinic acid. The fruiting bodies of some macromycetes (e.g. agarics) have been less used and not historically, but they can give a range of pinks, blues, yellows, reds and browns (e.g. *Boletus*, *Cortinarius*, *Hydnellum*, *Hygrocybe* spp.) using mordants such as alum or iron. Lichens in particular should not be collected indiscriminately for dyeing purposes from natural or seminatural habitats as this is contrary to the conservation of biodiversity.
- Lit.*: Bolton (*Lichens for vegetable dyeing*, 1960; edn 2, 1982), Brough (*Syesis* 17: 81, 1984; 250 tests on 42 Can. lichens), Cardon (*Guide des teintures naturelles*, 1990), Casselman (*Craft of the dyer: colour from plants and lichens of the Northeast*, 1980), Kok (*Lichenologist* 3: 248, 1966; orchil dyes), Rice & Beebe (*Mushrooms for color*, edn 2, 1980), Richardson (*The vanishing lichens*, 1975), Solberg (*Acta Chem. Scand.* 10: 1116, 1956; dyeing wool with lichens and lichen substances).
- Dyonisia**, see *Dionysia*.
- Dyplolabia** A. Massal. (1854), Graphidaceae. See Kalb & Staiger (*Hoppea* 61: 409, 2000; revision), Archer (*Biblthca Lichenol.* 94, 2006; revision), Staiger *et al.* (*MR* 110: 765, 2006; phylogeny), Archer (*Systematics & Biodiversity* 5: 9, 2007; Solomon Is).
- Dyrithiopsis** L. Cai, R. Jeewon & K.D. Hyde (2003), Amphisphaeriaceae. Anamorph *Monochaetiopsis*. 1, China. See Jeewon *et al.* (*Mycol.* 95: 912, 2003).
- Dyrithium** M.E. Barr (1994), *Pezizomycotina*. 1, N. America; Puerto Rico. See Eriksson & Hawksworth (*SA* 13: 191, 1995; nomencl.), Kang *et al.* (*Fungal Diversity* 2: 135, 1999; application of name).
- dysonic** (of dermatophytes), growing more slowly in culture, frequently with less aerial mycelium, than a normal, **eugonic**, strain. See Johnstone & La Touche (*TBMS* 39: 442, 1956).
- Dyslachnum** Clem. (1909) = *Lachnum* fide Raitviir (*Scripta Mycol.* 1: 1, 1970).
- Dyslecanis** Clem. (1909) = *Lecania* fide Hawksworth

- et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Dysrhynchis** Clem. (1909), Parodiopsidaceae. 7, widespread (tropical). See Hosagoudar (*Persoonia* 18: 123, 2002).
- Dysticta** Clem. (1909) = *Sticta* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Dystictina** Clem. (1909) = *Sticta* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- dystrophic**, inadequately nourished. Cf. eutrophic, oligotrophic.
- E** (1) the ratio of length to width (of spores, basidia, etc.); Corner (*New Phytol.* 46: 195, 1947). Cf. Q; (2) Royal Botanic Garden, Edinburgh (UK); founded 1670; a direct grant institution of the Department of Agriculture and Fisheries for Scotland; see Fletcher & Brown (*The Royal Botanic Garden, Edinburgh, 1670-1970*, 1970), Hedge & Lamond (*Index of collectors in the Edinburgh herbarium*, 1970), Watling (*Trans. bot. Soc. Edinb.* 45: 1, 1986).
- e-** (prefix) (ex-), from; out of; without; not having. See ex.
- Earlea** Arthur (1906) = *Phragmidium* fide Arthur (*Manual Rusts US & Canada*, 1934).
- Earliella** Murrill (1905), Polyporaceae. 1, N. America. See Ryvarden (*Mycotaxon* 23: 169, 1985), Gilbertson & Ryvarden (*N. Amer. Polyp.* 1: 249, 1986).
- earth-balls**, basidiomata of *Sclerodermatales*.
- earth-stars**, basidiomata of *Geastrum*.
- earth-tongues**, ascomata of *Geoglossum*.
- Eballistra** R. Bauer, Begerow, A. Nagler & Oberw. (2001), Eballistraceae. 3 (on *Poaceae*), widespread. See Bauer *et al.* (*MR* 416: 416, 2001; phylogen.), Piepenbring (*Caldasia* 24: 103, 2002; Colombia), Vánky & Vánky (*Lidia* 5: 157, 2002; southern Africa), Thaung (*Australasian Mycologist* 24: 29, 2005; Burma).
- Eballistraceae** R. Bauer, Begerow, A. Nagler & Oberw. (2001), Georgefischeriales. 1 gen., 3 spp.
Lit.: Bauer *et al.* (*MR* 105: 423, 2001), Bauer *et al.* (*MR* 109: 1250, 2005), Vánky (*Mycotaxon* 91: 217, 2005).
- Ebollia** Minter & Caine (1980), anamorphic *Pezizomycotina*, St.0fH.1. 1, Chile. See Minter & Caine (*TBMS* 74: 436, 1980).
- Ecchyna** Fr. ex Boud. (1885) = *Phleogenia* fide Donk (*Persoonia* 4: 160, 1966).
- Ecchynaceae** Rea (1922) = *Phleogenaceae*.
- Eccilia** (Fr.) P. Kumm. (1871) = *Entoloma* fide Kuyper (*in litt.*).
- eccrinid**, one of the *Eccrinales* or *Amoebidiales*.
- Echidnocymbium** Brusse (1987), Ramalinaceae (L). 1, S. Africa. See Brusse (*Mycotaxon* 29: 173, 1987), Ekman (*Op. bot.* 127: 148 pp., 1996; N America).
- Echidnodella** Theiss. & Syd. (1918), Asterinaceae. 12, widespread (esp. tropical). See Goos (*Mycotaxon* 73: 455, 1999), Hosagoudar (*Indian Phytopath.* 58: 194, 2005; India), Thaung (*Australas. Mycol.* 25: 5, 2006; Myanmar).
- Echidnodes** Theiss. & Syd. (1918), Asterinaceae. Anamorph *Asterostomula*. c. 17, widespread (tropical). See Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Goos (*Mycotaxon* 73: 455, 1999), Hosagoudar (*Indian Phytopath.* 58: 194, 2005; India), Thaung (*Australas. Mycol.* 25: 5, 2006; Myanmar).
- echinate** (dim. *echinulate*) (of spores, etc.), having sharply pointed spines (Fig. 20.2); spinose.
- Echinella** Massee (1895) = *Pirottaea* fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).
- Echinoascotheca** Matsush. (1995), ? Phaeotrichaceae. 1, Pakistan. See Matsushima (*Matsush. Mycol. Mem.* 8, 1995).
- Echinobotryaceae** Nann. (1934) = *Microascaceae*.
- Echinobotryum** Corda (1831), anamorphic *Microascaceae*, Hsy.0eP.10. 1, widespread. Synanamorph *Doratomyces*.
- Echinocatena** R. Campb. & B. Sutton (1977), anamorphic *Pezizomycotina*, Hso.0eP.3. 1, India. See Campbell & Sutton (*TBMS* 69: 126, 1977).
- Echinochaetaceae** Jülich (1982) = *Polyporaceae*.
- Echinochaete** D.A. Reid (1963), *Polyporaceae*. 4, widespread (tropical). See Reid (*Mem. N. Y. bot. Gdn* 28: 187, 1976), Ryvarden & Johansen (*Prelim. Polyp. Fl. E. Afr.*: 315, 1980), Corner (*Beih. Nova Hedwigia* 78: 105, 1984), Núñez & Ryvarden (*Syn. Fung.* 10: 19, 1995), Silveira (*Mycotaxon* 93: 1, 2005; S. Am.).
- Echinochondrium** Samson & Aa (1975), anamorphic *Pezizomycotina*, Hso.#eP.1. 1, Sri Lanka. bulbils with spines. See Samson & Aa (*Revue Mycol. Paris* 39: 103, 1975).
- Echinoderma** (Locq. ex Bon) Bon (1991) = *Lepiota* fide Kuyper (*in litt.*).
- Echinodia** Pat. (1919), anamorphic *Echinoporia*. 1, Singapore.
- Echinodiscus** Etayo & Diederich (2000), Helotiales. 1 (lichenicolous), Europe. See Etayo & Diederich (*Bull. Soc. Nat. luxemb.* 100: 64, 2000).
- Echinodontiaceae** Donk (1961), Russulales. 2 gen. (+ 2 syn.), 7 spp.
Lit.: Donk (*Taxon*: 263, 1951-63), Gross (*Mycopath. Mycol. appl.* 24: 1, 1964), Brodo (*Bryologist* 76: 260, 1973), Stalpers (*Taxon* 28: 414, 1979), Stalpers (*Stud. Mycol.* 40: 185 pp., 1996), Ginns (*Mycol.* 90: 19, 1998), Tabata *et al.* (*Mycoscience* 41: 585, 2000), Binder & Hibbett (*Mol. Phylogen. Evol.* 22: 76, 2002), Larsson & Larsson (*Mycol.* 95: 1037, 2003), Maijala *et al.* (*Mycol.* 95: 209, 2003).
- Echinodontium** Ellis & Everh. (1900), *Echinodontiaceae*. 5, N. America; Japan. *E. tinctorium* (Indian paint fungus, conifer wood rot). See Thomas (*Publ. Dep. Agric. Can. For. Bio. Div.* 1041, 1958), Gross (*Mycopath. Mycol. appl.* 24: 1, 1964; key), Tabata *et al.* (*Mycoscience* 41: 585, 2000; molecular phylogeny), Larsson & Larsson (*Mycol.* 95: 1037, 2003; phylogeny).
- Echinodothis** G.F. Atk. (1894) = *Dussiella* fide White (*Am. J. Bot.* 80: 1465, 1993).
- Echinomyces** Rappaz (1987), *Diatrypaceae*. 2, Africa; Australia. See Læssøe (*SA* 13: 43, 1994; ? synonymy with *Fassia*), Chacón (*Acta Bot. Mexicana* 49: 15, 1999; Mexico).
- Echinophallus** Henn. (1898), *Phallaceae*. 1, East Indies. See Demoulin (*in litt.*), Boedijn (*Bull. Jard. bot. Buitenz. ser. 3* 12: 90, 1932) possibly based on *Phallus* 'egg' fide.
- Echinoplaca** Fée (1824), *Gomphillaceae* (L). 25, widespread (tropical). See Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952), Vězda (*Folia geobot. phytotax.* 14: 43, 1979), Vězda & Poelt (*Folia geobot. phytotax.* 22: 179, 1987), Lücking (*Biblthca Lichenol.* 65: 1, 1997).
- Echinopodospora** B.M. Robison (1970) = *Apiosordaria* fide Jong & Davis (*Mycol.* 66: 467, 1974).
- Echinoporia** Ryvarden (1980), *Schizoporaceae*. Anamorph *Echinodia*. 2, widespread (tropical). See Ry-

- var den & Johansen (*Prelim. Polyp. Fl. E. Afr.*: 325, 1980), Langer (*Biblthca Mycol.* 154, 1994; syn of *Hyphodontia*).
- Echinosphaeria** A.N. Mill. & Huhndorf (2004), Helminthosphaeriaceae. Anamorph *Vermiculariopsisella*. 1, widespread. See Miller & Huhndorf (*MR* 108: 29, 2004), Puja *et al.* (*Cryptog. Mycol.* 27: 11, 2006).
- Echinospora** Mirza (1963) nom. inval. $\equiv$ *Apiosordaria*.
- Echinosporangium** Malloch (1967) [non *Echinosporangium* Kylin 1956, *Rhodophyta*] $\equiv$ *Lobosporangium*.
- Echinosporella** Contu (1992) = *Calocybe* fide Kuyper (*in litt.*).
- Echinosporium** Woron. (1913) = *Petrakia* fide Petrak (*Sydowia* 20: 186, 1968).
- Echinothecium** Zopf (1898), ? Capnodiaceae. 2 (on lichens), Europe; N. America. See Navarro-Rosinés & Gómez-Bolea (*Folia Botanica Miscellanea* 6: 61, 1989; Iberian peninsula), Calatayud *et al.* (*MR* 106: 1230, 2002; confusion with *Lichenostigma*).
- Echinotrema** Park.-Rhodes (1955) = *Trechispora* fide Larsson (*MR* 98: 1153, 1994).
- Echinula** Graddon (1977), Hyaloscyphaceae. 1, British Isles. See Graddon (*TBMS* 69: 255, 1977).
- echinulate**, see echinate.
- Echinus** Haller (1768) $\equiv$ *Hydnum*.
- Echusias** Hazsl. (1873) = *Nitschkia* fide Höhnelt (*Annlis mycol.* 17: 130, 1919).
- eclosion**, an explosive series of movements which results in the release of a germinating inner spore from a rigid exosporium, as in *Hypoxylon fragiforme* (Chapela *et al.*, *CJB* 68: 2571, 1990).
- Ecology**. Fungal ecology (**myco-**) is the entire field of ecological and coenological study in fungi. See Ainsworth & Sussman (*The Fungi* 3, 1968; many chs), Allsopp *et al.* (Eds) (*Microbial diversity and ecosystem function*, 1995), Christensen (*Mycol.* 81: 1, 1989; review, 186 refs.), Cooke (*Ecology* 29: 376, 1948, lit. fungus sociology, ecology; *Bot. Rev.* 24: 241, 1958; *Mycopath. Mycol. appl.* 48 (1), 1972, IMC 1 papers), Cooke & Rayner (*Ecology of saprotrophic fungi*, 1984), Dighton *et al.* (*The fungal community: its organization and role in the ecosystem*, edn 3, 2005), Dix & Webster (*Fungal ecology*, 1995) Gadd *et al.* (Eds) (*Fungi in the environment. British Mycological Society Symposium Series* 25, 2007), Gilbert (*La mycologie sur le terrain*, 1928), Grigorova & Norris (Eds) (*Techniques in microbial ecology*, 1990), Harley (*J. Ecol.* 59: 887, 1971; in ecosystems), Lynch & Hobbie (Eds) (*Microorganisms in action: concepts and applications in microbial ecology*, 1988), Morten Lange (*Dansk. bot. Arkiv* 13 (1), 1948; agarics of Maglemose), Nuss (*Zur Oekologie der Porlinge*, 1975), Pugh (*TBMS* 74: 1, 1980; strategies), Ramsbottom (*Mushrooms and toadstools*, 1953), Schultz & Boyle (*MR* 109: 661, 2005; review), Watling (*TBMS* 90: 1, 1988; macro-mycetes), Weir (*Mycol.* 10: 4, 1918; altitudinal range of forest fungi), Wicklow & Carroll (Eds) (*The fungal community*, 1981; wide ranging surveys, relationship to general ecological concepts; edn 2, 1992), Wilkins *et al.* (*Ann. appl. Biol.* 24: 703, 25: 472, 26: 25, 1937-39; larger fungi).
- Lichens are primary colonizers in plant succession, occurring in all pioneer terrestrial habitats. Single species may grow on a wide range of substrata or be restricted to particular types. Whole communities rather than individual species tend to be characteristic of particular substrata growing in a particular climatic region, though a few species are restricted to particular trees (e.g. *Lecanora populicola* on *Populus*), esp. those which are probably not really lichenized (e.g. *Arthopyrenia laburni* on *Laburnum*, *Stenocybe septata* on *Ilex*). On bark and rocks, pH, shade, nutrient enrichment, buffer and ion exchange capacities, air pollution, and disturbance affect the communities developed. Lichens tend to dominate habitats in which competition from other plants is minimal. Vertical zonation of communities occurs on freshwater and maritime rocks (see Aquatic fungi and Marine fungi) and trees (Kershaw, *Lichenologist* 2: 263, 1964). See Barkman (*Phytosociology and ecology of cryptogamic epiphytes*, 1958), Brodo (*in Ahmadjian & Hale*, 1974: 401 [1973]; substrate ecology), Seaward (Ed.) (*Lichen ecology*, 1977; comprehensive survey, glossary).
- See also Air pollution, Aquatic fungi, Biodiversity, Bioindication, Cave fungi, Coprophilous fungi, Entomogenous fungi, Endophyte, Fungicolous fungi, Insects and fungi, Lichenicolous fungi, Lichenometry, Growth rates, Mycorrhiza, Mycosociology, Plant pathogenic fungi, Phytosociology, Radiation and fungi, RIEC, Sand dune fungi, Soil fungi, Wood-attacking fungi.
- ecorticate**, having no cortex.
- ecotype**, part of a population of a species showing morphological, chemical, or physiological characteristics which appear to be genetically determined and correlated with particular ecological conditions, but which are not considered of major taxonomic significance.
- ectal**, outer; outermost.
- ectal excipulum** (of ascomata), the outer layers including the subhymenium in a non-lichenized apothecium, sometimes multi-layered; see excipulum.
- Ecteinomyces** Thaxt. (1903), Laboulbeniaceae. 1, America; Europe. See Benjamin *in* Thaxter (*Mem. Am. Acad. Arts Sci.* 1896-1931 12-16, 1971), Tavares (*Mycol. Mem.* 9: 627 pp., 1985), Santamaría (*Fl. Mycol. Iberica* 5, 2003; Iberian peninsula).
- Ectendomeliola** Hosag. & D.K. Agarwal (2006), Meliolaceae. 1, India. See Hosagoudar & Agarwal (*Indian Phytopath.* 59: 98, 2006).
- ecto-** (prefix), outside.
- ectoascus**, the outer wall of a fissitunicate (q.v.) ascus, as in *Lecanidion*.
- ectochroic**, see colour.
- Ectochytridium** Scherff. (1925) $\equiv$ *Zygorhizidium*.
- Ectographis** Trevis. (1853) nom. rej. prop. = *Phaeographis* fide Lücking *et al.* (*Taxon* 56: 1296, 2007; nomencl.).
- Ectolechia** A. Massal. (1853) = *Ocellularia* fide Hale (*Bull. Br. Mus. nat. hist. Bot.* 8: 227, 1981).
- Ectolechia** Trevis. (1853) = *Sporopodium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Ectolechiaceae** Zahlbr. (1905), Lecanorales (L). 17 gen. (+ 10 syn.), 137 spp.
- Lit.*: Vězda (*Folia geobot. phytotax.* 21: 199, 1986), Kalb & Vězda (*Folia geobot. phytotax.* 22: 286, 1987; 13 spp. Brazil), Lücking *et al.* (*Bot. Acta* 107: 393, 1994)
- Lit.*: Sérusiaux (*Abstracta Botanica* 21: 145, 1997), Lücking (*Trop. Bryol.* 15: 45, 1998), Lücking (*Phyton Horn* 39: 131, 1999), McCarthy *et al.* (*Lichenologist* 32: 317, 2000).

Ectomyces P. Tate (1927) = *Termitaria* fide Tate (*Parasitology* 20: 77, 1968).

ectomycorrhiza, see mycorrhiza.

ectoparasite, a parasite living on the outside of its host.

ectoplacodial, see stroma.

Ectosphaeria Speg. (1921) = *Diatrype* fide Petrak & Sydow (*Annls mycol.* 32: 23, 1934).

ectospore (1) an exogenous spore; (2) a basidiospore (obsol.).

Ectosticta Speg. (1912) = *Rhizosphaera* fide Clements & Shear (*Gen. Fung.*, 1931), Sutton (*Mycol. Pap.* 141, 1977).

Ectostroma Fr. (1823) nom. dub., anamorphic *Pezizomycotina*. See Carmichael *et al.* (*Genera of Hyphomycetes*, 1980).

ectostroma, see stroma.

ectothecal (of ascomycetes), having the hymenium exposed.

Ectothrix (of ascomycetes), having the hymenium exposed.

ectothrix, living on the surface of hair.

Ectotrichophyton Castell. & Chalm. (1919) = *Trichophyton* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

ectotroph (adj. **ectotrophic**), see mycorrhiza.

ectotropic, curving out.

ectotunica, the outer wall of a bitunicate ascus.

ED, effective dose; **ED₅₀**, the effective dose for a 50% (usually lethal) response (Horsfall, *Principles of fungicidal action*, 1956).

edaphic, pertaining to the soil.

Edenia M.C. González, Anaya, Glenn, Saucedo & Hanlin (2007), Pleosporaceae. 1, Mexico. See González *et al.* (*Mycotaxon* 101: 251, 2007).

Edhazardia J.J. Becnel, V.Sprague & T. Fukuda (1989), Microsporidia. 1.

Edible fungi. For an extensive review, see Boa (2004).

Fungi are an important source of food in many countries, and may be cultivated or gathered from the wild. The size of the gathered wild edible fungus market globally has been estimated as several million tonnes with a value of at least US\$2 billion in 2004 (Boa, 2004). Examples of countries where wild edible fungi are gathered for personal consumption, and for sale locally include: Malawi, Tanzania and other countries in an extensive regions of central and southern Africa where Miombo woodland is present; Chile, Guatemala, Mexico and the USA in the Americas; China, Nepal, North Korea, Russia, South Korea, Taiwan and Turkey in Asia; Belarus, the Czech Republic, France, Italy, Poland, Rumania, Russia, Spain, Turkey and Ukraine in Europe (Boa, 2004). Emigrants from countries of the former Soviet Union to Israel, Europe, Asia and Mexico to the USA tend to continue their collecting practices in the country of arrival. Wild edible fungi are gathered extensively for export, most notably matsutake (*Tricholoma* spp.) to Japan from China, and the Pacific northwest of Canada and the USA. Exports can constitute an important component of local and national economies. Species may be consumed for their nutritional value, which is generally undervalued (de Román *et al.*, 2006), or to enhance the flavour of meals.

The main species gathered or cultivated are fleshy basidiomycetes (esp. of *Agaricus*, *Amanita*, *Boletus*, *Cantharellus*, *Coprinus*, *Lactarius*, *Macrolepiota*, *Pleurotus*, *Russula*, *Termitomyces*, *Tricholoma* etc.),

and some larger ascomycetes (e.g. *Cyttaria*, *Morchella*, *Terfezia* and *Tuber*). The range of species consumed often varies geographically (e.g. *Cyttaria* is only consumed in southern South America), but this pattern is becoming eroded with globalization of markets. Fleshy basidiomycetes and subterranean ascomycetes (*Terfezia* and *Tuber*) are more frequent in late summer and autumn; the other larger ascomycetes chiefly occur in spring. The edible part is generally the ascoma or basidioma but in *Laccocephalum mylittae* (blackfellows' bread of Australia), *Poria cocos* (Indian bread or tuckahoe of America; cf. stone-fungus), and some tropical species of *Lentinus* it is the sclerotium (which in *Lentinus* may weigh 10kg or more). Microfungi may also be significant components of food. In Taiwan young *Ustilago esculenta* in *Zizania aquatica* (Canadian rice) is used and in Mexico cobs of maize infected with *U. maydis* ('huitlacoche') is commonly eaten. Yeast (*Saccharomyces cerevisiae*) after autolysis (under the trade names Marmite, Vegex, etc.) is a food for humans and dry yeast such as *Candida utilis* (q.v.) is coming into use, as is mycoprotein (q.v.). Button mushrooms (*Agaricus* spp.), oyster (*Pleurotus* spp.), padi-straw (*Volvariella volvacea*), and shii-take (*Lentinula edodes*) mushrooms, and black truffles (*Tuber melanosporum*) are commonly cultured (see Mushroom cultivation). *Agrocybe aegerita* is sometimes obtained by watering old poplar (*Populus*) wood.

Commercial collection of fungi from the wild is extensive and expanded greatly when countries in Eastern Europe became independent from the former Soviet Union. There was a surge in amounts of chanterelles (*Cantharellus* spp.) gathered and exported to western Europe in the 1990s while Italian companies constantly scout for new sources of *Boletus edulis* from around the world. *Lactarius deliciosus* (niscalos, rovelones) is gathered from the French Alps to western Spain to meet a large demand from Catalans (de Román & Boa, 2006). There are conservation (q.v.) concerns about use of wild edible fungi which are linked to loss of woodland habitat and to excessive harvesting. In some countries, guidelines or regulations concerning wild harvesting have been introduced, see e.g. Ławrynowicz (Conservation of fungi in Poland. In Perini (Ed.). *Conservation of fungi*, 25, 1997; regulations in Poland) while licenses must be bought in parts of Italy, a common practice now extended to matsutake areas in the Pacific northwest. The absolute amount gathered is thought to be less important than disturbance to soil when raking for some species (e.g. truffles and matsutake) and compaction from people walking in areas.

There are many ways to prepare edible fungi for the table. If flavour is important, then small pieces of the fungus can be spread throughout the food; if aroma is important, it may be better to place thin slices on top of the food. Various cook books are available which specialize in fungus recipes. Macrofungi may be eaten for ceremonial reasons (see Ethnomycology and Hallucinogenic fungi), and may also provide food for animals (see Animal mycophagists).

Lichens form a very important food for reindeer and caribou (*Bryoria*, *Cladonia*, Iceland moss, q.v.), and for invertebrates. Although not poisonous (except possibly those containing large amounts of vulpinic acid, e.g. *Letharia vulpina*, Wolf's moss, q.v.), lichens are not generally eaten by humans, with

only a few exceptions (e.g. rock tripe, shaybah, manna). See Dahl (*Bot. Rev.* 20: 463, 1954), Llano (*Bot. Rev.* 10: 1, 1944), Richardson (*The vanishing lichens*, 1975), Seaward (Ed.) (*Lichen ecology*, 1977).

Lit.: Batra (*Biologia*, Lahore 29: 293, 1983; Afghanistan, Pakistan, N. India), Boa (Wild edible fungi, a global overview of their use and importance to people. *FAO Non-wood Forest Products* 17: 1, 2004; also available in French and Spanish), de Román & Boa (The marketing of *Lactarius deliciosus* in Spain. *Economic Bot.* 60: 284, 2006), de Román *et al.* (Wild-gathered fungi for health and rural livelihoods. *Proc. Nutrition Soc.* 65: 190, 2006), Fidalgo & Prance (*Mycol.* 68: 201, 1976; Brazilian tribes), Hall *et al.* (*Taming the truffle*, 2007), Huang ([*Edible fungi cyclopedia*], 1993; in Chinese), Mao ([*The macrofungi of China*], 2000; in Chinese), Palm & Chapela (*Mycology in Sustainable Development*, 1997; many refs), Purkayastha & Chandra (*Manual of Indian edible mushrooms*, 1985), Rammeloo & Walley (The edible fungi of Africa south of the Sahara, 1993; 300 spp.), Singer & Harris (*Mushrooms and truffles. Botany, cultivation and utilization*, 2nd edn, 1987), Villareal and Pérez-Moreno (Los hongos comestibles silvestres de México, un enfoque integral. *Micología Neotropica Aplicada* 2: 77, 1989; Mexico), Wasson & Wasson (*Mushrooms, Russia and history*, 1957).

See also Ethnomycology, Hallucinogenic fungi, Industrial mycology, Macromycetes, mycoprotein, Mushroom cultivation, soma.

Edmundmasonia Subram. (1958), anamorphic *Sordariales*. 1, widespread. See Kendrick & Carmichael in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 390, 1973; syn of *Brachysporiella*), Arambarri & Godeas (*Mycotaxon* 52: 91, 1994; Argentina).

Edrudia W.P. Jord. (1980), *Lecanoraceae* (L.). 1, California. See Poelt & Hafellner (*Mitt. bot. StSamml., München* 16: 503, 1980), Wright (*Bull. Calif. Lichen Soc.* 7: 7, 2000).

Edwardiella Henssen (1986), *Lichinaceae* (L.). 1, Marion Island. See Henssen (*Lichenologist* 18: 51, 1986), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key).

Edythea H.S. Jacks. (1931), *Pucciniales*. 3 (on *Berberis* (*Berberidaceae*)), S. America. See Thirumalachar & Cummins (*Mycol.* 40: 47, 1948), Hennen & Ono (*Mycol.* 70: 569, 1978), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003; placed in *Uropyxidaceae*).

Edyuillia Subram. (1972), *Trichocomaceae*. Anamorph *Aspergillus*. 1, widespread. See Subramanian & Rajendran (*Revue Mycol. Paris* 41: 223, 1977; ontogeny), Kuraishi *et al.* (*NATO ASI Series A: Life Sciences* 185: 407, 1990; ubiquinones).

Eeniella M.T. Sm., Bat. Vegte & Scheffers (1981), anamorphic *Saccharomycetaceae*, Hso.0eH.10/19. 1, Sweden. See Boekhout *et al.* (*Int. J. Syst. Bacteriol.* 44: 781, 1994), Yamada *et al.* (*J. Industr. Microbiol.* 14: 456, 1995; phylogeny).

effete (1) overmature, exhausted; (2) (of fruiting bodies), empty.

Effetia Bartoli, Maggi & Persiani (1984), ? *Sordariales*. Anamorph *Virgariella*-like. 1 (from soil), Ivory Coast. See Bartoli *et al.* (*Mycotaxon* 19: 515, 1984), Réblová (*Mycol.* 95: 128, 2003).

effigurate (of lichen thalli), obscurely lobed.

efflorescent, bursting out of.

effuse, stretched out flat, esp. as a film-like growth.

effused-reflexed (of *Agaricomycotina*), stretched out over the substratum but turned up at the edge to make a pileus.

Efibula Sheng H. Wu (1990) = *Phanerochaete* fide Hjortstam & Larsson (*Windahlia* 21, 1994).

Efibulobasidium K. Wells (1975), *Sebacinaceae*. 4, widespread. See Wells (*Mycol.* 67: 148, 1975), Weiss & Oberwinkler (*MR* 105: 403, 2001; posn, phylogeny), Mahamulkar *et al.* (*Indian Phytopathology* 55: 464, 2002; n.sp. India).

egg (1) the female gamete; (2) (of phalloids, *Amanita*, etc.), the young basidioma before the volva is broken.

Eichleriella Bres. (1903), *Auriculariaceae*. c. 7, widespread. See Wells & Raitviir (*Mycol.* 72: 564, 1980), Roberts (*Mycotaxon* 96: 83, 2006; Jamaica).

Eidamella Matr. & Dassonv. (1901) = *Myxotrichum* fide Orr *et al.* (*CJB* 41: 1439, 1963), Currah (*Mycotaxon* 24: 1, 1985).

Eidamia Lindau (1904) = *Harzia* fide Carmichael *et al.* (*Genera of Hyphomycetes*, 1980).

Eiglera Hafellner (1984), *Hymeneliaceae* (L.). 2, Europe; N. America (esp. coastal). See Lumbsch (*Bryologist* 100: 180, 1997).

Eigleraceae Hafellner (1984) = *Hymeneliaceae*.

Eiona Kohlm. (1968), *Pezizomycotina*. 1 (marine), Denmark. See Johnson *et al.* (*Bot. Mar.* 34: 229, 1991; ascospore ontogeny), Kohlmeyer (*SA* 10: 35, 1991; posn).

Ejectosporus S.W. Peterson, Lichtw. & M.C. Williams (1991), *Legeriomycetaceae*. 2 (in *Plecoptera*), Canada; USA. See Peterson *et al.* (*Mycol.* 83: 389, 1991), Strongman (*Mycol.* 97: 333, 2006).

Eklundia C.W. Dodge (1968) = *Candelariella* fide Castello & Nimis (*Lichenologist* 26: 283, 1994).

Ekmanomyces Petr. & Cif. (1932) = *Dictyonella* fide von Arx (*Persoonia* 2: 421, 1963).

Elachopeltella Bat. & Cavalc. (1964), anamorphic *Pezizomycotina*, Cpt.0eH.?. 2, Brazil. See Batista & Cavalcanti (*Anais Congr. Soc. Bot. Brasil* 14: 178, 1963), Farr (*Mycol.* 78: 269, 1986; Brazil), Reynolds & Gilbert (*Cryptog. Mycol.* 27: 249, 2006; Panama).

Elachopeltis Syd. (1927), anamorphic *Pezizomycotina*, Cpt.0eH.?. 4, America (tropical). See Farr (*Mycol.* 78: 269, 1986; Brazil), Reynolds & Gilbert (*Cryptog. Mycol.* 27: 249, 2006; Panama).

Elachophyma Petr. (1931) = *Molleriella* fide von Arx (*Persoonia* 2: 421, 1963).

Eladia G. Sm. (1961) = *Penicillium* Link fide Smith (*TBMS* 44: 47, 1961), Pitt *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 9, 2000).

Elaeodema Syd. (1922), anamorphic *Pezizomycotina*, Hso or Cac.0eP.?. 2, China. See Sutton (*Mycol. Pap.* 141, 1977).

Elaeomyces Kirchn. (1888) nom. dub., ? *Dothideomycetes*.

Elaphocephala Pouzar (1983), ? *Atheliaceae*. 1, Europe. See Pouzar (*Česká Mykol.* 37: 206, 1983), Grosse-Brauckmann & Kummer (*Feddes Repert.* 115: 90, 2004; Germany).

Elaphocordyceps G.H. Sung & Spatafora (2007), *Ophiocordycipitaceae*. Anamorph *Verticillium*-like. 21 (mostly parasitic on *Elaphomyces*), widespread. See Sung *et al.* (*Stud. Mycol.* 57, 2007).

Elaphomyces Nees (1820), *Elaphomycetaceae*. 25 (ectomycorrhizal, hypogeous), widespread. See Ko-

bayashi (*Nagaoa* 7: 35, 1960; key 14 Jap. spp.), Trappe (*TMSJ* 17: 209, 1976; variability), Samuelson *et al.* (*Mycol.* 79: 571, 1987; ultrastr. ascospore ornam.), Zhang & Minter (*CJB* 67: 909, 1989; key 5 spp. Canada), Zhang (*MR* 95: 973, 1991; key 7 spp. China), Pegler *et al.* (*British truffles*, 1993; key 5 Br. spp.), Landvik *et al.* (*Mycoscience* 37: 237, 1997; DNA), Xu (*Mycosystema* 18: 238, 1999; ecology), Miller *et al.* (*MR* 105: 1268, 2001; phylogeny).

Elaphomycetaceae Tul. ex Paol. (1889), Eurotiales. 2 gen. (+ 6 syn.), 27 spp.

Lit.: Samuelson *et al.* (*Mycol.* 79: 571, 1987), Zhang & Minter (*CJB* 67: 909, 1989), Zhang (*MR* 95: 973, 1991), Landvik & Eriksson (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. 269 269: 225, 1994), Landvik *et al.* (*Mycoscience* 37: 237, 1996), Xu (*Mycosystema* 18: 238, 1999), Miller *et al.* (*MR* 105: 1268, 2001), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny).

Elaphomycetales Trappe (1979) = Eurotiales.

Elasmomyces Cavara (1898) = *Russula* fide Miller *et al.* (*Mycol.* 98: 960, 2006).

Elasmomycetaceae Locq. ex Pegler & T.W.K. Young (1979) = *Russulaceae*.

elater (1) a free capillitium-thread, e.g. in *Myxogastria* and *Farysia*; (2) a body with spiral or annular markings in the gleba of *Battarrea*.

Elateraecium Thirum., F. Kern & B.V. Patil (1966), anamorphic *Hiratsukamyces*. 3 (on *Salacia* (*Celastraceae*), *Desmodium* (*Leguminosae*)), India; S. Africa. Anamorph name for (I). See Laundon (*Mycotaxon* 3: 133, 1975), Thirumalachar *et al.* (*Sydowia* 27: 80, 1973-4; teleomorphs).

Elateromyces Bubák (1912) = *Farysia* fide Vánky (*in litt.*).

Elattopycnis Bat. & Cavalc. (1964), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, Brazil. See Batista & Cavalcanti (*Anais Congr. Soc. Bot. Brasil* 16: 181, 1963).

Elderia McLennan (1961) = *Stephensia* fide Trappe (*Mycotaxon* 9: 247, 1979), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).

Electron microscopy, see Ultrastructure.

Electrophoresis. A method of chromatography (q.v.) in which charged particles (esp. DNA, RNA, proteins) are separated by their differential migration in an inert matrix by an electric field. Agarose provides a matrix of large pores particularly suitable for DNA and RNA electrophoresis, and polyacrylamide (PAGE) and starch provide matrices of smaller pore size more suitable for the separation of proteins (or for the single base resolution required for DNA sequencing). DNA and RNA migration is directly related to particle size, but proteins migration may be affected by both size and charge (size only if the dissociating system used). The extraction methods depend on whether proteins or nucleic acids are being examined, and the bands are stained for study. The technique is valuable for studying both total protein patterns and particular enzymes (inter- and extracellular), especially variation in one enzyme between isolates; the variants are **isozymes** (**isoenzymes**) and about 140 can be assayed (e.g. esterases, dehydrogenases, pectinases, phosphatases).

Automated and standardized units are available, which can operate with computer-linked gel-readers and increasingly, slab gels are being replaced by cap-

illary (and other rapid 'cassette'-type) electrophoresis. The techniques have proved especially valuable in characterization of closely related strains of plant pathogenic fungi.

Pulsed field gel - (PFGE), a term used to describe a number of different techniques for separating large pieces of DNA, e.g. chromosomes. Different proprietary systems are available (e.g. CHEF, FIGE, PFGE), but all involve applying electric field to an electrophoresis gel as a series of pulses or variations rather than a single continuous constant field. See Boekhout *et al.* (*Ant. v. Leeuwenhoek* 63: 157, 1993). Now use is less frequent in mycology, and mainly in bacteriology.

Lit.: Gabriel & Gersten (*Analyt. Biochem.* 45: 1741, 1992; staining), Loxdale & Den Hollander (Eds) (*Electrophoretic studies on agricultural pests*, 1989), Paterson & Bridge (*Biochemical techniques for filamentous fungi [IMI Techn. Handbk 1]*, 1994), Hames (*Gel Electrophoresis of Proteins*, edn 3, 1998); capillary electrophoresis: Price *et al.* (*Med. Mycol.* 41: 369, 2003; sequencing of fungi), Dresler-Nurmi *et al.* (*J. Microbiol. Methods* 41: 161, 2000; detection of *Trametes*), Wright *et al.* (*Soil Biol. Biochem.* 30: 1853, 1998; use in mycorrhizas).

Elegantomyces Goh, K.M. Tsui & K.D. Hyde (1998) = *Sporidesmium* fide Goh *et al.* (*MR* 102: 239, 1998).

Elenkinella Woron. (1922) = *Mollerella* fide von Arx (*Persoonia* 2: 421, 1963).

Eleutherascus Arx (1971), *Ascodesmidaceae*. 4, widespread. See Steffens & Jones (*CJB* 61: 1599, 1983; asci), van Brummelen (*Persoonia* 14: 1, 1989), van Brummelen (*Stud. Mycol.* 31: 41, 1989; ultrastr.), Stchigel *et al.* (*MR* 105: 377, 2001), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny).

Eleutheris Clem. & Shear (1931) = *Eleutheromycella*.

Eleutheromycella Höhn. (1908), anamorphic *Pezizomycotina*, Cpd.0eH.15. 1, Europe. See Seeler (*Farlowia* 1: 119, 1943).

Eleutheromyces Fuckel (1870), anamorphic *Leotiomyces*, Hsy.0eH.15. 3 (on macromycetes), widespread (temperate). The genus is highly polyphyletic. See Seeler (*Farlowia* 1: 119, 1943), Sigler (*Cryptog. Bot.* 1: 384, 1990; yeast-like synanamorph), Tsuneda *et al.* (*Mycol.* 89: 867, 1997; black spot disease of *Lentinula edodes*), Maekawa & Tsuneda (*Mycotaxon* 78: 167, 2001; *Hyphozyma* synanam.).

Eleutherosphaera Grove (1907) ? = *Pyxidiophora* fide Hawksworth & Webster (*TBMS* 68: 329, 1977), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).

elf cups, ascomata of *Pezizales*.

Elfvingia P. Karst. (1889) = *Ganoderma* fide Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974).

Elfvingiella Murrill (1914) = *Fomes*.

ELISA (enzyme-linked immunosorbent assay). A very widely used method for detecting and quantifying antibodies (see antigen). Species-specific antigens in yeasts (Middelhoven & Notermans, *J. Gen. Appl. Bact.* 34: 15, 1988).

Elixia Lumbsch (1997), *Elixaceae* (L). 1, Europe. See Lumbsch (*J. Hattori bot. Lab.* 83: 1, 1997), Wedin *et al.* (*MR* 109: 159, 2005; phylogeny).

Elixaceae Lumbsch (1997), *Umbilicariales* (L). 1 gen., 1 spp.

Lit.: Lumbsch *et al.* (*Mol. Phylogen. Evol.* 31: 822, 2004), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006), Lumbsch *et al.* (*MR* 111: 1133, 2007).

Elletevera Deighton (1969), anamorphic *Mycosphae-*

- rellaceae*, Hso.≡ eP.10. 1 (on *Phyllachora*), N. America; Africa. See Deighton (*Mycol. Pap.* 118: 17, 1969), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003).
- Ellimonia** Syd. (1930) = *Inocyclus* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Elliottinia** L.M. Kohn (1979), Sclerotiniaceae. 1, Europe. See Kohn (*Mycotaxon* 9: 415, 1979), Diamandis (*Micologia* 2000: 143, 2000; conservation).
- ellipsoidal** (of spores, etc.), elliptical in optical section (Fig. 23.1).
- Ellis** (Job Bicknell; 1829-1905; USA). Student, Union College, Schenectady, New York (1849-1851) [with Tuckerman (q.v.) and Peck (q.v.)]; school teacher (1851-1864); served on the Union side in the American Civil War (1864-1865); teaching and farming (1865-1875). Pioneering North American mycologist, taking up mycology in 1878, describing more than 4,000 species, mainly in works published in *Bulletin of the Torrey Botanical Club* and *Journal of Mycology*; noted for his work on ascomycetes, particularly pyrenomycetes; with Everhart and Kellerman, founder of *Journal of Mycology*, the forerunner of *Mycol.* His specimens are in the fungal reference collection in New York Botanic Garden (NY). *Publs.* (with Everhart) *North American Pyrenomycetes* (1892). *Biogs, obits etc.* Barr, Huhndorf & Rogerson (*Pyrenomycetes* described by J.B. Ellis. *Memoirs of the New York Botanic Garden* 79: 1, 1996); Cash (A record of the fungi named by J.B. Ellis. I-III. *USDA Special Publication, Plant Disease Survey* 2: 1-165, 167-345, 347-518, 1952-1954); Grumann (1974: 187); Kaye (*Mycotaxon* 26: 29, 1986); Kellerman (*Journal of Mycology* 12: 41, 1906) [portrait]; Rodrigues (*Mycotaxon* 34: 577, 1989) [index 202 types with amyloid rings]; Stafleu & Cowan (*TL-2* 1: 742, 1976); see also the website: Ahn (*A Biography of Job Bicknell Ellis* <http://sciweb.nybg.org/science2/hcol/intern/ellis1.asp>).
- Ellis** (Martin Beazor; 1911-1996; Guernsey, later England). Mycologist (1946-1960) then Chief Mycologist (1960-1976), Commonwealth Mycological Institute, Kew. A taxonomist, primarily of pigmented hyphomycetes, the meticulous scholarship and superb artwork of his publications made identification of these organisms possible for the first time by the non-expert. *Publs.* *Dematiaceous Hyphomycetes* (1971); *More Dematiaceous Hyphomycetes* (1976); (with J.P. Ellis) *Microfungi on Land Plants* (1985); (with J.P. Ellis) *Microfungi on Miscellaneous Substrates* (1988). *Biogs, obits etc.* Sutton & Mordue (*MR* 101: 510, 1997) [portrait].
- Ellisembia** Subram. (1992), anamorphic *Sordariomycetes*, Hso.≡ eP.1/19. 17, widespread. See Subramanian (*Proc. Indian natn Sci. Acad. Part B. Biol. Sci.* 58: 183, 1992), Shenoy *et al.* (*MR* 110: 916, 2006; phylogeny, polyphyly).
- Ellisia** Bat. & Peres (1965) [non *Ellisia* L. 1763, *Hydrophyllaceae*] ? = *Heteroconium* fide Carmichael *et al.* (*Genera of Hyphomycetes*, 1980).
- Ellisiella** Bat. (1956), anamorphic *Pezizomycotina*. 3, Portugal. See Batista (*An. Soc. Biol. Pernambuco* 14: 19, 1956).
- Ellisiella** Sacc. (1881) = *Colletotrichum* fide Nag Raj (*CJB* 51: 2463, 1973).
- Ellisiellina** Sousa da Câmara (1949) = *Colletotrichum* fide Sutton (*CJB* 44: 887, 1966).
- Ellisiodothis** Theiss. (1914) ? = *Muyocopron* fide Sivanesan (*in litt.*).
- Ellisiopsis** Bat. (1956) = *Beltraniella* fide Pirozynski & Patil (*CJB* 48: 567, 1970).
- Ellisomyces** Benny & R.K. Benj. (1975), *Mucoraceae*. 1, USA. See Beakes & Campos-Takaki (*TBMS* 83: 607, 1984; sporangium ultrastr.), Beakes *et al.* (*CJB* 62: 2677, 1984), Beakes *et al.* (*TBMS* 83: 593, 1984; thallospore formation and ultrastr.), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny).
- Ellula** Nag Raj (1980), anamorphic *Agaricomycetes*, St.0eH.2. 1 (with clamp connexions), Brazil. See Nag Raj (*CJB* 58: 2013, 1980).
- Ellurema** Nag Raj & W.B. Kendr. (1986), *Amphisphaeriaceae*. Anamorph *Hyalotiopsis*. 1 (from leaves), India. See Kang *et al.* (*Fungal Diversity* 1: 147, 1998; DNA), Kang *et al.* (*MR* 103: 53, 1999), Kang *et al.* (*Mycotaxon* 81: 321, 2002; phylogeny).
- elm disease (Dutch elm disease)**, a vascular disease of elm (*Ulmus*) caused by *Ophiostoma ulmi* or the even more aggressive *O. novo-ulmi*; the last sp. may be related to one from Himalaya; anamorphs in *Pesotum*. See *IMI Descriptions* 361 (1973), *IMI Map* 36, Holmes & Heybrock (*Phyt. classic* 13, 1990; transl. early papers), Brasier (*Mycopath.* 115: 155, 1991; *Nature* 372: 227, 1994).
- Elmeria** Bres. (1912) [non *Elmeria* Ridl. 1905, *Saxifragaceae*] = *Elmerina*.
- Elmerina** Bres. (1912), *Auriculariales*. 4, widespread (esp. tropical). See Imazeki (*Revue Mycol. Paris* 20: 159, 1955; as *Protodaedalea*), Parmasto (*Nova Hedwigia* 39: 101, 1984; monogr.), Reid (*Persoonia* 14: 465, 1992), Núñez (*Mycotaxon* 61: 177, 1997), Núñez (*Folia cryptog. Estonica* 33: 99, 1998; spp. key), Wang & Liu (*Mycosystema* 20: 159, 2001; as *Protodaedalea*), Weiss & Oberwinkler (*MR* 105: 403, 2001), Hattori (*Mycoscience* 44: 265, 2003).
- Elmerinula** Syd. (1934), *Dothideomycetes*. 1, Philippines.
- Elmerococcum** Theiss. & Syd. (1915) = *Plowrightia* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Elosia** Pers. (1822) = *Alternaria* fide Hughes (*CJB* 36: 727, 1958).
- Elpidophora** Ehrenb. ex Link (1824) = *Graphiola* fide Mussat (*Syll. fung.* 15: 134, 1901).
- Elsikisporonites** P. Kumar (1990), Fossil Fungi. 1, India.
- Elsinoaceae** Höhn. ex Sacc. & Trotter (1913), *Myriangiales*. 11 gen. (+ 19 syn.), 126 spp.
Lit.: Eriksson (*Op. Bot.* 60, 1981), Gardner & Hodges (*Mycol.* 78: 506, 1986), Gabel & Tiffany (*Mycol.* 79: 737, 1987), Johnston & Beever (*N.Z. Jl Bot.* 32: 519, 1994), Palm (*Mycol.* 91: 1, 1999), Swart *et al.* (*Mycol.* 93: 366, 2001), Alvarez *et al.* (*Pl. Dis.* 87: 1322, 2003), Ridley & Ramsfield (*Mycol.* 97: 1362, 2005), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Elsinoë** Racib. (1900), *Elsinoaceae*. Anamorph *Sphaceloma*. 48, widespread (esp. warmer areas). *E. fawcettii* (citrus scab), *E. canavaliae* (scab of *Canavalia*), *E. phaseoli* (scab of Lima bean). See Gabel & Tiffany (*Mycol.* 79: 737, 1987; development), Alcorn *et al.* (*Australas. Pl. Path.* 28: 115, 1999; anam. connexion), Swart *et al.* (*Mycol.* 93: 366, 2001; spp. on *Proteaceae*), Alvarez *et al.* (*Pl. Dis.* 87: 1322, 2003; genetic diversity, Brazil), Ridley & Ramsfield (*Mycol.* 97: 1362, 2005; on *Pittosporum*, New Zealand), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).

Elvela, see *Helvella*.

Elytroderma Darker (1932), Rhytismataceae. 2, Europe; N. America. *E. deformans* (witches' brooms on pine). See Minter & Fonseca (*Nova Hedwigia* 37: 181, 1983), Hansen & Lewis (*Compendium of Conifer Diseases*, 1997), Gernandt *et al.* (*Mycol.* 93: 915, 2001; phylogeny), Ortiz-García *et al.* (*Mycol.* 95: 846, 2003; phylogeny, synonymy).

Elytrosporangium Morais, Bat. & Massa (1966) nom. dub., Actinobacteria. q.v.

Emarcea Duong, Jeewon & K.D. Hyde (2004) = *Anthostomella* fide Duong *et al.* (*Stud. Mycol.* 50: 255, 2004).

emarginate (1) (of lamellae), see sinuate; (2) (of apothecia), lacking a thalline exciple (excipulum thallinum) (lichens) or a raised proper exciple (excipulum proprium).

Embellisia E.G. Simmons (1971), anamorphic *Allewia*, Hso.≡ eP.26. 19, widespread. See Simmons (*Mycotaxon* 38: 251, 1990; spp. and teleomorphs), Pryor & Bigelow (*Mycol.* 95: 1141, 2003; phylogeny, polyphyly).

Emblemia Pers. (1827) ? = *Phaeographina* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Emblemospora Jeng & J.C. Krug (1976), Lasiosphaeriaceae. 2, S. America. See Jeng & Krug (*CJB* 54: 1971, 1976).

Embolidium Bat. (1964) = *Coniella* fide Sutton (*Mycol. Pap.* 141, 1977).

Embolidium Sacc. (1878) = *Calicium* fide Schmidt (*Mitt. Inst. Allg. Botanik Hamburg* 13: 111, 1970).

Embolus Batsch (1783) [non *Embolus* Haller 1768] ? = *Chaenotheca* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

emend, to correct an error. Cf. amend.

Emericella Berk. (1857), Trichocomaceae. Anamorph *Aspergillus*. 36, widespread. See Christensen & Raper (*TBMS* 71: 177, 1978), Frisvad in Samson & Pitt (Eds) (*Advances in Penicillium and Aspergillus systematics* 102: 437, 1985; chemotaxonomy), Horie *et al.* (*Mycoscience* 37: 137, 1996; Brazil), Horie *et al.* (*Mycoscience* 37: 323, 1996; China), Stchigel *et al.* (*MR* 103: 1057, 1999), Peterson (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 323, 2000; phylogeny), Zohri (*Folia Microbiol. Praha* 45: 391, 2000; biochemistry), Klich (*Identification of Common Aspergillus Species*: 116 pp., 2002), Frisvad & Samson (*Syst. Appl. Microbiol.* 27: 672, 2004; Venezuela), Gugni *et al.* (*J. Clin. Microbiol.* 42: 914, 2004; onychomycosis), Cary *et al.* (*Mycol.* 97: 425, 2005; aflatoxin-producing spp.).

Emericellopsis J.F.H. Beyma (1940), Hypocreales. Anamorph *Acremonium*-like. 11, widespread. See Davidson & Christensen (*TBMS* 57: 385, 1971; key), Gams (*Cephalosporium-artige Schimmelpilze*: 21, 1971; keys), Belyakova (*Mikol. Fitopatol.* 8: 385, 1974; key), Wu & Kimbrough (*CJB* 68: 1877, 1990; ultrastr.), Malloch in Hawksworth (Ed.) (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. 269 269: 374, 1994; posn), Glenn *et al.* (*Mycol.* 88: 369, 1996; DNA), Ogawa *et al.* (*Mycol.* 89: 756, 1997; phylogeny), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999; placement in *Bionectriaceae*).

Emilmuelleria Arx (1986), Chaetomiaceae. 1 (coprophilous), USA. See von Arx (*Sydowia* 38: 6, 1986), Barr (*Mycotaxon* 39: 43, 1990; posn), Silva & Hanlin

(*Mycoscience* 37: 261, 1997).

Emmia Zmitr., Spirin & Malysheva (2006), Polyporaceae. 2.

Emmonsia Cif. & Montemart. (1959), anamorphic *Ajellomycetaceae*. 1, widespread. See adiaspiromycosis, adiaspore. See Carmichael (*CJB* 40, 1962), van Oorschot (*Stud. Mycol.* 20, 1980), Sigler (*J. Med. Vet. Mycol.* 34: 303, 1996), Drouhet *et al.* (*J. Mycol. Médic.* 8: 64, 1998), Hoog *et al.* (*Medical Mycology* 36 Suppl. 1: 52, 1998; phylogeny), Peterson & Sigler (*J. Clin. Microbiol.* 36: 2918, 1998; genetic variation), Wellinghausen *et al.* (*International Journal of Medical Microbiology* 293: 441, 2003; in lungs), Untereiner *et al.* (*Mycol.* 96: 812, 2004; phylogeny, family placement).

Emmonsia Kwon-Chung (1972) = *Ajellomyces* fide McGinnis & Katz (*Mycotaxon* 8: 157, 1979), Fukushima *et al.* (*Mycopathologia* 116: 151, 1991).

Empusa Cohn (1855) [non *Empusa* Lindl. 1824, *Orchidaceae*] = *Entomophthora* Fresen.

Empusaceae Clem. & Shear (1931) = *Entomophthoraceae*.

Lit.: Kirk (*in litt.*).

Enantioptera Descals (1983), anamorphic *Pezizomycotina*, Hso.1bH.10. 1 (from foam), British Isles. See Descals (*TBMS* 80: 70, 1983), Marvanová (*Czech Mycol.* 56: 193, 2004; Czech Republic).

Enantiothamnus Pinoy (1911), anamorphic *Pezizomycotina*, Hso.???. 1 (on humans), Africa.

Enarthromyces Thaxt. (1896), Laboulbeniaceae. 1, Asia; Africa. See Terada *et al.* (*Bot. Bull. Acad. sin. Taipei* 45: 165, 2004; Taiwan).

Encephalitozoon Levaditi, Nicolau & Schoen (1923), Microsporidia. 5.

Encephalium Link (1816) = *Tremella* Pers. fide Donk (*Persoonia* 4: 178, 1966).

Encephalographa A. Massal. (1854), ? *Hysteriaceae* (?L). 2 (on lichens), Europe (southern). See Renobales & Aguirre (*SA Reprint of Volumes 1-4* (1982-1985) 8: 87, 1990; nomencl., posn), Tretiach & Modenesi (*Nova Hedwigia* 68: 527, 1999; ecology, poss. links with *Melaspilea*).

Encephalographomyces Cif. & Tomas. (1953) = *Poeltinula* fide Hawksworth (*SA* 10: 36, 1991).

Enchnoa Fr. (1849), Nitschkiaceae. 5 (from bark), widespread. Often placed in the *Calosphaeriaceae*. See Barr (*SA* 13: 192, 1995; posn), Réblová & Svrcek (*Czech Mycol.* 49: 193, 1997), Mostert *et al.* (*Stud. Mycol.* 54: 115 pp., 2006).

Enchnosphaeria Fuckel (1870) = *Herpotrichia* fide Barr (*Mycotaxon* 20, 1984).

Enchylium A. Massal. (1853) = *Pterygiopsis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Enchylium Gray (1821) = *Leptogium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Encliopyrenia Trevis. (1860) = *Verrucaria* Schrad. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Encoelia (Fr.) P. Karst. (1871) nom. cons., Sclerotiniaceae. Anamorph *Myrioconium*. c. 15, widespread (north temperate). See Korf & Kohn (*Mem. N. Y. bot. Gdn* 28: 109, 1976), Arendholz & Sharma (*Mycotaxon* 20: 633, 1984), Juzwik & Hinds (*CJB* 62: 1916, 1984; anamorph), Zhuang (*Mycotaxon* 31: 261, 1988), Verkley (*MR* 99: 187, 1995; asci), Baral & Richter (*Boletus* 21: 45, 1997; subgen. *Kirschsteinia*), Holst-Jensen *et al.* (*Mycol.* 89: 885,

- 1997), Holst-Jensen *et al.* (*Nordic Jl Bot.* 18: 705, 1999), Holst-Jensen *et al.* (*Mol. Biol. Evol.* 16: 114, 1999; posn), Zhuang (*Mycotaxon* 72: 325, 1999), Zhuang *et al.* (*Mycosystema* 19: 478, 2000; phylogeny).
- Encoeliella** Höhn. (1910) = Unguiculariopsis fide Zhuang (*Mycotaxon* 32: 1, 1988).
- Encoeliopsis** Nannf. (1932), Helotiaceae. 4, Europe; N. America. See Groves (*CJB* 47: 1319, 1969), Zhuang (*Mycotaxon* 32: 97, 1988).
- Endacinus** Raf. (1814) = Pisolithus fide Saccardo (*Syll. fung.* 7: 148, 1888).
- Endaematus** Raf. (1814) nom. dub., Fungi.
- Endematus** (orthographic variant), see *Endaematus*.
- endemic**, native to one country or geographical region.
- endo-** (prefix), inside.
- endoascospores**, spore-like cells produced within ascospores (see Morgan-Jones, *CJB* 51: 493, 1972).
- endoascus**, the often extensible inner wall layers of a bitunicate (q.v.) ascus.
- endobasidial** (of a conidiophore in a lichenized pycnidium), having a secondary sporing branch (obsol.); cf. exobasidial.
- Endobasidium** Speschnew (1901), Exobasidiaceae. 1, Samarkand (Asia). See Donk (*Reinwardtia* 4: 116, 1956; basidiomycete affinities doubtful).
- endobasidium**, see basidium.
- endobiotic**, making growth inside living organisms.
- Endoblastidium** Codreanu (1931), ? Blastocladiales. 2 (in *Insecta*), Europe.
- Endoblastoderma** B. Fisch. & Brebeck (1894) = Candida fide Lodder (*Yeasts, a taxonomic study* 2nd edn, 1970).
- Endoblastomyces** Odinzowa ex Kudrjanzev (1960) = Issatchenkia fide Kurtzman & Fell (*Yeasts, a taxonomic study* 4th edn: 223, 1998).
- Endobotrya** Berk. & M.A. Curtis (1874), anamorphic *Pezizomycotina*, Cac.#eP.1. 1, N. America.
- Endobotryella** Höhn. (1909), anamorphic *Pezizomycotina*, St.#eP.1. 1, Europe.
- Endocalyx** Berk. & Broome (1876), anamorphic *Pezizomycotina*, Hsp.0eP.10. 9, widespread (tropical). See Montemartini Corte (*Atti Ist. bot. Univ. Lab. Crittog. Pavia* sér. 5 20: 260, 1963; key), Okada & Tubaki (*Mycol.* 76: 300, 1984; cultural behaviour), Mena Portales & Mercado Sierra (*Revta Jardín bot. Nac. Univ. Habana* 5: 53, 1984; Cuba).
- Endocarpaceae** Fée ex Zenker (1827) = Verrucariaceae.
- Endocarpidium** Müll. Arg. (1862) = Placidiopsis fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- endocarpinoid** (of lichenized perithecia), sunk into the tissues of the thallus, as in *Endocarpon* (obsol.).
- Endocarpiscum** Nyl. (1864) = Heppia fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Endocarpomyces** E.A. Thomas ex Cif. & Tomas. (1953) = Dermatocarpon Eschw.
- Endocarpon** Hedw. (1789), Verrucariaceae (L.). c. 50, widespread (esp. temperate). See Singh & Upreti (*Candollea* 39: 539, 1984; key 6 spp., India), Wagner (*CJB* 65: 2441, 1987; ontogeny), Stocker-Wörgötter & Turk (*Pl. Syst. Evol.* 158: 313, 1988; ultrastr.), Wagner & Letrouit-Galinou (*CJB* 66: 2118, 1988; squamule development), McCarthy (*Lichenologist* 23: 27, 1991; 10 spp. Australia), Harada (*Nova Hedwigia* 56: 335, 1993; key 7 spp. Japan), Harada (*J. Nat. Hist. Mus. Inst. Chiba* 4: 97, 1997; Micronesia), Breuss (*Öst. Z. Pilzk.* 9: 147, 2000; Mexico), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny), Gueidan *et al.* (*MR* 111: 1145, 2007; phylogeny), Aptroot *et al.* (*Biblthca Lichenol.* 97, 2008; Costa Rica).
- endocarpous** (of gasteromycetes, etc.), having the mature hymenium covered over; angiocarpous.
- Endocena** Cromb. (1876), Acarosporaceae (L.). 1 (sterile), S. America. See Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998; DNA).
- Endochaetophora** J.F. White & T.N. Taylor (1988), Fossil Fungi, Ascomycota. 1 (Triassic), Antarctica.
- endochroic**, see colour.
- Endochytriaceae** Sparrow ex D.J.S. Barr (1980), Chytridiales. 10 gen., 56 spp.
Lit.: Barr *et al.* (*Mycol.* 79: 587, 1987), Chen & Chien (*Bot. Bull. Acad. sin. Taipei* 36: 235, 1995), Longcore (*Mycol.* 87: 25, 1995), Shin *et al.* (*CJB* 79: 1083, 2001).
- Endochytrium** Sparrow (1933), Endochytriaceae. 7, widespread (temperate). See Karling (*Mycol.* 33: 356, 1941).
- Endocladis** Clem. & Shear (1931) = Endoramularia.
- Endococcus** Nyl. (1855), Dothideomycetes. 24 (on lichens), widespread (esp. temperate). See Hawksworth (*Bot. Notiser* 132: 283, 1979), David & Etayo (*Lichenologist* 27: 314, 1995; on *Collema*), Etayo & Breuss (*Öst. Z. Pilzk.* 10: 315, 2001).
- Endocochlus** Drechsler (1935), Cochlonemataceae. 4, N. America; Kenya. See Drechsler (*Mycol.* 27: 14, 1935), Drechsler (*Mycol.* 28: 363, 1936), Drechsler (*Mycol.* 41: 229, 1949), Dyal (*Sydowia* 27: 293, 1976; keys parasites of nematodes and amoebae, bibliogr.).
- Endocoenobium** Ingold (1940), Endochytriaceae. 1, British Isles. See Canter (*J. Linn. Soc. Bot.* 91: 95, 1985).
- Endocoleroa** Petr. (1969) = Venturia Sacc. fide Sivanesan (*Biblthca Mycol.* 59, 1977).
- Endocolium** Syd. (1937), *Pezizomycotina*. 1, C. America.
- endocommensal**, an organism living as a commensal (see symbiosis) inside another (e.g. *Trichomycetes* in the gut of *Insecta*).
- Endoconia** Raf. (1819) nom. dub., ? Agaricomycetes. See Murrill (*Index Rafinesq.*, 1949).
- Endoconidioma** Tsuneda, Hambleton & Currah (2004), anamorphic *Dothideaceae*. 1, Canada. See Tsuneda *et al.* (*Mycol.* 96: 1129, 2004).
- Endoconidiophora** Münch (1907) = Ceratocystis fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Endoconidium** Prill. & Delacr. (1891), anamorphic *Gloeotinia*, Hsp.0eH.15. 3, widespread (temperate).
- endoconidium**, a conidium formed inside a hypha, e.g. as in *Thielaviopsis basicola*.
- Endoconospora** Gjaerum (1971), anamorphic *Pezizomycotina*, Hsp.0eH.15. 2, Norway; India. See Gjaerum (*Norw. Jl Bot.* 18: 109, 1971), Braun & Hosagoudar (*Mycotaxon* 46: 259, 1993).
- Endocoryneum** Petr. (1922), anamorphic *Pezizomycotina*, St.≡ eP.15. 2, Austria; Italy. See Marras *et al.* in Luisi *et al.* (Eds) (*Recent advances in oak decline*: 255, 1993).
- Endocreas** Samuels & Rogerson (1989) = Valsonectria fide Seifert & Samuels (*Mycol.* 89: 512, 1997), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Endocronartium** Y. Hirats. (1969), Cronartiaceae. 4 (on *Pinus* (*Pinaceae*)), Europe; North America; Ja-

- pan. A heterogeneous group of endo-cyclic rusts related to *Cronartium*. See Imazu & Kakishima (*Proc. 4th rust on pines working party* Tsukuba: 27, 1995), Vogler & Bruns (*Mycol.* 90: 244, 1998; DNA seq. analysis).
- endocyanosis**, the inclusion of cyanobacteria inside the cells of another organism; in fungi, see *Geosiphon*.
- Endocyclus** Syd. (1927) = *Schizothyrium* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- endocyclic**, see *Pucciniales* and Table 5.
- endocystidium**, see *cystidium*.
- endocystidium-form**, see *Pucciniales* and Table 5.
- Endodermophyton** Castell. (1910) = *Trichophyton* fide Sutton (*in litt.*).
- Endodesmia** Berk. & Broome (1871) [non *Endodesmia* Benth. 1862, *Clusiaceae*] = *Broomeola*.
- Endodesmidium** Canter (1949), *Synchytriaceae*. 1 (on desmids), Europe.
- Endodothella** Theiss. & Syd. (1915) = *Phyllachora* Nitschke ex Fuckel (1870) fide Cannon (*Mycol. Pap.* 163: 302 pp., 1991).
- Endodothiora** Petr. (1929), *Dothioraceae*. 1 (on *Dothidea*), former USSR.
- endoectothrix**, making growth in and on a hair.
- endogenous** (1) living inside; (2) immersed in the substratum; (3) undergoing development within.
- Endogloea** Höhn. (1915) = *Phomopsis* (Sacc.) Bubák. fide Sutton (*Mycol. Pap.* 141, 1977).
- Endogonaceae** Paol. (1889), *Endogonales*. 4 gen., 27 spp.
Lit.: Morton & Benny (*Mycotaxon* 37: 471, 1990; rev.), Yao *et al.* (*Kew Bull.* 50: 349, 1995), Yao *et al.* (*Genera of Endogonales*: 229 pp., 1996), Jeffries & Dodd (*Appl. Microb. System.*: 73, 2000), Kyde & Gould (*Microbial Endophytes*: 161, 2000), Benny *et al.* in McLaughlin *et al.* (Eds) (*The Mycota A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research* 7A: 113, 2001), Gleason & McGee (*Australasian Mycologist* 22: 73, 2004).
- Endogonales** Moreau ex R.K. Benj. (1979). *Mucoromycotina*. 1 fam., 4 gen., 27 spp. *Endomycorrhizal* and *saprobic* taxa transferred to *Glomerales* (q.v.) by Morton & Benny (1990). Fam.:
- Endogonaceae**
Lit.: Morton & Benny (1990), Pegler *et al.* (*British Truffles. A revision of British hypogeous fungi*, 1993), Warcup (*MR* 94: 173, 1990; Australia), Yao *et al.* (*Kew Bull.* 50: 349, 1995; gen. names, *Genera of Endogonales*, 1996; review), White *et al.* (*Mycol.* 98: 860, 2006; molecular phylogeny), Hibbett *et al.* (*MR* 111: 109, 2007), and see under Family.
- Endogone** Link (1809), *Endogonaceae*. c. 20 (*saprobic* or forming *ectomycorrhiza*), widespread (esp. temperate). See Gerdemann & Trappe (*Mycol. Mem.* 5, 1974; key NW Am. spp.), Tandy (*Aust. J. Bot.* 23: 849, 1975; Australia), Bonfante-Fasolo & Scannerini (*Mycopathologia* 59: 117, 1976; ultrastr.), Trappe & Gerdemann (*Mycol.* 71: 206, 1979), Berch & Fortin (*Mycol.* 75: 328, 1983; zygospore germination), Berch & Fortin (*CJB* 61: 899, 1983; axenic culture), Berch & Fortin (*CJB* 62: 170, 1984), Berch & Castellano (*Mycol.* 78: 292, 1986; sporulation in culture), Gibson *et al.* (*Mycol.* 79: 433, 1987; cytochemistry), Jabaji-Hare *et al.* (*Mycol.* 80: 54, 1988; fatty acids), Dalpé (*CJB* 68: 910, 1990; culture), Warcup (*MR* 94: 173, 1990; *ectomycorrhizal* association), Yao *et al.* (*Kew Bull.* 50: 306, 1995), Yao *et al.* (*Genera of Endogonales*: 229 pp., 1996), Błaszowski (*Mycotaxon* 63: 131, 1997), Błaszowski *et al.* (*MR* 102: 1096, 1998), Gleason & McGee (*Australasian Mycologist* 22: 73, 2004; ultrastr.), Goto & Maia (*Mycotaxon* 96: 327, 2006; Brazil), James *et al.* (*Nature* 443: 818, 2006; phylogeny).
- Endogonella** Höhn. (1913) = *Glaziella* fide Zycha *et al.* (*Mucorales*, 1969).
- endogonidium**, a gonidium having its development inside a receptacle or gonidangium (obsol.).
- Endogonopsis** R. Heim (1966), ? *Diplocystidiaceae*. 1, S. Asia. See Heim (*Revue Mycol. Paris* 31: 150, 1966) Possibly based on young *Astraeus* (Astr.), Heim (*Revue Mycol. Paris* 33: 379, 1968), Heim (*C.R. Acad. Sci. Paris D* 268: 1489, 1969).
- Endohormidium** Auersw. & Rabenh. (1869) = *Corynelia* fide Fitzpatrick (*Mycologia* 7 34: 464, 1943).
- Endohyalina** Marbach (2000), *Caliciaceae* (L). 2, neotropics. See Marbach (*Biblthca Lichenol.* 74: 201, 2000).
- endohypha**, see *hypha*.
- endokapyllic**, a thallus of a lichenicolous fungus in which no morphologically distinct lichenized structure is formed (Poelt & Vězda, 1984; Rambold & Triebel, *Bibl. Lich.* 48, 1992).
- Endolepiotula** Singer (1963), *Agaricaceae*. 1, Argentina. *Basidioma* gasteroid.
- endolithic**, in stone (Kobluk & Kahle, *Bull. Can. Pet. Geol.* 25: 208, 1977; fungi, bibliogr.); cf. *epilithic*. See also *cryptoendolithic*.
- Endolpidium** De Wild. (1894) = *Olpidium* fide Sparrow (*Aquatic Phycomycetes* Edn 2: 1187 pp., 1960).
- Endomelanconium** Petr. (1940), anamorphic *Austrocenangium*, St.0eP.1. 4, widespread. See Verkley & Aa (*Mycol.* 89: 967, 1997; Papua New Guinea), Yanna *et al.* (*Fungal Diversity* 2: 199, 1999; Hong Kong).
- Endomeliola** S. Hughes & Piroz. (1994), *Meliolaceae*. 1, New Zealand. See Hughes & Pirozynski (*N.Z. J. Bot.* 32: 53, 1994).
- Endomyces** Reess (1870), *Endomycetaceae*. 3 (on *Armillaria*), widespread (temperate). See Redhead & Malloch (*CJB* 55: 1701, 1977), von Arx (*Antonie van Leeuwenhoek* 43: 33, 1977), de Hoog in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 194, 1998), Suh *et al.* (*Mycol.* 93: 317, 2001), Suh *et al.* (*MR* 109: 261, 2005; ecology), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Endomycetaceae** J. Schröt. (1893), *Saccharomycetales*. 4 gen. (+ 1 syn.), 6 spp.
Lit.: Weijman (*Antonie van Leeuwenhoek* 42: 315, 1976), Redhead & Malloch (*CJB* 55: 1701, 1977), Hoog in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 194, 1998), Suh *et al.* (*Mycol.* 93: 317, 2001), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Endomycetales** Gäum. & C.W. Dodge (1928) = *Saccharomycetales*.
- Endomycetes** (Endomycota). Class (or phylum) for sporogenous and asporogenous yeasts, *Taphrinales*, *Exobasidiales*, and *Ustilaginales* (von Arx, *Pilzkunde*, 1967); emended to include *Trichomycetes*, etc. by Kreisel (1969), and emended to exclude *Exobasidiales*, *Taphrinales* and *Ustilaginales* by von Arx (1981); supported by glyceraldehyde-3-phosphate dehydrogenase sequences (Smith, *Proc. natn. Acad. Sci., USA* 86: 7063, 1989). See *Ustomycota*.
- endomycobiont**, a fungal biont in a symbiosis com-

- pletely immersed in the tissues of the host (e.g. the fungal partner in a mycophycobiosis); an inhabitant (see symbiosis); also used of certain mycorrhizas; see also Endophyte.
- Endomycodes** Delitsch (1943), Saccharomycetales. 2, widespread.
- Endomycopsella** Boedijn (1960) = Saccharomycopsis Schiønning fide Boedijn (*Mycopathologia* 12: 163, 1960), Kurtzman & Robnett (*Antonie van Leeuwenh.* 73: 331, 1998).
- Endomycopsis** Dekker (1931) = Guilliermondella fide von Arx & Yarrow (*Antonie van Leeuwenhoek* 50: 799, 1984).
- endomycorrhiza**, see mycorrhiza.
- Endomycota**, see Saccharomycotina.
- Endonema** Pascher (1929) = Pascherinema.
- Endonevrum** Czern. (1845) = Mycenastrum fide Stalpers (*in litt.*).
- Endonius** Raf. (1819) nom. dub., Fungi. No spp. included.
- endo-operculation** (of sporangial dehiscence in chytrids), operculum forced off and carried away by the emerging sporogenous contents (cf. exo-operculation).
- endoparasite**, a parasite living inside its host.
- endoperidermal**, within the periderm (Lambright & Tucker, *Bryologist* 83: 170, 1980); endophloeodal + hypophloeodal.
- endoperidium**, the inner layer of the peridium.
- Endoperplexa** P. Roberts (1993), Auriculariales. 4, widespread. See Roberts (*MR* 97: 471, 1993), Weiss *et al.* (*MR* 108: 1003, 2004; phylogeny).
- Endophallus** M. Zang & R.H. Petersen (1989), Phallaceae. 1, China. ? A monstrosity from *Phallus*.
- Endophis** Norman (1852) nom. rej. = Leptorhaphis fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Endophlaea** Cooke (1888) nom. dub., Pezizomycotina.
- endophloeodic (endophloeodal, endophloeic)** (of the thallus of a crustaceous lichen), almost entirely immersed in bark.
- Endophragmia** Duvernoy & Maire (1920) = Phragmocephala fide Kirk (*in litt.*), Ellis (*Mycol. Pap.* 72, 1959; key).
- Endophragmiella** B. Sutton (1973), anamorphic *Echinospaeria*, Hso. = eP.1. c. 75, widespread. See Hughes (*N.Z. Jl Bot.* 17: 139, 1979; key), Castañeda Ruiz *et al.* (*MR* 102: 548, 1998), Tsui *et al.* (*Cryptog. Mycol.* 22: 139, 2001; Hong Kong), M[a]noharachary & Agarwal (*Journal of Mycopathological Research* 41: 117, 2003; India), Miller & Huhndorf (*MR* 108: 26, 2004; phylogeny).
- Endophragmiopsis** M.B. Ellis (1966), anamorphic *Pezizomycotina*, Hso. = eP.1. 1, India. See Hughes (*CJB* 61: 1727, 1984).
- Endophyllaceae** Dietel (1897) = Pucciniaceae.
- Endophyllachora** Rehm (1913) = Phyllachora Nitschke ex Fuckel (1870) fide Clements & Shear (*Gen. Fung.*, 1931).
- Endophylloides** Whetzel & Olive (1917) = Dietelia fide Buriticá (*Rev. Acad. Colomb. Cienc.* 18: 131, 1991).
- endophyllous**, living within (i.e., below the cuticle) leaves.
- Endophyllum** Lév. (1825), Pucciniaceae. c. 30 (on angiosperms), widespread. *E. sempervivi* (houseleek, *Sempervivum*, rust). The telial are aecidium-like, the spores produce basidia on germination. See Ashworth (*TBMS* 19: 240, 1935; cytology, life-history), Buriticá (*Rev. Acad. Colomb. Cienc.* 18 no. 69: 131, 1991), Gjerum *et al.* (*Lidia* 5: 83, 2000; Uganda).
- Endophyte**. An organism that occurs within a living plant, cf. epiphyte (qv). Endophyte has been used in a variety of ways, giving rise to semantic confusion and ambiguities. In its widest sense the term has been used to include organisms ranging from bacteria to parasitic angiosperms (e.g. mistletoes) that exist completely or partially within any part of any plant-like organism. With respect to fungi, endophyte has been used to refer to those present as mycorrhizas (qv), as pathogenic infections or saprobic colonizations, and as outwardly symptomless infections showing no signs of either disease, decay or fructification. The distinction between latent pathogens that cause disease only under specific environmental circumstances, or latent saprobes that only cause symptoms upon death of the host plant tissues, and those fungi which remain as symptomless infections is not always clear. While there is frequent use of the term in a restricted sense to refer to symptomless, mutualistic (q.v.) fungi within aerial plant parts the term is also used to include all organisms that grow endophytically regardless of their symptoms or disease effects, see Chanway (*CJB* 74: 321, 1996), Stone *et al.* (*in* Bacon & White (Eds), *Microbial endophytes*: 3, 2000), Wennström (*Oikos* 71: 535, 1994), Wilson (*Oikos* 73: 274, 1995). Given its variety of usages, endophyte should be clearly defined when used.
- Isolation techniques typically involve plating healthy, surface-sterilized plant tissues on agar media and observing the outgrowth of fungi, or incubation of washed plant tissues under humid conditions and subsequent collection and plating of discharged spores (see Bacon, *in* Labeda (Ed.), *Isolation of Biotechnological Organisms from Nature*: 259, 1990; Bills, *in* Redlin & Carris (Eds), *Endophytic Fungi in Grasses and Woody Plants*: 31, 1996; Cohen, *Mycologia* 91: 917, 1999).
- Conifer needles, particularly of the *Pinaceae* support a complex mycota of symptomless inhabitants including, notably, species of *Lophodermium* and other members of the *Rhytismataceae*. Several species may inhabit a single needle. Colonization occurs from flushing onwards, with the fungus remaining symptomless in the leaf for several years before fruiting. Incidence varies with needle age and events in the life of the needle can determine which species fruit after needle death (Millar & Richards, *Mitteilungen der Bundesforschungsanstalt für Forst- und Holtzwirtschaft* 108: 57, 1975). Fungal endophytes in other woody plants have also been investigated (see Redlin & Carris (Eds), *Endophytic Fungi in Grasses and Woody Plants*, 1996; Wilson, *in* Bacon & White (Eds) *Microbial endophytes*: 389, 2000). These species are dispersed by spores and not transmitted by systemic infection of seeds, and while some show a high level of host specificity (e.g. Chapela *et al.*, *Physiol. & Mol. Pl. Path.* 39: 289, 1991), others have a wide range of host plants. Some plants contain more than one endophyte (e.g. *Castanea*, see Bissegger & Sieber, *Mycologia* 86: 648, 1994; *Picea*, see Müller & Hallaksela, *MR* 104: 1139, 2000). In many cases the role of the endophyte is unknown although insect antagonism and anti-herbivory are often suspected. It is possible that many are latent pathogenic

or sabrobic infections held in a balanced antagonism with their host (Schulz *et al.*, *MR* 103: 1275, 1999). There is also some indication that leaf endophytes may influence the onset of leaf senescence and abscission. Fungal endophytes of *Taxus* have the ability to produce taxol, an important anti-cancer drug (Stierle *et al.*, 1995).

Symptomless endophytes of grasses are mainly *Clavicipitaceae* (Glenn *et al.*, *Mycologia* 88: 369, 1996; White & Reddy, *Mycologia* 90: 226, 1998), with species of *Epichloë* and related anamorphic *Neotyphodium* spp. (Tredway *et al.*, *MR* 103: 1593, 1999; Christensen *et al.*, *MR* 104: 974, 2000) mainly on cool-season grasses, while *Balansia*, *Parepichloë*, and *Myriogenospora* are mainly on warm-season grasses. The fungi occur intercellularly and may fruit on leaves or inflorescences, some do not sporulate and are completely seed-transmitted (White, *Pl. Dis.* 71: 340, 1987; Sampson, *TBMS* 18: 337, 1935). While the fungi probably gain enhanced nutrition and greater protection against desiccation, predators and parasites, the host plants although sometimes displaying a degree of sterility often show increased drought tolerance, and are vegetatively invigorated (possibly due to fungally produced auxins, see Porter *et al.*, *J. Nat. Products* 42: 309, 1979), and exhibit increased resistance to pathogenic fungi and to herbivorous insects, nematodes and mammals. Resistance in many cases is due to the production of toxic secondary metabolites (qv) by the endophytic fungus. This is of particular importance where forage plants are involved (Lane *et al.*, in Bacon & White (Eds), *Microbial endophytes*: 341, 2000), and includes compounds such as pyrrolizidine alkaloids (lolines, active against insects), tremorgenic indole diterpene alkaloids (lolitrems, active against insects and mammals) and ergot alkaloids (mainly ergovaline, affecting mammals and insects). Some of the alkaloids have been implicated in mycotoxicoses (qv), such as lolitrems with staggers in livestock (mainly due to *Neotyphodium lolii* in *Lolium perenne*), or ergot peptides with fescue foot (*N. coenophialum* in *Festuca arundinacea*) and lysergic acid amides with sleepygrass and similar conditions (*Neotyphodium* in *Stipa robusta* and *Achnatherum inebrians*). Other compounds are known but their significance is less clear, including sesquiterpene alcohols which may have antifungal activity, and the widespread guanidium-containing pyrrolpyrazine alkaloid, peramine, which may be active against insects.

Lit.: endophytes of marine algae, Cubit (PhD Thesis, University of Oregon, USA., 1974); of liverworts, Duckett & Read (*New Phytol.* 129: 439, 1995); of mosses, Petrini (in Fokkenna & van den Heuval (Eds), *Microbiology of the Phyllosphere*: 175, 1986); of ferns, Fisher (*New Phytol.* 132: 119, 1996), Swatzell *et al.* (*Int. J. Plant Sci.* 157: 53, 1996); of tropical palms and other monocots, Rodrigues & Samuels (*MR* 94: 827, 1990), Dreyfuss & Petrini (*Bot. Helv.* 94: 33, 1984), Frohlich *et al.* (*MR* 104: 1202, 2000); of cotton, Gasoni & de Gurfinkel (*MR* 101: 867, 1997); of maize Yates *et al.* (*MR* 103: 129, 1999); non-clavicipitaceous grass endophytes, Siegel *et al.* (*Mycologia* 87: 196, 1995); on Orchidaceae, Bayman *et al.* (*New Phytol.* 135: 143, 1997); of soya, Walcott *et al.* (*Plant Dis.* 82: 584, 1998); of radish, Leeman *et al.* (*Eur. J. Plant Path.* 102: 21, 1996); dark-septate root endophytes, Caldwell *et al.* (*My-*

cologia 92: 230, 2000), Grunig *et al.* (*MR* 105: 24, 2001); zygomycetous endophytes, Zheng & Jiang (*Mycotaxon* 56: 455, 1995); of submerged roots, Iqbal *et al.* (*CJB* 73: 538, 1995); effects on nematodes, Elmi *et al.* (*Grass & Forage Sci.* 55: 166, 2000); effects on arthropods, Carriere *et al.* (*J. Econ. Entomol.* 91: 324, 1998), Hata & Futai (*CJB* 73: 384, 1995), Lewis & Vaughan (*Tests Agrochem. & Cultivars* 18: 34, 1997), Richmond & Shetlar (*J. Econ. Entomol.* 92: 1329-1334, 1999); effects on cattle, Cosgrove *et al.* (*Proc. N.Z. Grassland Assoc.* 57: 43, 1996), Oliver *et al.* (*J. Animal Sci.* 76: 2853, 1998), Shewmaker *et al.* (*Agronomy J.* 89: 695, 1997); successional fields, Clay & Holah (*Science* 285: 1742, 1999); evolution, Moon *et al.* (*Mycologia* 92: 1103, 2000); taxol production, Stierle *et al.* (*J. Nat. Prod.-Lloydia* 58: 1315, 1995).

Endoplacodium Petr. (1949), anamorphic *Pezizomycotina*, St.0eH.?. 1, Iran.

endopropagule, a propagule produced inside the body (medical mycology).

Endoptychum Czern. (1845) nom. rej. = *Chlorophyllum*. Secotiid fungus, formerly recognised as separate genus. fide Vellinga & De Kok (*Taxon* 51: 563, 2002).

Endopyreniaceae Zahlbr. (1898) = *Verrucariaceae*.

Endopyreniomyces E.A. Thomas (1939) nom. inval. = *Endocarpon*.

Endopyrenium Flot. (1855) = *Catapyrenium* fide Thomson (*Bryologist* 90: 27, 1987), Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Endoraecium Hodges & D.E. Gardner (1984), ? *Raveneliaceae*. 2 (on *Acacia* (*Leguminosae: Mimosoidea*)), Hawaii. See Scholler & Aime (*Mycoscience* 47: 159, 2006; emend., incl. *Racospermyces*).

Endoramularia Petr. (1923), anamorphic *Pezizomycotina*, Hsp or Cac. = eH.?. 1, Europe.

Endoreticulatus W.M. Brooks, J.J. Becnel & G.G. Kennedy (1988), *Microsporidia*. 4. See Brooks *et al.* (*J. Protozool.* 35: 487, 1988).

endosaprophytism, the destruction of an alga by the fungus in a lichen (Elenkin).

endosclerotium, a sclerotium of endogenous origin.

Endoscypha Syd. (1924), *Helotiales*. 1, New Zealand.

Endospora Scherff. (1925) nom. dub., ? *Chytridiomycetes*.

endospore (1) the inner wall of a spore (see ascospore, Spore wall); (2) an endogenous spore, e.g. a sporangiospore.

Endosporella Thaxt. (1920) = *Pyxidiophora* fide Blackwell (*Mycol.* 86: 1, 1994).

Endosporisorium Vánky (1995) = *Macalpinomyces* fide Vánky (*Mycotaxon* 62: 127, 1997).

Endosporoideus W.H. Ho, Yanna, K.D. Hyde & Goh (2005), anamorphic *Pezizomycotina*, H??.?. 1, Hong Kong. See Ho *et al.* (*Mycol.* 97: 239, 2005).

Endosporostilbe Subram. (1958) = *Bloxamia* fide Nag Raj & Kendrick (*Monogr. Chalara Allied Genera*, 1975).

Endostigme Syd. (1923) = *Venturia* Sacc. fide von Arx & Müller (*Stud. Mycol.* 9, 1975).

Endostilbum Malençon (1964), anamorphic *Pezizomycotina*, Hsy.0eH.15. 1, Europe; Morocco. See Korf & Candoussau (*BSMF* 90: 209, 1974).

endosymbiont, an organism which lives in mutualistic symbiosis within the cells of another organism; the inhabitant.

Endothia Fr. (1849), *Cryphonectriaceae*. Anamorph

- Endothiella*. 2, widespread. See also *Cryphonectria*. See Roane *In* Roane *et al.* (Eds) (*Chestnut blight, other Endothia diseases, and the genus Endothia*: 28, 1986; key 11 spp.), Micales & Stipes (*Phytopathology* 77: 650, 1987), Myburg *et al.* (*Mycol.* 91: 243, 1999; DNA), Castlebury *et al.* (*Mycol.* 94: 1017, 2002; phylogeny), Myburg *et al.* (*Mycoscience* 44: 187, 2003; on *Myrtaceae*), Myburg *et al.* (*Mycol.* 96: 990, 2004; phylogeny), Myburg *et al.* (*CJB* 82: 1730, 2004; phylogeny), Gryzenhout *et al.* (*FEMS Microbiol. Letters* 258: 161, 2006), Gryzenhout *et al.* (*Mycol.* 98: 239, 2006; phylogeny, n. fam.), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Endothiella** Sacc. (1906), anamorphic *Cryphonectria*, St.0eH.15. 3, Europe; N. America. See Roane *In* Roane *et al.* (Eds) (*Chestnut blight, other Endothia diseases, and the genus Endothia*: 28, 1986), Castlebury *et al.* (*Mycol.* 94: 1017, 2002), Myburg *et al.* (*Mycol.* 96: 990, 2004), Gryzenhout *et al.* (*FEMS Microbiol. Lett.* 258: 161, 2006).
- Endothiaspis** Sorokīn (1890), Ustilaginales. 2, central Asia. See Langdon & Fullerton (*Mycotaxon* 6: 421, 1978), Vánky (*Cryptog. Stud.* 1: 159 pp., 1987).
- Endothrix** Sorokīn (1890), Ustilaginales. 2, central Asia. See Langdon & Fullerton (*Mycotaxon* 6: 421, 1978), Vánky (*Cryptog. Stud.* 1: 159 pp., 1987).
- endothrix**, living inside a hair.
- Endotrabutia** Chardón (1930) = *Phyllachora* Nitschke ex Fuckel (1870) fide Petrak (*Sydowia* 5: 336, 1951).
- Endotrichum** Corda (1838) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- endotrophic**, see mycorrhiza.
- Endotryblidium** Petr. (1959), ? Patellariaceae. 1, widespread (temperate). See Magnes (*Bibliotheca Mycol.* 165, 1997).
- endotunica**, endoascus (q.v.).
- Endoxyla** Fuckel (1871), ? Boliniaceae. 9, widespread. See Barr (*Mycol. Mem.* 7: 232 pp., 1978), Barr (*Mycotaxon* 46: 45, 1993), Untereiner (*Mycol.* 85: 294, 1993; key), Réblová (*Mycol.* 98: 68, 2006; key).
- Endoxylina** Romell (1892), Diatrypaceae. 5, widespread. See Mhaskar (*Botanique, Nagpur* 3: 69, 1972), Ju *et al.* (*Mycotaxon* 58: 419, 1996), Chacón (*Fungal Diversity* 11: 61, 2002; key).
- endozoic**, living inside an animal.
- Endozythia** Petr. (1959), anamorphic *Pezizomycotina*, Cpd.0eH.?. 1 (in *Pleospora* perithecia), former Yugoslavia. See Petrak (*Sydowia* 13: 116, 1959).
- Enduria** Norman (1885) nom. dub., ? Dothideomycetes.
- Endyllum** Clem. (1931) = *Magnusiomyces*.
- Enerthidium** Syd. (1939), anamorphic *Pezizomycotina*, Cac.0eP.19. 1, Africa.
- Engelhardtella** A. Funk (1973), anamorphic *Pezizomycotina*, Hsp.1bH.15. 1 (on *Botryosphaeria*), N. America. See Funk (*CJB* 51: 1643, 1973).
- Engizostoma** Gray (1821) = *Valsa* Fr.
- Englera** F. Stevens (1939) = *Asterina* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Englerodothis** Theiss. & Syd. (1915), Parmulariaceae. 2, Africa. See Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962), Dulyamamode *et al.* (*MR* 105: 247, 2001).
- Engleromyces** Henn. (1900), Xylariaceae. 1, Africa; Asia. See Dennis (*Bull. Jard. bot. Brux.* 31: 148, 1961), Rogers (*Mycol.* 73: 28, 1981; posn), Kokwaro (*Bothalia* 14: 237, 1983; ethnomycol.), Zang (*Acta Bot. Yunn.* 14: 385, 1992; Asia).
- Englerula** Henn. (1904), Englerulaceae. Anamorph *Capnodiastrum*. 6, widespread. See Hansford (*Mycol. Pap.* 15, 1946), Reynolds & Gilbert (*Aust. Syst. Bot.* 18: 265, 2005; Australia).
- Englerulaceae** Henn. (1904), ? Dothideomycetes (inc. sed.). 11 gen. (+ 9 syn.), 106 spp.
Lit.: Stevens & Ryan (*Ill. biol. monogr.* 17 no. 2: 1, 1939), Doidge (*Bothalia* 4: 273, 1942; S. Afr.), Hughes (*CJB* 64: 1591, 1986), Hughes (*Mycol.* 82: 657, 1990), Castlebury *et al.* (*Mycotaxon* 54: 461, 1995).
- Englerulaster** Höhn. (1910) = *Asterina* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Englerulella** Hansf. (1946) = *Rhytidenglerula* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Engyodontium** de Hoog (1978), anamorphic *Cordycipitaceae*, Hso.0eH.10. 5, widespread. See Gams *et al.* (*Persoonia* 12: 135, 1984; key), Sekhon *et al.* (*Mycopathologia* 138: 1, 1997; antigens), Sung *et al.* (*Nova Hedwigia* 72: 311, 2001; phylogeny), Sung *et al.* (*Stud. Mycol.* 57: 1, 2007; phylogeny).
- enniatin**, **A (lateratiin)** and **B**, peptide antibiotics from *Fusarium orthoceras*; antibacterial (Gäumann *et al.*, *Experientia* 3: 202, 325, 1947); avenacein, sambucinum.
- enokitake** (winter mushroom), the edible *Flammulina velutipes*, cultivated in Japan and Taiwan (Chang & Hayes, 1978).
- enphytotic**, a plant disease of which the damage is constant from year to year; cf. epiphytotic.
- Enridescalsia** R.F. Castañeda & Guarro (1998), anamorphic *Pezizomycotina*, Hso.?.?. 1, Cuba. See Castañeda Ruiz *et al.* (*MR* 102: 42, 1998).
- Ensaluta** Zobel (1854) = *Tuber* fide Fischer (*Nat. Pflanzenfam.* 5b: viii, 1938), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- ensate (ensiform)**, narrow and pointed; sword-like in form.
- Enslinia** Fr. (1835) [non *Enslenia* Raf. 1817, *Acanthaceae*] = *Porodiscus* Murrill.
- Entelexis** Van der Walt & Johannsen (1973), ? Saccharomycetales. Anamorph *Torulopsis*. 1, S. Africa. See van der Walt & Johannsen (*Antonie van Leeuwenhoek Ned. Tijdschr. Hyg.* 39: 646, 1973).
- enteroblastic**, see blastic.
- Enterobotryum** Preuss (1853) nom. dub., Fungi. See Lundqvist (*Symb. bot. upsal.* 20 no. 1, 1972).
- Enterobrus** (orthographic variant), see *Enterobryus*.
- Enterocarpus** Locq.-Lin. (1977), Microascaceae. 2 (coprophilous), Sahara; Italy. See Locquin-Linard (*Revue Mycol. Paris* 41: 509, 1977), Doveri *et al.* (*Boll. Gruppo Micol. 'G. Bresadola'* 40: 187, 1998).
- Enterocytozoon** Desportes, Le Charpentier, Galian, Bernard, Cochand-Priollet, Lavergne, Ravisce & Modigliani (1985), Microsporidia. 1.
- Enterodictyon** Müll. Arg. (1892), Roccellaceae (L). 2, East Indies.
- Enterodictyonomyces** Cif. & Tomas. (1953) = *Enterodictyon*.
- Enterodictyum** Clem. & Shear (1931) = *Enterodictyon*.
- Enterographa** Fée (1824), Roccellaceae (±L). c. 59 (partly on lichens), widespread (esp. tropical). See Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952), Coppins & James (*Lichenologist* 11: 27, 1979; Brit. spp.), Torrente & Egea (*Bibliotheca Lichenol.* 32, 1989), Aptroot *et al.* (*Bibliotheca Lichenol.* 57: 19, 1995; key 7

- foliicolous spp.), Aptroot *et al.* (*Bryologist* 106: 278, 2003; chemistry), Sparrius (*Biblthca Lichenol.* 89: 141 pp., 2004; monograph), Ertz *et al.* (*Biblthca Lichenol.* 91: 155 pp., 2005), Sparrius *et al.* (*Lichenologist* 38: 27, 2006; SE Asia).
- Enteromyxa** Ces. (1879) ? = *Lycogalopsis* fide Stalpers (*in litt.*).
- Enteroramus** Lichtw., M.M. White, Cafaro & Misra (1999), Pichiaceae. 1, USA. See Lichtwardt *et al.* (*Mycol.* 91: 697, 1999), Suh *et al.* (*Mycol.* 96: 756, 2004; phylogeny).
- Enterostigma** Müll. Arg. (1885) = *Thelotrema* fide Salisbury (*Lichenologist* 5: 319, 1972).
- Enterostigmatomyces** Cif. & Tomas. (1953) = *Enterostigma*.
- Enthallopycnidium** F. Stevens (1925), anamorphic *Pezizomycotina*, Cpt.0fH.?. 2, pantropical. See Parbery & Brown (*Microbiology of the Phyllosphere*: 101, 1986).
- entheogen**, a plant (or fungus) substance used by humans in prehistory associated with religious feelings; see ethnomycology, hallucinogenic fungi, soma.
- entire** (of edges of lamellae, etc.), not torn; having no teeth.
- ento-** (prefix), inside.
- Entoderma** Hanula, Andreadis & M. Blackw. (1991), anamorphic *Pezizomycotina*, Cac.0-1eH.1. 1 (on *Insecta*), USA. See Hanula *et al.* (*J. Invert. Path.* 58: 328, 1991).
- Entodesmium** Riess (1854), Lophiostomataceae. 7 (on legumes), widespread (temperate). See Holm (*Symb. bot. upsal.* 14 no. 3: 1, 1957), Shoemaker (*CJB* 62: 2730, 1984; key 6 spp.), Barr (*Mycotaxon* 43: 371, 1992; posn), Liew *et al.* (*Mol. Phylogen. Evol.* 16: 392, 2000; interascal tissue, phylogeny).
- Entoleuca** Syd. (1922), Xylariaceae. Anamorph *Geniculisporium*. 3, widespread (temperate). See Læssøe (*SA* 13: 43, 1994), Rogers & Ju (*Mycotaxon* 59: 441, 1996; monogr.), Mazzaglia *et al.* (*MR* 105: 670, 2001; phylogeny), Stadler *et al.* (*MR* 105: 1191, 2001; biochemistry), Petrini (*N.Z. Jl Bot.* 41: 71, 2003; New Zealand), Ju *et al.* (*Mycol.* 96: 1393, 2004), Kasanen *et al.* (*MR* 108: 766, 2004; genetic diversity).
- Entoloma** (Fr.) P. Kumm. (1871), Entolomataceae. c. 1000, widespread (esp. tropical). See Orton (*TBMS* 43: 328, 1960; key 15 Br. spp.), Largent & Benedict (*Mycol.* 62: 440, 1970; key subgenera), Pegler & Young (*Kew Bull.* 30: 19, 1975; key 9 Br. spp.), Horak (*Sydowia* 28: 171, 1976; cuboid spored spp.), Mazzer (*Biblthca Mycol.* 46, 1976; monogr.), Horak (*Sydowia* 29: 289, 1977), Pegler (*Kew Bull. Addit. Ser.* 6, 1977; key 5 E. Afr. spp.), Horak (*Sydowia* 31: 58, 1978), Horak (*Sydowia* 30: 40, 1978; 74 S. Am. spp.), Romagnesi & Gilles (*Beih. Nova Hedwigia* 59, 1978; Ivory Coast spp.), Horak (*N.Z. Jl Bot.* 17: 275, 1979; key 9 NZ spp.), Nordeloos (*Persoonia* 10: 207, 1979; key 11 spp. subgen. *Pouzaromyces*), Nordeloos (*Persoonia* 10: 427, 1979; subgen. *Nolanea*, key Eur. spp.), Pegler & Young (*Beih. Sydowia* 8, 1979), Horak (*Beih. Nova Hedwigia* 65, 1980; Indomalaya, Australasia), Nordeloos (*Persoonia* 11: 121, 1980; subgen. *Entoloma*, key Eur. spp.), Nordeloos (*Persoonia* 11: 451, 1980; subgen. *Leptonia*, key Eur. spp.), Baroni (*Beih. Nova Hedwigia* 67, 1982; revision), Baroni & Petersen (*Mycol.* 79: 358, 1987), Baroni & Halling (*Mycol.* 84: 419, 1992; key N. Am. spp.), Nordeloos (*Entoloma s.l.*, 1992; Eur. spp.), Manimohan *et al.* (*MR* 99: 1083, 1995; key 21 Indian spp.), Bon (*Bull. Trimestr. Féd. Mycol. Dauphiné-Savoie* 41: 13, 2001; key alpine spp.), Hofstetter *et al.* (*MR* 106: 1043, 2002; phylogeny), Contu (*Micologia e Vegetazione Mediterranea* 17: 95, 2002; Italy), Consiglio (*Micologia e Vegetazione Mediterranea* 18: 143, 2003), Manimohan *et al.* (*Persoonia* 19: 45, 2006; Indian spp.), Gates & Noordeloos (*Persoonia* 19: 157, 2007; Tasmania).
- Entolomataceae** Kotl. & Pouzar (1972), Agaricales. 4 gen. (+ 27 syn.), 1071 spp.
Lit.: Noordeloos (*Beih. Nova Hedwigia* 91: 419 pp., 1987), Noordeloos & Gulden (*CJB* 67: 1727, 1989), Baroni & Horak (*Mycol.* 86: 138, 1994), Manimohan *et al.* (*MR* 99: 1083, 1995), Baroni (*Kew Bull.* 54: 777, 1999), Eyssartier *et al.* (*MR* 105: 1144, 2001), Hofstetter (*MR* 106: 1043, 2002), Moncalvo *et al.* (*Mol. Phylogen. Evol.* 23: 357, 2002), Noordeloos & Gulden (*Mem. N. Y. bot. Gdn* 89: 97, 2004).
- Entolomina** Arnaud (1952) nom. inval., Thelephoraceae. 1, Europe.
- entomo-** (prefix), of *Insecta*.
- Entomocorticium** H.S. Whitney, Bandoni & Oberw. (1987), Peniophoraceae. 1, Canada. See Whitney *et al.* (*CJB* 65: 96, 1987).
- Entomocosma** Speg. (1918) ? = *Pyxidiophora* fide Blackwell (*Mycol.* 86: 1, 1994).
- entomogenous**, living in or on insects, esp. as pathogens.
- Entomogenous fungi**. Range from commensals or mutualists, through ectoparasites which do not seriously affect their arthropod hosts, to pathogens that are lethal and include representatives of all the major groups of fungi. Excluding the laboulbeniomyces, 750 spp. in 56 gen. known to be pathogens or parasites of arthropod pests. The terms entomopathogens, entomogenous mutualistic symbionts, entomogenous ectoparasites and entomogenous endoparasites have been proposed (Evans, in Pirozynski & Hawksworth (Eds), *Coevolution of fungi with plants and animals*: 149, 1988).
- Septobasidium* has symbiotic associations with scale insects, as has *Stereum sanguinolentum* with *Sirex* (Perkin, *Ann. appl. Biol.* 29: 268, 1942), and a number of insects make use of fungi in their alimentary systems; e.g. Phaff *et al.* (*Ecology* 37: 533, 1956; yeasts of *Drosophila*). See Brues (*Insect dietary*, 1946), Steinhaus (*Insect microbiology*, 1946; *Insect pathology*, edn 2, 1963), Shifrine & Phaff (*Mycol.* 48: 41, 1956; yeasts and bark beetles), Madelin (*Endeavour* 19: 181, 1960), Batra (Ed.) (*Insect-fungus symbiosis*, 1980).
- Trichomycetes* and *Laboulbeniales* have little effect on their hosts but the chytrid *Coelomomyces*, the oomycete *Lagenidium giganteum* (both mainly on mosquito larvae), and among zygomycetes the *Entomophthoraceae* (e.g. *Entomophthora*, *Erynia*, *Massospora*, *Neozygites*, *Zoophthora*) are important insect pathogens. Among ascomycetes *Ascosphaera*, *Cordyceps*, *Torrubiella*, and *Hypocrella* and its *Aschersonia* anamorph, frequently cause epizootics as do the hyphomycetes *Beauveria*, *Culicinomyces*, *Hirsutella*, *Metarhizium*, *Nomuraea*, *Paecilomyces*, and *Verticillium*. Several of these genera are being exploited as mycoinsecticides to control a range of arthropod pests (see mycopesticides).
- Lit.*: **General**: Brady (*Biocontrol News and Information* 2: 281, 1981), Evans (see Misra & Horn, pp.

- 119-144; fungi on ants), Evans & Hywel-Jones (in Ben-Dov & Hodgson (Eds), *Soft scale insects*: 5, 1994; fungi on coccids), Evans & Prior (in Rosen (Ed.), *Armored scale insects*: 3, 1990; fungi on scales), Evans & Samson (*Mycologist* 1: 152, 1987; fungi on spiders), Hajek (in Lumsden & Vaughan (Eds), *Pest Management: biologically based technologies*: 54, 1993; prospects for insect control), Madelin (*Ann. Rev. Entomol.* 11: 423, 1966; in Ainsworth & Sussman (Eds), *The Fungi* 3: 227, 1968), McCoy (*J. Cell Biochem.* 13A 156, 1989; review control of pests), Kobayasi & Shimizu (*Iconography of vegetable wasps and plant worms*, 1983; taxonomy), Misra & Horn (*Trichomycetes and other fungal groups*, 2001; ecology, taxonomy), Moore (*Biocontrol News and Information* 9: 209, 1988; fungi on mealybugs), Müller-Kögler (*Pilzkrankheiten bei Insekten*, 1965), Petch (*TBMS* 7-12, 1921-27; *Studies* 16-27, 1931-44, *Notes*), Samson *et al.* (*Atlas of entomopathogenic fungi*, 1988), Scholte *et al.* (*J. insect sci.* 4: 19, 2004; fungi on mosquitos), Shah & Bell (*Appl. Microbiol. Biotechnol.* 61: 413, 2003; review on control of pests), Steinhaus (1963), Tavares (*Laboulbeniales, Fungi, Ascomycetes*, 1985), Vega & Blackwell (*Insect-fungal associations: ecology and evolution* 336 pp., 2005), Wheeler & Blackwell (*Fungus-insect relationships*, 1984; compr. review).
- Regional:** **British Isles**, Petch (*TBMS* 31: 286, 1948), Leatherdale (*Entomophaga* 15: 419, 1970; hosts). **Israel**, Kenneth *et al.* (*Israel J. agric. Res.* 21: 63, 1971), Kenneth & Olmert (*Israel J. Entomol.* 10: 105, 1975). **N. America**, Charles (*Insect Pest Surv. Bull. US* 21 (Suppl. 9), 1941). **Former USSR**, Koval' (*Key to the entomogenous fungi of the USSR*, 1974), Khachatourians (*Handb. Appl. Mycol.: Humans, Animals & Insects* 2: 613, 1991; physiology and genetics). **Taiwan**, Tzean *et al.* (*Atlas of entomopathogenic fungi from Taiwan*, 1997). **South Korea**, Sung Jae-Mo (*The insects-born fungus of Korea in color*, 1996).
- See ambrosia fungi, Co-evolution, Insects and fungi, *Laboulbeniales*.
- Entomopatella** Petr. (1927) = *Chaetospermum* fide Petrak (*Annls mycol.* 32: 447, 1934).
- Entomopeziza** Kleb. (1914) = *Diplocarpon* fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).
- Entomophaga** A. Batko (1964), Entomophthoraceae. 17, widespread. *E. grylli* on locusts. See Remaudière & Keller (*Mycotaxon* 11: 323, 1980), Humber (*Mycotaxon* 21: 265, 1984; 1989), Keller (*Sydowia* 40: 122, 1987; key), Murrin & Nolan (*CJB* 65: 169, 1987; ultrastr.), Nolan (*Can. J. Microbiol.* 33: 808, 1987; protoplasts), Bidochka *et al.* (*Appl. Environm. Microbiol.* 61: 556, 1995), Hajek *et al.* (*J. Invert. Path.* 68: 260, 1996), Bidochka *et al.* (*Mol. Ecol.* 6: 303, 1997; pathotypes), Hajek *et al.* (*Mycol.* 95: 262, 2003; PCR-RFLP), Keller & Petrini (*Sydowia* 57: 23, 2005; key), Keller (*Sydowia* 59: 75, 2007; Switzerland, n.sp.).
- entomophilous** (of fungi), having spores distributed by insects.
- Entomophthora** Fresen. (1856), Entomophthoraceae. c. 30 (on *Arthropoda*, *Insecta*), widespread. *E. muscae* on house flies. See Gustafsson (*LantHogsk Annlr* 31: 103, 1965; taxonomy), Gustafsson (*LantHogsk Annlr* 31: 405, 1966; cultivation, physiology), Remaudière & Keller (*Mycotaxon* 11: 323, 1980; segregate genera), Waterhouse & Brady (*Bull. BMS* 16: 113, 1982; keys), Eilenberg *et al.* (*J. Invert. Path.* 48: 318, 1986; ultrastr.), Keller (*Sydowia* 40: 122, 1987; key), Humber (*Mycotaxon* 34: 441, 1989; redscript.), Eilenberg *et al.* (*J. Invert. Path.* 65: 179, 1995; ultrastr.), Keller (*Sydowia* 54: 157, 2002; n.sp.), Keller & Petrini (*Sydowia* 57: 23, 2005; key), Keller (*Sydowia* 58: 38, 2006; n.sp.), López Lastra *et al.* (*Mycopathologia* 161: 251, 2006; Argentina).
- Entomophthora** Krenner (1961) nom. inval. = *Entomophthora* Fresen. fide Kirk (*in litt.*).
- Entomophthoraceae** Nowak. (1877), Entomophthorales. 12 gen. (+ 6 syn.), 202 spp.
- Lit.*: Humber (*Mycotaxon* 34: 441, 1989), Murrin & Nolan (*CJB* 67: 754, 1989), Perry & Fleming (*Mycol.* 81: 154, 1989), Bidochka *et al.* (*Appl. Environm. Microbiol.* 61: 556, 1995), Bidochka *et al.* (*Mol. Ecol.* 6: 303, 1997), Jensen *et al.* (*Fungal Genetics Biol.* 24: 325, 1998), Keller *et al.* (*Sydowia* 51: 197, 1999), Freimoser *et al.* (*Can. J. Microbiol.* 47: 1082, 2001), Jensen & Eilenberg (*MR* 105: 307, 2001), Tymon *et al.* (*MR* 108: 419, 2004), Keller & Petrini (*Sydowia* 57: 23, 2005), Tymon & Pell (*MR* 109: 285, 2005).
- Entomophthorales** G. Winter (1880). Entomophthoromycotina. 5 fam., 23 gen., 277 spp. Spores forcibly discharged; most are parasites of insects. Fams:
- (1) **Ancylistaceae**
 - (2) **Completoriaceae**
 - (3) **Entomophthoraceae**
 - (4) **Neozygitaceae**
 - (5) **Meristacraceae**
- Lit.*: Pohlád & Bernard (*Mycol.* 70: 130, 1978; key spp. on nemat. and tardigr.), Waterhouse (in Ainsworth *et al.* (Eds), *The Fungi* 4B: 219, 1973; key gen.), Lakon (*Nova Hedw.* 5: 7, 1963; gen. key), Remaudière & Keller (*Mycotaxon* 11: 323, 1980), Tucker (*Mycotaxon* 13: 481, 1981; key non-entomogen. spp.), Humber & Ramoska (in Samson *et al.*, *Fundamental and applied aspects of invertebrate pathology*: 190, 1986; life cycles), Latgé *et al.* (in Samson *et al.*, *Fundamental and applied aspects of invertebrate pathology*: 190, 1986; life cycles), Wolf (*Nova Hedw.* 46: 121, 1988; parasitism), Humber (*Mycotaxon* 34: 441, 1989; emend.), Mikawa (*Bull. natn Sci. Mus. Tokyo B* 15: 49, 1989; Nepal), Papierok (*Ann. Entom. Fenn.* 55: 63, 1989; Finland), Toriello *et al.* (*J. Inv. Path.* 53: 358, 1989; immunological separation of gen.), Keller (*Sydowia* 40: 122, 1987, 43: 39, 1991; Switzerland), Balazy (*Flora of Poland* 24. *Entomophthorales*, 1993), Nagahama *et al.* (*Mycol.* 87: 203, 1995; phylogeny by 18S RNA), Lacey (Ed.) (*Manual of Techiques in Insect pathology*, 1997), Jensen *et al.* (*Fung. Genet. Biol.* 24: 325, 1998; phylogeny), Humber (*J. Invert. Pathol.* 98: 262, 2008; entomopathogenicity).
- Entomophthoromycotina** G. Winter (1880), see *Entomophthorales*.
- Entomospora** Sacc. ex Jacz. (1926) = *Taphrina* fide Eriksson & Hawksworth (*SA* 7: 70, 1988).
- Entomosporium** Lév. (1856), anamorphic *Diplocarpon*, Cac.#eH.15. 1 (on *Rosaceae*), widespread (temperate). See Sutton (*The Coelomycetes*, 1980), Muthumary (*Curr. Sci.* 57: 195, 1987; conidiogenesis), Shin *et al.* (*Korean Jl Pl. Path.* 14: 732, 1998; Korea).
- Entomyclium** Wallr. (1833) = *Dendryphion* fide Hughes (*CJB* 36: 727, 1958).
- Entonaema** Möller (1901), Xylariaceae. Anamorph

- Nodulisporium*. 6, widespread (esp. tropical). Clusters within *Hypoxylon* s.l. See Heim (*BSMF* 76: 121, 1960; morphol.), Rogers (*Mycol.* 73: 28, 1981; key, monogr.), Rogers (*Mycotaxon* 15: 500, 1982; anam.), Sihanonth *et al.* (*MR* 102: 458, 1998), Stadler *et al.* (*MR* 108: 239, 2004; biochemistry), Triebel *et al.* (*Nova Hedwigia* 80: 25, 2005; phylogeny), Bitzer *et al.* (*MR* 112: 251, 2008; phylogeny, chemistry), Stadler *et al.* (*Mycol. Progr.* 7: 53, 2008; phylogeny, chemistry).
- entoparasitic**, parasitic inside the host.
- Entopeltacites** Selkirk (1972), Fossil Fungi. 5 (Miocene), Australia.
- Entopeltis** Höhn. (1910) = *Vizella* fide Hughes (*CJB* 31: 577, 1953), Swart (*TBMS* 57: 455, 1971), von Arx & Müller (*Stud. Mycol.* 9, 1975), Johnston (*N.Z. Jl Bot.* 38: 629, 2000), Cunnington (*Mycotaxon* 93: 135, 2005).
- Entophlyctidaceae** Whiffen (1944) = Endochytriaceae.
- Entophlyctis** A. Fisch. (1892), Endochytriaceae. c. 20, widespread (temperate). See Barr (*CJB* 49: 2215, 1971), Longcore (*Mycol.* 87: 25, 1995).
- entoplacodial**, see stroma.
- Entorrhiza** C.A. Weber (1884), Entorrhizaceae. 14 (on *Juncaceae* and *Cyperaceae* roots), widespread. See Fineran (*Nova Hedwigia* 29: 825, 1978), Fineran (*Nova Hedwigia* 30: 1, 1979), Vánky (*Mycotaxon* 68: 343, 1998; key).
- Entorrhizaceae** R. Bauer & Oberw. (1997), Entorrhizales. 2 gen. (+ 1 syn.), 15 spp.
Lit.: Vánky (*Cryptog. Stud.* 1: 159 pp., 1987), Bauer *et al.* (*CJB* 75: 1273, 1997), Begerow *et al.* (*CJB* 75: 2045, 1998), Piepenbring *et al.* (*Bot. Acta* 111: 444, 1998), Piepenbring *et al.* (*Protoplasma* 204: 170, 1998), Vánky & McKenzie (*Fungal Diversity Res. Ser.* 8: 259 pp., 2002), Vánky (*Mycotaxon* 89: 55, 2004).
- Entorrhizales** R. Bauer & Oberw. (1997). Entorrhizomycetidae. 1 fam., 2 gen., 15 spp. Fam.:
- Entorrhizaceae**
For *Lit.* see under fam.
- Entorrhizomycetes** Begerow, Stoll & R. Bauer (2007), Ustilaginomycotina. 1 ord., 1 fam., 2 gen., 15 spp. Ord.:
- Entorrhizales**
For *Lit.* see ord. and fam.
- Entorrhizomycetidae** R. Bauer, Oberw. & Vánky (1997), see *Entorrhizomycetes*.
For *Lit.* see fam.
- Entosordaria** (Sacc.) Höhn. (1920) = *Stereosphaeria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Entosordaria** Speg. (1920) nom. nud. = *Anthostomella* fide Francis (*Mycol. Pap.* 139, 1975).
- Entosthelia** (Wallr.) Hue (1915) = *Dermatocarpon* Eschw. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- entostroma**, see stroma.
- Entopezites** Poinar & H.R. Buckley (2007), Fossil Fungi. 1.
- Entrophospora** R.N. Ames & R.W. Schneid. (1979), Acaulosporaceae. 5, widespread. Unknown phylogenetic affiliation. See Ames & Schneider (*Mycotaxon* 8: 347, 1979), Schenck *et al.* (*Mycol.* 76: 685, 1984), Sieverding & Toro (*Mycotaxon* 28: 209, 1987), Wu *et al.* (*Mycotaxon* 53: 283, 1995), Wu *et al.* (*Mycol.* 87: 582, 1995; aeroponic spore ontogeny), Yao *et al.* (*Genera of Endogonales*: 229 pp., 1996), Błasz-
- kowski *et al.* (*Mycotaxon* 68: 165, 1998), Wang *et al.* (*Mycoscience* 17: 92, 1998), Fracchia *et al.* (*Nova Hedwigia* 77: 383, 2003; isolation, culture and host colonization of *Entrophospora schenckii*), Redecker & Raab (*Mycol.* 98: 885, 2006; phylogeny), Sieverding & Oehl (*J. Appl. Bot. Food Quality Angew. Botan.* 80: 69, 2006).
- Entrophosporaceae** Oehl & Sieverd. (2006) = Acaulosporaceae.
- Entyloma** de Bary (1874), Entylomataceae. Anamorph *Entylomella*. c. 180 (on dicots), widespread. Spores hyaline or pale, intercellular. The sori are generally in leaves (causing leaf spots) and there is frequently an anamorphic stage; cf. *Entylomella* and *Cylindrosporium* s.l. *Entyloma dahliae* (on *Dahlia*), *E. australe* (on *Physalis*), *E. calendulae* (on *Calendula*), *E. ellisii* (on *Spinacia*), *E. fuscum* (on *Papaver* and *Glaucium*), *E. petuniae* (on *Petunia*). See Begerow *et al.* (*MR* 106: 1392, 2002; phylog.), Piątek (*Mycotaxon* 93: 323, 2005; on *Convolvulaceae*), Spooner & Legon (*Mycologist* 20: 90, 2006; UK).
- Entylomaster** Vánky & R.G. Shivas (2006), Doassansiaceae. 2 (on *Araceae*), Australia; Europe (southern). See Vánky & Shivas (*Mycol. Balcanica* 3: 13, 2006).
- Entylomataceae** R. Bauer & Oberw. (1997), Entylomatales. 2 gen., 225 spp.
Lit.: Boekhout *et al.* (*Stud. Mycol.* 38: 175, 1995), Bauer *et al.* (*CJB* 75: 1273, 1997), Begerow *et al.* (*CJB* 75: 2045, 1998), Begerow *et al.* (*MR* 104: 53, 2000), Adejumo *et al.* (*Mycopathologia* 150: 85, 2001), Begerow *et al.* (*MR* 106: 1392, 2002), Piepenbring (*Bot. Jb.* 24: 241, 2003), Jackson (*Evolution Lancaster, Pa.* 58: 1909, 2004), Zwetko & Blanz (*Biosystem. Ecol. Ser.* 21: 241 pp., 2004), Boekhout *et al.* (*FEMS Yeast Res.* 6: 63, 2005).
- Entylomatales** R. Bauer & Oberw. (1997). Exobasidiomycetes. 1 fam., 2 gen., 225 spp. Fam.:
- Entylomataceae**
For *Lit.* see under fam.
- Entylomella** Höhn. (1924), anamorphic *Entyloma*. 45, widespread. See Ciferri (*Omagiu lui Traian Săvulescu cu prilejul împlinirii a 70 de ani*: 175, 1959), Braun & Hill (*Mycol. Progr.* 1: 19, 2002; anam., New Zealand).
- Entylomellaceae** Cif. (1959) = Entylomataceae.
- Eoagaricus** L. Krieg. (1923) = *Physalacria*.
- Eoaleurina** Korf & W.Y. Zhuang (1986), Pyronemataceae. 1, C. & S. America. See Zhuang & Korf (*Mycotaxon* 26: 361, 1986), Korf (*SA* 6: 127, 1987).
- Eocronartiaceae** Jülich (1982), Platygloceales. 5 gen. (+ 1 syn.), 9 spp.
- Eocronartium** G.F. Atk. (1902), Eocronartiaceae. 1 (on *Musci*), Europe; N. America. See Stanley (*Trans. Am. microsc. Soc.* 59: 407, 1940), Khan & Kimbrough (*CJB* 58: 642, 1980; ultrastr.), Frieders & McLaughlin (*MR* 105: 734, 2001; cytol., ultrastr., anam.).
- Eoetvoesia** Schulzer (1866) nom. dub., anamorphic *Pezizomycotina*.
- Eolichen** Zukal (1884) ? = *Nectria*. Affinities are unclear. fide Keissler (*Rabenh. Krypt.-Fl.* 9 1(2), 1936).
- Eolichenomyces** Cif. & Tomas. (1954) = *Eolichen*.
- Eomycenella** G.F. Atk. (1902) = *Mycena* fide Kuyper (*in litt.*).
- Eomyces** F. Ludw. (1894) nom. dub., Algae. Based on an achlorotic alga fide Batra (*in Subramanian (Ed.), Taxonomy of fungi* 1: 187, 1978).

- Eomycetopsis** J.W. Schopf (1968), Fossil Fungi ? Fungi. 1, Australia.
- Eopolyporoides** Rigby (1982), Fossil Fungi. 1, Australia. See Playford *et al.* (*Publication Geological Survey of Queensland* 380: 5, 1982).
- Eopyrenula** R.C. Harris (1973), Dacampiaceae (L). 3, widespread (north temperate). See Aptroot (*Bibliotheca Lichenol.* 44, 1991; posn), Harris (*More Florida Lichens*, 1995), Johansson & Hermansson (*Graphis Scripta* 12: 19, 2000; Sweden).
- Eosphaeria** Höhn. (1917), Lasiosphaeriaceae. Anamorph *Phialophora*-like. 1, Europe; N. America. See Petrini *et al.* (*TBMS* 82: 554, 1984).
- Eoterfezia** G.F. Atk. (1902), Eoterfeziaceae. 1 or 2, N. America. No recent information is available. See van Brummelen in Hawksworth (Ed.) (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. 269 269: 400, 1994).
- Eoterfeziaceae** G.F. Atk. (1902), Pezizomycotina (inc. sed.). 1 gen., 2 spp.
Lit.: Jeng & Cain (*Mycotaxon* 3: 387, 1976).
- Epaphroconidia** Calat. & V. Atienza (1995), anamorphic *Pezizomycotina*. 1, Spain; N. America. See Calatayud & Atienza (*MR* 99: 850, 1995), Diederich (*Herzogia* 16: 41, 2003; USA).
- epapillate**, having no papillae.
- Epebaceae** Th. Fr. (1860) = Lichinaceae.
- Ephebe** Fr. (1825), Lichinaceae (L). 12, widespread. See Henssen (*Symb. bot. upsal.* 18 no. 1, 1963), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key), Schultz & Büdel (*Lichenologist* 35: 151, 2003; phylogeny).
- Ephebeia** Nyl. (1875) = *Ephebe* fide Henssen (*Symb. bot. upsal.* 18 no. 1, 1963).
- Ephebella** Itzigs. (1857) nom. dub., Fungi. Apparently based on an alga fide Currah (*SA* 5: 130, 1986).
- Ephebomyces** Cif. & Tomas. (1953) = *Ephebe* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Ephedracetes** T.C. Huang (1981), Fossil Fungi. 1 (Miocene), Taiwan.
- Ephedrosphaera** Dumort. (1822) nom. rej. = *Nectria* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Ephelidium** C.W. Dodge & E.D. Rudolph (1955), anamorphic *Pezizomycotina*, ??? (L). 1, Antarctica. See Dodge & Rudolph (*Ann. Mo. bot. Gdn* 42: 136, 1955).
- Ephelidium** Speg. (1920) nom. conf., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Ephelina** Sacc. (1889) = *Leptotrochila* fide Schüepp (*Phytopath. Z.* 36: 236, 1959).
- Epheliopsis** Henn. (1908) = *Eutypa* fide Petrak (*Sydowia* 5: 169, 1951), Ciferri (*Atti Ist. bot. Univ. Lab. Crittog. Pavia sér.* 5 19: 105, 1962), Rappaz (*Mycol. helv.* 2: 285, 1987).
- Ephelis** Fr. (1849), anamorphic *Balansia*, *Epichloë*, *Hsp.0fH.?* 5 (mostly on grasses), widespread (esp. tropical). See Ullasa (*Mycol.* 61: 572, 1969), Govindu & Thirumalachar in Subramanian (Ed.) (*Taxonomy of fungi* 2: 328, 1984), Morgan-Jones *et al.* (*Mycotaxon* 43: 401, 1992; review), Phelps *et al.* (*Mycotaxon* 49: 91, 1993), Phelps & Morgan-Jones (*Mycotaxon* 50: 61, 1994), Kulda *et al.* (*Mycol.* 89: 431, 1997; phylogeny), Tanaka *et al.* (*MR* 105: 811, 2001; Asia).
- Ephemerellomyces** M.M. White & Lichtw. (2004), Harpellales. 1, Norway. See White & Lichtwardt (*Mycol.* 96: 893, 2004).
- Ephemeroascus** Emden (1973) = *Coniochaeta* fide van Emden (*TBMS* 61: 599, 1973), Garcia *et al.* (*MR* 110: 1271, 2006; phylogeny, synonymy).
- Ephemerocybe** Fayod (1889) = *Coprinellus* fide Kuyper (*in litt.*).
- epi-** (prefix), upon.
- epibasidium**, see basidium.
- Epibelonium** E. Müll. (1963), Saccardiaceae. 1, France. See Müller (*Phytopath. Z.* 47: 240, 1963).
- epibiotic**, living on the surface of another organism.
- Epibotrys** Theiss. & Syd. (1915) = *Gilletiella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Epibryon** Döbbeler (1978), ? *Pseudoperisporiaceae*. 30 (on *Musci*), widespread. See Döbbeler (*Sendtnera* 5: 19, 1998), Wubet *et al.* (*New Phytol.* 161: 517, 2004; New Zealand), Döbbeler (*Nova Hedwigia* 82: 257, 2006; Ecuador), Döbbeler (*MR* 111: 1406, 2007).
- epibryophilous**, growing over bryophytes.
- Epichloë** (Fr.) Tul. & C. Tul. (1865), Clavicipitaceae. Anamorph *Neotyphodium*. 18, widespread. *E. typhina* (choke of grasses). See Doguet (*BSMF* 76: 171, 1960; development), White (*Am. J. Bot.* 84: 170, 1977; centrum), White (*Mycol.* 85: 444, 1993; Br. spp.), Bacon & Hill (*Neotyphodium/Grass Interactions*, 1994), Schardl (*Ann. Rev. Phytopath.* 34: 109, 1996; review), Chung *et al.* (*Phytopathology* 87: 599, 1997; genetics), Schardl *et al.* (*Mol. Biol. Evol.* 14: 133, 1997; coevolution with grasses), Bacon & White (*Microbial Endophytes*, 2000), Moon *et al.* (*Mycol.* 92: 1103, 2000; evolution), White *et al.* (*Stud. Mycol.* 45: 95, 2000), Craven *et al.* (*Sydowia* 53: 44, 2001; hybridisation), Craven *et al.* (*Ann. Mo. bot. Gdn* 88: 14, 2001; phylogeny), Schardl (*Fungal Genetics Biol.* 33: 69, 2001; on *Festuca*), White *et al.* (*Symbiosis* 31: 241, 2001; S America), Moon *et al.* (*Mycol.* 94: 694, 2002; S hemisphere), White *et al.* (*Cellular Origin and Life in Extreme Habitats* 4: 413, 2002; evolution), Bischoff & White (*Mycology Series* 19: 125, 2003; review), Brem & Leuchtmann (*Evolution* Lancaster, Pa. 57: 37, 2003; evolution), Leuchtmann (*Mycology Series* 19: 169, 2003; biodiversity), Schardl & Moon (*Mycology Series* 19: 273, 2003; review), Sullivan & Faeth (*Mol. Ecol.* 13: 649, 2004; gene flow), Gentile *et al.* (*Mol. Phylogen. Evol.* 35: 196, 2005; Argentina), Spooner & Kemp (*Mycologist* 19: 82, 2005; UK), Li *et al.* (*Mycol.* 98: 560, 2006; China), Yanagida *et al.* (*Mycol.* 97: 1287, 2005; on *Agropyron*), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny), Moon *et al.* (*Mycol.* 99: 895, 2007; on *Stipeae* and *Meliceae*).
- Epichloea** Giard (1889) nom. dub., Fungi.
- epichroic**, see colour.
- Epichysium** Tode (1790) nom. dub., Fungi. ? Based on insect debris fide Fries (*Syst. mycol.* 3: 293, 1832).
- Epicladonia** D. Hawksw. (1981), anamorphic *Pezizomycotina*, Cpd.0-1eH.15. 3 (on lichens, esp. *Cladonia*), Europe. See Hawksworth (*Bull. Br. Mus. nat. Hist. Bot.* 9: 15, 1981).
- Epiclinium** Fr. (1849), anamorphic *Pezizomycotina*, Ccu.1eH.?. 2, Europe; America.
- Epicnaphus** Singer (1960), Marasmiaceae. 3, S. America. See Raithelhuber (*Metrodiana* 4: 52, 1973).
- Epicoccaceae** Nann. (1934) = *Pleosporaceae*.
- Epicoccospora** Budathoki & S.K. Singh (1995), anamorphic *Pezizomycotina*, Hso.???. 1, Nepal. See Budathoki & Singh (*Indian Phytopath.* 48: 103, 1995).
- Epicoccum** Link (1815), anamorphic *Pleosporaceae*, Hsp.#eP.1. 4, widespread. *E. nigrum*, *E. andropo-*

- gonis* (syn. *Cerebella andropogonis*) on *Sphacelia* of *Claviceps* and frequently mistaken as *Ustilaginales*. See Langdon (*Phytopathology* 32: 613, 1942), Langdon (*Mycol. Pap.* 61, 1955), Schol-Schwarz (*TBMS* 42: 149, 1959), Madrigal & Melgarejo (*CJB* 73: 425, 1995; antibiotic activity), Arenal *et al.* (*MR* 104: 301, 2000; *Phoma* synanamorph), Arenal *et al.* (*Journal of Applied Microbiology* 93: 36, 2002; diagnostics), Pažoutová & Kolínská (*Czech Mycol.* 54: 155, 2003; phylogeny), Arenal *et al.* (*Mycotaxon* 89: 465, 2004; phylogeny, *Phoma* synanamorph), Wang & Guo (*Mycosystema* 23: 474, 2004; morphology, phylogeny), Mims & Richardson (*CJB* 83: 1354, 2005; ultrastr.).
- epicortex**, a thin polysaccharide-like layer over the surface of the cellular upper cortex in thalli of some *Parmeliaceae* visible by SEM (Hawksworth, in Hale, *Smithson. Contr. bot.* 10: 5, 1973) and which may have regular pores functioning in gas exchange (Hale, *Lichenologist* 13: 1, 1981). See Hyvärinen (*Lichenologist* 24: 267, 1992; environmental induction), Lumbsch & Kothe (*Mycotaxon* 43: 277, 1992; *Coccocarpiaceae*, *Pannariaceae*).
- Epicorticium** Velen. (1926) = *Phaeomarasmium* fide Singer (*Agaric. mod. Tax.* edn 3, 1975).
- Epicrea** Petr. (1950), ? *Clavicipitaceae*. 1 (on stromata of *Hypocrella*), Ecuador. See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- epicutis**, see *cutis*.
- Epicymatia** Fuckel (1870) = *Stigmatidium* fide Roux & Triebel (*Bull. Soc. linn. Provence* 45: 451, 1994).
- Epicyta** Syd. (1926) = *Aplosporella* fide Clements & Shear (*Gen. Fung.*, 1931).
- epidemic** (1) (adj.), (of a disease of humans, but used of plants and animals), general and severe in a group for a time; (2) (n.), the disease itself; cf. epiphytotic, epizootic.
- epidemiology**, the study of disease incidence, distribution and control. See Plant pathogenic fungi.
- Epidermella** Tehon (1935) ? = *Hypoderma* De Not. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Epidermidophyton** E. Lang (1879) nom. rej., anamorphic *Pezizomycotina*.
- Epidermomyces** Loeffler (1983) = *Epidermophyton* Sabour.
- Epidermophyton** E. Lang (1879) nom. rej. = *Epidermophyton* Sabour.
- Epidermophyton** Sabour. (1907) nom. cons., anamorphic *Arthrodermataceae*, Hso. = eH.2. 2 (on humans), widespread. Macroconidia pyriform; microconidia absent. *E. floccosum* (syn. *E. inguinale* and *E. cruris*) on humans (glabrous skin) causing tinea cruris and tinea pedis. See Guého *et al.* (*Annales de l'Institut Pasteur Microbiologie* 136B: 195, 1985; ultrastr.), Sundaram *et al.* (*Curr. Sci.* 55: 406, 1986; morphology), Cabañes *et al.* (*Revta Iberoamer. Micol.* 10: 14, 1993; nomencl., morphology), Weitzman *et al.* (*Manual of Clinical Microbiology* Edn 6: 791, 1995; review), Kawasaki *et al.* (*Mycopathologia* 134: 121, 1996; phylogeny), Gräser *et al.* (*Medical Mycology* 37: 105, 1999; phylogeny), Kane & Summerbell (*Manual of Clinical Microbiology*: 1275, 1999; review), Kano *et al.* (*Mycopathologia* 146: 111, 1999; phylogeny), Untereiner *et al.* (*Mycol.* 96: 812, 2004; phylogeny).
- epidermophytosis**, see dermatophytosis (esp. tinea cruris and tinea pedis).
- Epidochiopsis** P. Karst. (1892), anamorphic *Pezizomycotina*, ?eH.?. 1, Europe.
- Epidochium** Fr. (1849) = *Tremella* Pers. fide Donk (*Taxon* 7: 193, 1958).
- Epidrolithus** Raf. (1836) ? = *Leptogium* fide Merrill (*Index Rafinesq.*, 1949).
- epiflora**, surface flora; sometimes applied (incorrectly) to the microbiota on seed surfaces; the epibiota.
- epigeal** (epigean, epigeic), on the earth.
- epigeic** (of lichens), not attached to any substrate but blowing about on the surface of the ground; see wandering lichens.
- epigenous**, growing on the surface.
- Epiglia** Boud. (1885) = *Mniaecia* fide Korf in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 249, 1973).
- Epigloea** Zukal (1889), *Epigloeeaceae* (?L). 13 (on *Algae*), Europe; Antarctica. See Döbbeler (*Beih. Nova Hedwigia* 79: 203, 1984; key), David (*SA* 6: 217, 1987), Döbbeler (*Sendtnera* 2: 277, 1994), Ceynowa-Gieldon (*Acta Mycologica Warszawa* 37: 3, 2002; Poland), Cykowska & Flakus (*Polish Botanical Journal* 50: 233, 2005; Poland), Pérez-Ortega & Barreno (*Nova Hedwigia* 83: 523, 2006; Iberian peninsula).
- Epigloeeaceae** Zahlbr. (1903), *Pezizomycotina* (inc. sed.) (±L). 1 gen. (+ 2 syn.), 13 spp.
Lit.: David (*SA* 6: 217, 1987), Döbbeler (*Sendtnera* 2: 277, 1994).
- Epigloemyces** Cif. & Tomas. (1957) = *Epigloea*.
- epigynous**, having the antheridium above the oogonium on one hypha.
- epihymenium**, a thin layer of interwoven hyphae on the surface of the hymenium (Corner, 1950; epithecium).
- epikapylic**, a thallus of a lichenicolous fungus in which a morphologically distinct lichenized structure is formed (Poelt & Vězda, 1984).
- Epilichen** Clem. (1909), ? *Rhizocarpaceae* (±L). 1 (on *Baeomyces*), widespread (north temperate). See Hafellner (*Beih. Nova Hedwigia* 62, 1979).
- Epilithia** Nyl. (1853) = *Gyalideopsis* See Lücking *et al.* (*Lichenologist* 37: 165, 2005).
- epilithic**, living on the surface of stones; cf. endolithic.
- epinecral layer**, see necral layer.
- Epinetria** Syd. & P. Syd. (1917) = *Dimerosporiella* Speg. fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Epinyctis** Wallr. (1831) = *Lepraria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Epipeltis** Theiss. (1913) = *Schizothyrium* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Epiphegia** G.H. Otth (1870) ? = *Massarina* fide Aptroot (*Nova Hedwigia* 66: 89, 1998).
- Epiphloea** Trevis. (1880), *Lichinaceae* (L). 1, Europe. See Gyelnik (*Rabenh. Krypt.-Fl.* 9 2.2, 1940).
- epiphloeodal**, living upon bark.
- Epiphora** Nyl. (1876) [non *Epiphora* Lindl. 1837, *Orchidaceae*] = *Plectocarpon* fide Santesson (*The lichens and lichenicolous fungi of Sweden and Norway*, 1993).
- epiphragm**, the membrane over the young fruit-body in the *Nidulariaceae*.
- epiphyllous**, on the upper surface of a leaf; foliicolous.
- Epiphyma** Theiss. (1916) = *Botryosphaeria* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- epiphyte**, a plant living on another, but not as a parasite.

- epiphytic** (adj.), frequently = corticolous.
- epiphytotic**, an epidemic among plants.
- epiplasm** (of an ascus), the cytoplasm not used up in the 'free cell formation' of ascospores.
- Epiploca** Kleb. (1918) = *Epipolaeum* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Epipolaeum** Theiss. & P. Syd. (1918), Pseudoperisporiaceae. 17, widespread. See Shoemaker (*CJB* 43: 631, 1965), Farr (*Mycol.* 71: 243, 1979).
- Episclerotium** L.M. Kohn (1984), Helotiaceae. 2, Europe. See Malaval (*Docums Mycol.* 19: 9, 1989; ascus ultrastr.).
- Episeptum** J.I.R. Larsson (1986), Microsporidia. 3. See Larsson (*Arch. Protistenk.* 131: 257, 1986).
- Episoma** Syd. (1925) = *Phaeostigme* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Episphaerella** Petr. (1924), Pseudoperisporiaceae. 5, America; Africa. See Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962), Farr *et al.* (*CJB* 63: 1983, 1985), Barr (*Mycotaxon* 64: 149, 1997).
- Episphaeria** Donk (1962), Inocybaceae. 1, Europe. Perhaps *Strophariaceae*. See Donk (*Persoonia* 2: 336, 1962).
- epispore**, see ascospore, Spore wall.
- episporium**, see Spore wall.
- Episporogoniella** U. Braun (1994), anamorphic *Pezizomycotina*, Hso.≡ eP.1. 1 (on *Bryophyta*), Brazil. See Braun (*Mycotaxon* 51: 41, 1994).
- Epistictum** Trevis. (1869) = *Dermatocarpon* Eschw. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Epistigme** Syd. (1924), anamorphic *Pezizomycotina*, Cpd.0eP.?. 1, S. Africa.
- epistroma**, see stroma.
- Epitea** Fr. (1832) = *Phragmidium* fide Dietel (*Nat. Pflanzenfam.* 6, 1928) applying to *Caoma* stage.
- epithalline**, of a falsely thalline apothecial edge in lichenized fungi.
- epithecium**, tissue at the surface of an apothecium formed by the branching of the ends of the paraphyses above the asci; cf. epihymenium, pseudoepithecium.
- Epithele** (Pat.) Pat. (1900), Polyporaceae. 10, widespread. See Boquien (*Mycol.* 63: 937, 1971; key), Hjortstam & Ryvarden (*Syn. Fung.* 20: 23, 2005).
- Epitheliaceae** Jülich (1982) = Polyporaceae.
- epithelium**, see cutis.
- Epithelopsis** Jülich (1976), Polyporaceae. 2, Australia; India; New Zealand. See Jülich (*Persoonia* 8: 457, 1976), Lepp (*Australasian Mycologist* 23: 53, 2004).
- epithet** (1) the second (specific) adjectival part of a Latinized binomial (the 'trivial' name of the zoologist); (2) the third or fourth (varietal, etc.) term.
- Epithyrium** (Sacc.) Trotter (1931), anamorphic *Sarea*, St.0eP.15. 1 (on conifer resin), widespread. See Hawksworth & Sherwood (*CJB* 59: 357, 1981).
- epitunica**, see exosporium; Spore wall.
- epitype**, see Nomenclature, type.
- Epixyla** Raf. (1806) nom. dub., Fungi.
- epixylic (epixylous)**, living on wood; lignicolous.
- Epixylon** Füsting (1867) = *Hypoxylon* Bull. fide Læssøe (*SA* 13: 43, 1994).
- epizoic**, living on animals.
- epizootic**, an epidemic among animals.
- epizootic lymphangitis**, a disease of horses caused by *Histoplasma farciminosum*.
- Epochniella** Sacc. (1880) = *Stemphylium* fide Lindau (*Rabenh. Krypt.-Fl.* 1: 207, 1907).
- Epochnium** Link (1809) = *Monilia* Bonord. fide Hughes (*CJB* 36: 727, 1958).
- epruinose**, having no pruina.
- Epulorhiza** R.T. Moore (1987), anamorphic *Tulasnella*. 3 (mycorrhizal), widespread. See Currah *et al.* (*CJB* 68: 1171, 1990; mycorrhizal sp.), Currah & Zelmer (*Rep. Tottori mycol. Inst.* 30: 43, 1992), Roberts (*Rhizoctonia-forming fungi*, 1999), Gleason & McGee (*Australasian Mycologist* 21: 12, 2002; septal pore cap ultrastructure), Ma *et al.* (*MR* 107: 1041, 2003; molecular phylogeny).
- equal** (of a stipe), having the same diameter throughout.
- Erannium** Bonord. (1860) = *Coleosporium* fide Saccardo (*Syll. fung.* 18: 774, 1906).
- Erastia** Niemelä & Kinnunen (2005), Polyporaceae. 2, widespread. See Niemelä & Kinnunen (*Karstenia* 45: 76, 2005).
- erasure phenomenon** (in *Dictyostelium*), the loss by amoebae of the capacity to recapitulate when developing cultures are disaggregated and placed on a growth medium.
- Erebonema** A. Roem. (1845) nom. dub., anamorphic *Pezizomycotina*.
- erect**, upright; straight, not curved, up.
- Eremascaceae** Engl. & E. Gilg (1924), Eurotiomycetidae (inc. sed.). 1 gen., 2 spp.
Lit.: Hocking (*Handbook of Applied Mycology* Vol. 3. Foods and Feeds: 69, 1991), Berbee & Taylor (*Mol. Biol. Evol.* 9: 278, 1992; DNA), Landvik *et al.* (*Mycoscience* 37: 237, 1996; DNA), Anderson *et al.* (*MR* 102: 541, 1998; DNA), Kurtzman & Robnett (*Antonie van Leeuwenhoek* 73: 331, 1998), Lumbsch *et al.* (*Pl. Biol.* 2: 525, 2000).
- Eremascus** Eidam (1883), Eremascaceae. 2, Europe; India. See Harrold (*Ann. Bot. Lond.* 14: 127, 1950), Berbee & Taylor (*Mol. Biol. Evol.* 9: 278, 1992; posn), Landvik *et al.* (*Mycoscience* 37: 237, 1997; DNA), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny).
- Eremastrella** S. Vogel (1955), ? Psoraceae (L). 1, S. Africa; Australia. See Schneider (*Bibliotheca Lichenol.* 13, 1980), Pietschman (*Nova Hedwigia* 51: 521, 1990; posn), Lumbsch & Kothe (*Nova Hedwigia* 57: 19, 1993; thalli).
- Eremiomyces** Trappe & Kagan-Zur (2005), Pezizaceae. 1 (hypogeous), S. Africa. See Ferdman *et al.* (*MR* 109: 244, 2005), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Eremodothis** Arx (1976), Sporormiaceae. 1, India; Japan. See Udagawa & Ueda (*J. Jap. Bot.* 56: 289, 1981), Kruys *et al.* (*MR* 110: 527, 2006; phylogeny).
- Eremomyces** Malloch & Cain (1971), Eremomycetaceae. Anamorphs *Arthrographis*-like, *Trichosporiella*-like. 2 (coprophilous), widespread. See Malloch & Sigler (*CJB* 66: 1929, 1988).
- Eremomycetaceae** Malloch & Cain (1971), ? Dothideomycetes (inc. sed.). 3 gen. (+ 1 syn.), 11 spp.
Lit.: Malloch & Sigler (*CJB* 66: 1929, 1988), von Arx *et al.* (*Beih. Nova Hedwigia* 94: 104 pp., 1988), Lumley *et al.* (*Mycotaxon* 74: 395, 2000).
- Eremotheca** Theiss. & Syd. (1917) = *Schizothyrium* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Eremothecella** Syd. & P. Syd. (1917), Arthoniaceae (L). 6, widespread (tropical). See Sérusiaux (*SA* 11: 39, 1992), Grube (*Bryologist* 101: 377, 1998; phylogeny), Grube & Lücking (*MR* 105: 1007, 2001; as-

cogenous hyphae).

Eremotheciaceae Kurtzman (1995), Saccharomycetales. 2 gen. (+ 3 syn.), 3 spp. Some authors treat this as a synonym of *Saccharomycetaceae*.

Lit.: Yamada *et al.* (*Bull. Fac. Agric. Shizuoka Univ.* 44: 9, 1994), Kurtzman (*J. Industr. Microbiol.* 14: 523, 1995), Prillinger *et al.* (*Yeast Chichester* 13: 945, 1997), de Hoog *et al.* in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 201, 1998), Wendland *et al.* (*Curr. Genet.* 35: 618, 1999), Kurtzman & Robnett (*FEMS Yeast Res.* 3: 417, 2003), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).

Eremothecium Borzí (1888), Eremotheciaceae. 2, widespread. See Batra (*USDA Tech. Bull.* 1469, 1973; key), Rosing (*Mycol.* 79: 157, 1987; ultrastr.), Kurtzman (*J. Industr. Microbiol.* 14: 523, 1995), Prillinger *et al.* (*Yeast Chichester* 13: 945, 1997; placement in *Saccharomycetaceae*), de Hoog *et al.* in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 201, 1998), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).

ergoline alkaloids, from *Claviceps* sclerotia include both lysergic acid derivatives (esp. *C. purpurea*, *C. paspali*) and clavine alkaloids (esp. *C. fusiformis*, *C. gigantea*, *Sphacelia sorghi*). Cf. ergot.

ergometrine (D-lysergic acid propanolamide), an ergot alkaloid from *Claviceps purpurea* sclerotia (esp. Spanish and Portuguese); used in medicine against migraine. Cf. ergotamine.

ergosterol, the commonest sterol of fungi (hence also in lichens) first isolated from *Claviceps purpurea* sclerotia; yeast ergosterol is converted to vitamin D₂ by ultraviolet radiation. Commonly used as an index for living-fungal mass in decaying materials (Newell, Fungal biomass and productivity (in Paul (Ed.), *Methods in Microbiology* 30 *Marine Microbiology*) pp. 357-372, 2001).

Ergot (1) the *Claviceps* disease of cereals and other grasses, esp. *Claviceps africana* (on *Sorghum* spp.), *C. fusiformis* (on *Pennisetum*), *C. paspali* (on *Paspalum* spp.), and *C. purpurea* (on *Secale* and other grasses); (2) an ergot fungus; (3) (in trade), the sclerotia of ergot fungi.

Infection (of ovaries) of cereals and grasses is largely limited to outcrossing plants with flowers which open, and occurs by rain- or insect-borne conidia of the *Sphacelia* state which occur suspended in 'honey dew' exuded from the host florets in response to infection. Sclerotial development begins 2-3 weeks after infection. The sclerotia contain a range of alkaloids (of which the most important are lysergic acid derivatives; see Stoll & Hofmann, in Manske (Ed.) (*The alkaloids* 8: 725, 1965); also ergometrine, ergotamine, ergotoxine, including the active principals not only of the poisonous properties of ergot but also of the therapeutic applications (e.g. in migraine, obstetrics, and as hallucinogens). The ergoline ring system is built up from *L*-tryptophan and mevalonic acid. *N*-methyl group is derived from methionine.

Ergot of rye contaminating bread causes **ergotism** in humans which is of two main types: the gangrenous (St Anthony's Fire of the Middle Ages) and the spasmodic (see Barger, *Ergot and ergotism*, 1931; Bové, *The story of ergot*, 1970). Human exposure to low levels of ergolines still appears to be widespread and there have been severe outbreaks perhaps in France in 1951 (Fuller, *The day of St. Anthony's fire*,

1968, although mercury poisoning has also been suggested as a cause of this outbreak), and more recently in Ethiopia and India (*WHO Environmental Health Criteria* 105, 1990).

Claviceps paspali causes paspalum staggers in cattle, sheep, and horses (Hopkirk, *NZ J Agric.* 53: 103, 1936) and *C. fusiformis* on *Pennisetum typhoides* has been associated with agalactia in sows resulting in the death of new-borne piglets (Loveless, *TBMS* 50: 15, 1967).

Ergot of rye was once the only source of the medicinal ergot alkaloids but since the early 1960s semi-synthetic alkaloids have been prepared on a large scale from lysergic acid produced by *C. paspali* fermentations. Ergot alkaloids are also produced by other genera (Reháček & Sajdl, *Ergot alkaloids*, 1990). See also Kren & Cvak (*Ergot: the genus Claviceps*, 518 pp., 1999), Schardl *et al.* (*Alkaloids Chem. Biol.* 63: 45, 2006), White *et al.* (*Clavicipitalean fungi: evolutionary biology, chemistry, bio-control and cultural aspects*, 2003). See hallucinogenic fungi.

Ergotaetia E.J. Quekett (1841) = *Sphacelia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

ergotamine, a cyclic tripeptide derivative of lysergic acid from *Claviceps purpurea* sclerotia; used in medicine against migraine. Cf. ergometrine.

ergotism, ergot poisoning. See ergot.

ergotoxine, a mixture of ergocornine, ergocristine, and ergokryptine; cyclic tripeptide derivatives of lysergic acid from *Claviceps purpurea* sclerotia.

Ericianella Brond. (1828) = *Bactridium* fide Fries (*Summa veg. Scand.*, 1849).

Eriksson (Jakob; 1848-1931; Sweden). Professor and Director, Department of Plant Physiology and Agricultural Botany, Academy of Agriculture, Stockholm (1885-1913). He discovered physiologic races in rusts (see *Jahrbücher für Wissenschaftliche Botanik* 29: 499, 1896). *Publs.* (with Hennings) *Die Getreideroste, ihre Geschichte und Natur, sowie Massregeln gegen dieselben* (1896) [first published in Swedish in *Medd. Kongl. Landtbruks Akad. Esper.* 38, 1894]; *Über die Specialisierung des Parasitismus bei den Getreiderostpilzen. Bericht der Deutschen Botanischen Gesellschaft* (1894); *Über die Mykoplasma-theorie. Biologisches Zentralblatt* (1910); *Die Pilzkrankheiten der landwirtschaftlichen Kultur-gegewachse* (1926) [in English, 1930; first printed in Swedish, 1910 and in English, 1912]. *Biogs, obits etc.* Stafleu & Cowan (*TL-2* 1: 798, 1976).

Erikssonia Penz. & Sacc. (1898), Phyllachoraceae. 5 (biotrophic on leaves), widespread (tropical). See Stevenson (*Mycol.* 35: 629, 1943).

Erikssonopsis M. Morelet (1971), Helotiaceae. 1, Europe. See Morelet (*Bulletin de la Société des Sciences naturelles et d'Archéologie de Toulon et du Var* 195: 7, 1971).

Erinaceae Quél. (1886) = Bankeraceae.

Erinacella, see *Ericianella*.

erinaceous, prickly like a hedgehog.

Erinaceus Dill. ex Maratti (1822) = *Hydnum* fide Donk (*Persoonia* 8: 279, 1975).

Erinella Quél. (1886) = *Lachnum*.

Erinella Sacc. (1889) = *Lachnum* fide Spooner (*Bibliotheca Mycol.* 116, 1987).

Erinellina Seaver (1951) = *Lachnum* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Erineum Pers. (1822) nom. dub., Fungi. Gall on an

- outgrowth caused by gall-mites (*Arachnida*; *Eriophyidae*).
- Eriocaulago** Vánky (2005), ? Ustilaginaceae. 2 (on *Eriocaulaceae*), Africa; S. Asia; N. America. See Vánky (*Mycol. Balcanica* 2: 113, 2005).
- Eriocercospora** Deighton (1969), anamorphic *Mycosphaerellaceae*, Hso.≡ eP.10. 2 (on *Asterinaceae*), widespread (tropical). See Deighton (*Mycol. Pap.* 118: 5, 1969), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003).
- Eriocercospora** Rak. Kumar, A.N. Rai & Kamal ex U. Braun (1998), anamorphic *Mycosphaerellaceae*, Hso.≡ eP.?. 2, India. See Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 2: 398, 1998).
- Eriocladus** Lév. (1846) nom. rej. ≡ *Lachnocladium*.
- Eriocorys** Qué. (1886) ≡ *Strobilomyces*.
- Erioderma** Fée (1825), Pannariaceae (L). 40, widespread (esp. tropical). See Elix *et al.* (*Aust. J. Chem.* 40: 1581, 1987; biochemistry), Jørgensen (*Ann. bot. fenn.* 38: 259, 2001; E Asia), Jørgensen (*Taxon* 50: 525, 2001; nomencl.), Jørgensen & Arvidsson (*Nova Hedwigia* 73: 497, 2001; sorediate spp.), Jørgensen & Arvidsson (*Nordic J. Bot.* 22: 87, 2002; S America), Jørgensen & Sipman (*Ann. bot. fenn.* 39: 201, 2002; SE Asia), Wiklund & Wedin (*Cladistics* 19: 419, 2003; phylogeny), Jørgensen & Arvidsson (*Symb. bot. upsal.* 34 no. 1: 113, 2004; Ecuador), Wedin & Wiklund (*Symb. bot. upsal.* 34 no. 1: 469, 2004; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Eriomene** (Sacc.) Clem. & Shear (1931) = *Menispora* fide Hughes (*CJB* 36: 727, 1958).
- Eriomenella** Peyronel (1918) = *Menispora* fide Hughes (*CJB* 36: 727, 1958).
- Eriomoeszia** Vánky (2005), ? Ustilaginaceae. 1 (on *Eriocaulaceae*), S. Asia; N. America. See Vánky (*Mycol. Balcanica* 2: 105, 2005).
- Eriomycopsis** Speg. (1910), anamorphic *Pezizomycotina*, Hso.≡ eH.10. c. 13 (fungicolous), widespread. See Deighton & Pirozynski (*Mycol. Pap.* 128, 1972), Braun & Mel'nik (*Mikol. Fitopatol.* 32: 3, 1998; Russia), Johnston (*N.Z. J. Bot.* 37: 289, 1999; New Zealand).
- Erionema** Maire (1906) = *Menispora* fide Hughes (*CJB* 36: 727, 1958).
- Eriopezia** (Sacc.) Rehm (1892), Hyaloscyphaceae. c. 30, Europe; New Zealand. See Korf (*Mycotaxon* 7: 457, 1978), Spooner (*Bibliotheca Mycol.* 116, 1987), Kobler (*Schweiz. Z. Pilzk.* 69: 30, 1991).
- Eriopeziza**, see *Eriopezia*.
- Erioscypha** Kirschst. (1938) = *Lachnum* fide Korf (*Mycotaxon* 7: 399, 1978).
- Erioscyphella** Kirschst. (1938) = *Lachnum* fide Korf (*Mycotaxon* 7: 399, 1978), Haines & Dumont (*Mycotaxon* 19: 1, 1984).
- Eriosperma** Raf. (1808) nom. dub., ? Agaricales.
- Eriosphaera** De Toni (1888) [non *Eriosphaera* F. Dietr. 1817, *Compositae*] ≡ *Lasiosphaera*.
- Eriosphaerella** Höhn. (1906) = *Eriosphaeria* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Eriosphaeria** Sacc. (1875), Trichosphaeriaceae. 6 (from wood and bark), Asia; Europe. See Réblová (*Czech Mycol.* 50: 73, 1997), Shenoy *et al.* (*MR* 110: 916, 2006).
- Eriospora** Berk. & Broome (1850), anamorphic *Stictidaceae*, Cpd.0fH.10. 5, Europe; S. America. See Petrak (*Sydowia* 1: 94, 1947).
- Eriosporangium** Bertero ex Ruschenb. (1831) = *Puccinia* fide Jackson (*Mycol.* 24: 62, 1932).
- Eriosporella** Höhn. (1916), anamorphic *Pezizomycotina*, St.1bH.15. 1, Europe. See Punithalingam (*MR* 107: 917, 2003; cytology).
- Eriosporina** Tognini (1894) ? = *Sirothecium* fide Sutton (*Mycol. Pap.* 141, 1977).
- Eriosporium** Vánky (2005), ? Ustilaginaceae. 2 (on *Eriocaulaceae*), Africa. See Vánky (*Mycol. Balcanica* 2: 113, 2005).
- Eriosporopsis** Petr. (1947), anamorphic *Pezizomycotina*, Cpd.0fH.?. 1, Europe.
- Eriothyrium** Speg. (1888), anamorphic *Pezizomycotina*, Cpt.0eH.?. 5, S. America.
- Erispora** Pat. (1922), *Pezizomycotina*. 1, Philippines. Type material is lost and affinities are unclear, fide Rossman *et al.* (*Stud. Mycol.* 42, 1999).
- Ernakulamia** Subram. (1996), anamorphic *Pezizomycotina*. 1, S.E. Asia. See Subramanian (*Kavaka* 22/23: 67, 1994).
- erogen**, a substance controlling the induction and differentiation of sex organs; **erotactin**, a sperm attractant; **erotropin**, a substance inducing a chemotropic response in sex organs (Machlis, *Mycol.* 64: 238, 1972). See hormones.
- Eromitra** Lév. (1846) ≡ *Mitrophora*.
- erose** (of a lamella, etc.), having delicate tooth-like projections from the edge.
- Erostella** (Sacc.) Sacc. (1906) = *Togninia* fide Barr *et al.* (*Mycotaxon* 48: 529, 1993), Mostert *et al.* (*Mycol.* 95: 646, 2003).
- Erothrotheca** G.H. Martin & Charles (1928) = *Melanospora* Corda fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- erratic** (of lichen thalli), not fixed to the substratum and often blowing around, e.g. *Chondropsis semiviridis*, *Sphaerothallia esculenta* ('manna'); epigaeic; vagrant; wandering lichens.
- Erratomyces** M. Piepenbr. & R. Bauer (1997), ? *Tilletiaceae*. 5 (on leaves of *Leguminosae*), Australia; India; S. & N. America. See Castlebury *et al.* (*Mycol.* 97: 888, 2005; phylog.).
- erumpent**, bursting through the surface of the substratum. Cf. *perrumpent*.
- Eruptio** M.E. Barr (1996), ? *Mycosphaerellaceae*. Anamorphs *Lecanosticta*, *Dothistroma*. 3, widespread. See Evans (*Mycol. Pap.* 153, 1984; as *Mycosphaerella*), Barr (*Mycotaxon* 60: 433, 1996), Crous (*MR* 103: 607, 1999), Verkley *et al.* (*Mycol.* 96: 558, 2004; phylogeny).
- Erynia** (Nowak. ex Batko) Remaud. & Hennebert (1980), *Entomophthoraceae*. 16 (on *Insecta*), widespread. See Remaudière & Hennebert (*Mycotaxon* 11: 269, 1980), Humber (*Mycotaxon* 13: 471, 1981), Humber (*Mycotaxon* 15: 167, 1982), Butt & Beckett (*Protoplasma* 120: 72, 1984; ultrastr. mitosis & spindle-pole body), Butt & Beckett (*Protoplasma* 120: 61, 1984; ultrastr. mitosis & spindle-pole body), Descals & Webster (*TBMS* 83: 669, 1984; aquatic spp.), Li & Humber (*CJB* 62: 653, 1984), Ben-Ze'ev (*Mycotaxon* 25: 1, 1986), Ben-Ze'ev (*Mycotaxon* 27: 263, 1986), Ben-Ze'ev (*Mycotaxon* 28: 403, 1987), Humber (*Mycotaxon* 34: 441, 1989), Perry & Fleming (*Mycol.* 81: 154, 1989; zygospore germination), Keller (*Sydowia* 43: 39, 1991), Keller (*Sydowia* 45: 252, 1993), Robel (*MR* 101: 573, 1997; polymorphism), Li *et al.* (*Mycosystema* 17: 91, 1998), Keller

& Petrini (*Sydowia* 57: 23, 2005; key), Keller (*Sydowia* 58: 38, 2006; Switzerland), Keller (*Sydowia* 59: 75, 2007; Switzerland, n.sp.).

Eryniopsis Humber (1984), Entomophthoraceae. 3, Europe; USA. See Humber (*Mycotaxon* 21: 257, 1984), Keller & Eilenberg (*Sydowia* 45: 264, 1993), Keller & Petrini (*Sydowia* 57: 23, 2005; key), Keller (*Sydowia* 59: 75, 2007; Switzerland, n.sp.).

Eryporus Quél. (1886) = *Boletinus* fide Murrill (*N. Amer. Fl.* 9: 133, 1910).

Erysibe Theophr. ex Wallr. (1833) nom. dub., anamorphic *Pucciniales*. Anamorph name mainly for (II).

Erysiphaceae Tul. & C. Tul. (1861), Erysiphales. 19 gen. (+ 40 syn.), 769 spp.

Lit.: Braun (*Beih. Nova Hedwigia* 89: 700 pp., 1987), Braun (*The Powdery Mildews (Erysiphales) of Europe*: 337 pp., 1995), Cook *et al.* (*MR* 101: 975, 1997), Saenz (*McIlvainea* 13: 33, 1998), Takamatsu *et al.* (*Mycoscience* 39: 441, 1998), Braun (*Schlechtendalia* 3: 48, 1999), Saenz & Taylor (*CJB* 77: 150, 1999), Braun & Takamatsu (*Schlechtendalia* 4: 1, 2000), Mori *et al.* (*Mycol.* 92: 74, 2000), Takamatsu (*Mycoscience* 45: 147, 2004), Takamatsu & Matsuda (*Mycoscience* 45: 340, 2004), Hirose *et al.* (*MR* 109: 912, 2005), Takamatsu *et al.* (*MR* 110: 1093, 2006), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Takamatsu *et al.* (*MR* 112: 299, 2008; phylogeny).

Erysiphales H. Gwynne-Vaughan (1922). Leotiomycetidae. 1 fam., 19 gen., 769 spp. Fam.:

Erysiphaceae

Lit.: **General**: Amano (*Host range and geographical distribution of the powdery mildew fungi*, 1987; compr. host & geogr. distr.), Bélanger *et al.* (Eds) (*The powdery Mildews: A comprehensive Treatise*, 2000), Blumer (*Beitr. Krypt. Flora Schweiz* 7(1), 1933; *Echte Mehltäupilze (Erysiphaceae)*, 1967; keys; descriptions), Boesewinkel (*Revue mycol.* 41: 493, 1977; ident. by conidia, key), Braun (*Feddes Repert.* 88: 655, 1978; taxonomy, *A monograph of the Erysiphales*, 1987 [*Beih. Nova Hedw.* 89]; keys 435 spp., *Schlechtendalia* 3: 48, 1999; generic concepts), Braun & Takamatsu (*Schlechtendalia* 4: 1, 2000; gen. & fam. concept), Cook *et al.* (*MR* 101: 975, 1997; anams, SEM), Gelyuta (*Biol. Zh. Armen.* 41: 351, 1988; fam. concepts), Hirata (*Host range and geographical distribution of the powdery mildews*, 1968; *Sydowia* 25: 100, 1972), Hirata *et al.* (*CJB* 78: 1521, 2000; ITS, coevolution), Junell (*TBMS* 45: 539, 1965; nomenclature), Mori *et al.* (*Mycol.* 92: 74, 2000; mol. syst., *Mycoscience* 41: 437, 2000; evolution), Saenz (*McIlvainea* 13: 33, 1998; rDNA), Saenz & Taylor (*CJB* 77: 150, 1999; mol. syst.), Spencer (Ed.) (*The powdery mildews*, 1978), Takamatsu *et al.* (*Mycoscience* 39: 441, 1998; DNA; *MR* 104: 1304, 2000; coevolution), Zheng (*Mycotaxon* 22: 209, 1985; key),

Regional: **Argentina**: Havrylenko (*Erysiphales de la Region Andino-Patagonica*, 1997; 51 spp.). **Armenia**: Simonyan (*Mikoflora Armenii*, VII Erysiphales, 1994; 106 spp.). **Bulgaria**: Fakirova (*Fungi Bulgaricae*, 1 Ordo Erysiphales, 1991; 95 spp.). **Canada**: Parmelee (*CJB* 55: 1940, 1977; host index). **China**, Zheng & Yu (*Fl. Fung. Sin.* 1, 1987; 214 spp.), Chen & Gao (*Powdery Mildews in Fujian, Fuzhou, China*, 1993; 90 spp.). **Estonia**, Karis (*Esti jahukastelised (Erysiphaceae)*, 1987). **Europe**, see Blumer (1933, 1967 above), Braun (*The powdery*

mildews (Erysiphales) of Europe, 1995). **Greece**, Pantidou (*Annls Inst. Phytopath. Benaki* n.s. 10: 187, 1971). **India**, Sharma & Patel (*Mycol. Inform.* 4, 1995; checklist and bibliog.). **Israel**, Chorin & Palti (*Israel J. agric. Res.* 12: 153, 1963). **Italy**, Ciferri & Camera (*Quaderno Ist. bot. Univ. Pavia* 21, 1962). **Japan**, Homma (*J. Fac. Agric., Hokkaido Imp. Univ. Sapporo* 38: 183, 1937). **Kazakhstan**, Vasyagina *et al.* (*[Flora sporovikh rastenii Kazakhstana]* 3, 1961). **Korea**: Shin (*Erysiphaceae of Korea*, 1986; 62 spp.). **Lithuania**: Grigaliūnaitė (*Mycota Lithuaniae* III Erysiphales 1, 1997; 86 spp.). **New Zealand**, Hammett (*N.Z. Jl Bot.* 15: 687, 1977). **Poland**: Sałata (*Flora Polska Grzyby* 15, 1985). **Portugal**, de Varennes e Mendonça & de Sequeira (*Agron. lusit.* 24: 87, 1963; 26: 21, 1965; 33: 151, 1972). **Romania**, Sandu-Ville (*Ciupercile Erysiphaceae din Romania*, 1967), Eliade (*Lucr. Grăd. Bot. Bucur.* 1990: 105, 1990; 147 spp.). **Russia**, Golovin (*[Powdery mildews parasitizing cultivated and useful plants]*, 1960), Bunkina (*Plantae non Vasculares, Fungi et Bryopsida Orientis Extremi Sovietici, Fungi*, 2 Ascomycetes, Erysiphales, Clavicipitales, Helotiales, 1991; 121 spp.). **Slovakia**: Paulech (*Flóra Slovenska* X/1, *Mycota* (Huby), Ascomycetes (Vreckaté), Erysiphales (Múčnatkotvaré), 1995; 108 spp.). **South Africa**, van Jaarsveld (*Phytophylactica* 16: 155, 1984). **Spain**, Durrieu & Macé (*BSMF* 88: 175, 1973). **Sweden**, Junell (*Symb. bot. upsal.* 19 (1), 1967). **UK**, Ing (*Mycologist* 4: 46, 88, 125, 172, 1990, checklist; 5: 24, 60, 1991, key). **Ukraine**: Gelyuta (*Flora Fungorum RSS Ucrainicae, Ascomycetes, Erysiphales*, 1989; 108 spp.).

Erysiphe R. Hedw. ex DC. (1805), Erysiphaceae. Anamorph *Oidium* subgen. *Pseudoidium*. 326, widespread. See Martin & Gay (*CJB* 61: 2472, 1983; conidiogenesis), Braun (*Beih. Nova Hedwigia* 89, 1987; key), Zeller (*Mycol.* 87: 525, 1995; morphology syst.), Braun (*Schlechtendalia* 2: 48, 1998; gen. taxonomy), Takamatsu *et al.* (*Mycoscience* 40: 252, 1999; molec. syst.), Braun & Takamatsu (*Schlechtendalia* 4: 3, 2000; emend), Mori *et al.* (*Mycoscience* 41: 437, 2000; phylogeny), Stummer *et al.* (*MR* 104: 44, 2000; as *Uncinula*, genetic diversity), Havrylenko (*Nova Hedwigia* 72: 409, 2001; Argentina), Takamatsu *et al.* (*Mycoscience* 43: 333, 2002; on *Glycine*), Zimmermannová-Pastircáková *et al.* (*Schlechtendalia* 8: 39, 2002; on *Aesculus*, Europe), Cunningham *et al.* (*Australas. Pl. Path.* 32: 421, 2003; molecular identification, anamorphs), Nomura *et al.* (*Mycoscience* 44: 157, 2003; on *Vitis*), Cunningham *et al.* (*Australas. Pl. Path.* 33: 281, 2004; on *Fabaceae*, Australia), Cunningham *et al.* (*Fungal Diversity* 16: 1, 2004; genetic diversity), Jackson (*Evolution* Lancaster, Pa. 58: 1909, 2004; host-jumping), Takamatsu (*Mycoscience* 45: 147, 2004; phylogeny), Takamatsu & Matsuda (*Mycoscience* 45: 340, 2004; evolution), Péros *et al.* (*Eur. J. Pl. Path.* 113: 407, 2005; on *Vitis*, France), Amrani & Corio-Costet (*Pl. Path.* 55: 505, 2006; pathogenicity on *Vitis*), Braun *et al.* (*Mycol. Progr.* 5: 139, 2006; on *Carpinus*), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Takamatsu *et al.* (*MR* 111: 809, 2007; *E. alphitoides* group).

Erysiphella Peck (1876) = *Erysiphe* fide Salmon (*Mem. Torrey bot. Club* 9: 1, 1900).

Erysiphites Mesch. (1902), Fossil Fungi. 1 (Tertiary), former USSR.

- Erysiphites** Pampal. (1902), Fossil Fungi ? Fungi. 1 (Miocene), Sicily. See Salmon (*J. Bot. Lond.* 41: 127, 1903).
- Erysiphomycetidae** = Leotiomycetidae. See *Erysiphales*; now placed within the *Leotiomyces*.
For *Lit.* see fam.
- Erysiphopsis** Halst. (1899) = *Erysiphe* fide Salmon (*Mem. Torrey bot. Club* 9: 1, 1900).
- Erysiphopsis** Speg. (1910), anamorphic *Pezizomycotina*. 1, S. America. See Petrak & Sydow (*Annls mycol.* 34: 36, 1936).
- Erythrimum** J. Erikss. & Hjortstam (1970), Corticiaceae. 3, widespread. See Eriksson & Hjortstam (*Svensk bot. Tidskr.* 64: 165, 1970), Roux & Coetzee (*Pl. Dis.* 89: 1158, 2005; pink disease in South Africa).
- Erythrobasidiales** R. Bauer, Begerow, J.P. Samp., M. Weiss & Oberw. (2006). Cystobasidiomycetes. 2 gen., 2 spp. No families recognized.
- Erythrobasidium** Hamam., Sugiy. & Komag. (1988), anamorphic *Erythrobasidiales*. 1, Japan. See Hamamoto *et al.* (*J. gen. appl. Microbiol.* Tokyo 37: 131, 1991; nomencl.), Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 1351, 2000; mol. phylogeny), Bauer *et al.* (*Mycol. Progr.* 5: 41, 2006).
- Erythrocarpon** Zukal (1885), Chaetomiaceae. 1, Europe. Affinities are obscure, no recent research is available.
- Erythrocarpum** Sacc. (1891) = *Erythrocarpon*.
- Erythrodecton** G. Thor (1991), Roccellaceae (L). 2, widespread. See Henssen & Thor (*Nordic J. Bot.* 18: 95, 1998; ontogeny), Thor (*Biblthca Lichenol.* 95: 543, 2007; Malaysia).
- Erythrogloeum** Petr. (1953), anamorphic *Pezizomycotina*, St.0eH.15. 1, Costa Rica. See Ferreira *et al.* (*Fitopatol. Brasil* 17: 106, 1992; anthracnose disease of *Hymenaea* spp.).
- Erythrogymnotheca** Yaguchi & Udagawa (1994), Trichocomaceae. 1, Japan. See Yaguchi *et al.* (*Mycoscience* 35: 219, 1994).
- Erythromada** Huhndorf, A.N. Mill., F.A. Fernández & Lodge (2005), Sordariomycetes. 1, Puerto Rico. See Huhndorf *et al.* (*Fungal Diversity* 20: 63, 2005).
- Erythromyces** Hjortstam & Ryvarden (1990), Hymenochaetaceae. 1, widespread. See Hjortstam & Ryvarden (*Mycotaxon* 37: 55, 1990), Hjortstam *et al.* (*Kew Bull.* 53: 805, 1998).
- Erythrosphaera** Sorokīn (1871) = *Cephalotheca* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Esalque** J.F. Hennen, M.B. Figueredo & A.A. Carvalho (2000), ? Raveneliaceae. 1 (on *Caesalpinia* (*Leguminosae*)), Brazil. See Hennen (*Mycol.* 92: 315, 2000) Cf. *Hennenia*.
- Eschatogonia** Trevis. (1853), ? Acarosporaceae (L). 2, tropical. See Timdal (*Lichenologist* 40: 31, 2008; Peru, key).
- Escovopsis** J.J. Muchovej & Della Lucia (1990), anamorphic *Hypocreales*, Hso.0eH.15. 2 (from attine ant nests), widespread. See Romero *et al.* (*Rev. Mex. Micol.* 3: 231, 1987; as *Phialocladus*), Seifert *et al.* (*Mycol.* 87: 407, 1995), Jacobs *et al.* (*Mycol.* 97: 111, 2005; phylogeny).
- esculent**, of use as a food; see Edible fungi.
- Esdipatilia** Phadke (1981), anamorphic *Pezizomycotina*, Hsy.≡ eH.1. 1, India. See Phadke (*TBMS* 77: 642, 1981).
- eseptate**, see aseptate.
- Esfandiaria** Petr. (1955) [non *Esfandiaria* Charif & Aellen 1955, *Chaenopodiaceae*] = *Esfandiariomyces*.
- Esfandiariomyces** Ershad (1985), *Pezizomycotina*. 1, Iran. See Ershad (*Iranian Journal of Plant Pathology* 21: 8, 1985).
- esorediate** (**esorediose**), having no soredia.
- Esslingeriana** Hale & M.J. Lai (1980), *Parmeliaceae* (L). 1, USA. See Kärnefelt *et al.* (*Pl. Syst. Evol.* 183: 113, 1992; status), Mattsson & Articus (*Symb. bot. upsala.* 34 no. 1: 237, 2004; phylogeny).
- Esteya** J.Y. Liou, J.Y. Shih & Tzean (1999), anamorphic *Pezizomycotina*, Hso.?.?. 1, Taiwan; Europe. See Liou *et al.* (*MR* 103: 243, 1999), Kubátová *et al.* (*Czech Mycol.* 52: 227, 2000; Czech Republic).
- Etheiroduon** Banker (1902) = *Steccherinum* fide Banker (*Mycol.* 21: 145, 1929).
- Etheiophora** Kohlm. & Volkm.-Kohlm. (1989), *Hypocreomycetidae*. 3 (marine), Atlantic Ocean; Pacific Ocean. See Kohlmeyer & Volkmann-Kohlmeyer (*MR* 92: 416, 1989; key), Schoch *et al.* (*MR* 111: 154, 2007; phylogeny).
- Ethnomycology**. Mycology as a branch of ethnology, i.e. the attitudes to, lore and use etc. of fungi by different ethnic, racial or national divisions of humanity. To date, most studies in ethnomycology have concentrated on edible and poisonous macrofungi (q.v.), and on the role of fungi, often hallucinogenic, in religion. Studies on other aspects, such as medicinal use of fungi, are only now beginning. In respect of edible and poisonous macrofungi, different human societies exhibit a full range of attitudes from indifference to strong interest, often resolved as either a powerful ignorance and fear of all macrofungi (typical of, for example, the Anglo-Saxon peoples) or an enthusiasm for using wild edible species combined with extensive practical experience of which species are to be avoided (typical of, for example, northern Slav people). Geographical coverage by existing ethnomycological work is patchy, and many human societies in Africa, Asia, the Pacific ocean islands and South America in particular remain completely unstudied or with tantalizing indications of a wealth of cultural experience still undocumented. Pioneering but unpublished work by Teng (q.v.) on the ethnomycology of China was confiscated during the country's 'cultural revolution', and is presumed destroyed. In addition to connexions with established and recognized religions, there are many beliefs linking fungi to the supernatural, for example through fairy rings (q.v.) or as a result of consumption of hallucinogenic fungi (q.v.).
Lit.: Adhikari & Durrieu (*BSMF* 112: 31, 1996; Nepal), Akpaja *et al.* (*Int. J. Medicinal Mushrooms* 7: 373, 2005; ethnomycology among the Bini people of Nigeria), Birks (*McIlvainea* 10: 89, 1991; fungi in folk medicine), Bulakh (*Int. J. Medicinal Mushrooms* 3: 125, 2001; medicinal mushrooms in the Russian far east), Buller (*TBMS* 5: 21, 1914; fungus lore or ancient Greeks and Romans), Chamberlain (*Mycologist* 10: 173, 1996; southwest China), Grzywnowicz (*Int. J. Medicinal Mushrooms* 3: 154, 2001; medicinal mushrooms in Polish folk medicine), Guzmán (*Int. J. Medicinal Mushrooms* 3: 95, 2001; medicinal mushrooms in Mexican folk traditions), Härkönen (*Symb. Bot. Ups.* 30: 145, 1995; Tanzania), Harsh *et al.* (*J. Tropical For.* 9: 270, 1993; forest fungi and tribal economy in Madhya Pradesh, India), Hobbs (*Medicinal mushrooms: an exploration of tradition*,

- healing and culture, edn 2, 1995), Kalotas (*Fungi of Australia* 18: 269, 1997; aboriginal knowledge and uses of fungi), Keewaydinoquay (*Puhpohwee for the people: a narrative account of some uses of fungi among the Ahnishinaabeg*, 67 pp, 1998; ethnomycology among some North American tribes), Lowy (*Mycol.* 64: 816, 1972, Maya codices; 66: 188, 1974, *Amanita muscaria* and the thunderbolt legend; *Revista Interam. Rev.* 2: 405, 1972, 5: 110, 1975, 10: 94, 1980, mushrooms and religion), Mata (*Rev. Mex. Micol.* 3: 175, 1987; ethnomycology among the Mayans of Yucatan), Gamundí & Minter (*IMI Descriptions of Fungi and Bacteria* 160: 1592, 2004; vernacular names and folk uses of *Cyttaria* by now extinct Fuegian natives), Montoya-Esquivel (*McIlvainea* 13: 6, 1998; ethnomycology of Tlaxcala, Mexico), Morris (*Nyala* 16: 1, 1992; Malawi), Osemwegie *et al.* (*Int. J. Medicinal Mushrooms* 5: 313, 2003; ethnomycology among the Igbo people of Nigeria), Oso (*Mycol.* 67: 311, 1975; ethnomycology of the Yoruba, Nigeria), Pearce (*Bull. Brit. Mycol. Soc.* 15: 139, 1981; Zambia), Prance (*Advances in economic botany* 1: 127, 1984; use of fungi by Amazonian Indians), Rai *et al.* (*Mycologist* 7: 192, 1993; ethnic use of medicinal mushrooms in central India), Redlinger (Ed.) (*The sacred mushroom seeker*, 1990), Saar (*J. Ethnopharmacology* 31: 175, 1991; fungi in Khanty folk medicine, Siberia), Sillitoe (*Science in New Guinea* 21: 3, 1995; ethnomycology in Papua New Guinea southern highlands), Vaidya & Rabba (*Mycologist* 7: 131, 1993; fungi in folk medicine), Wasson & Wasson (*Mushrooms, Russia and history*, 2 vols. 1957). See also: Edible fungi, Hallucinogenic fungi, Soma.
- etiology**, see aetiology.
- eu-** (prefix), true; sometimes used, but wrongly for the subgenus or section including the type species of the generic name of which it is an infrageneric taxon.
- Euacanth** Theiss. (1917), Scortechiniaceae. 1. See Nannfeldt (*Svensk bot. Tidskr.* 66: 49, 1975), Subramanian & Sekar (*Kavaka* 18: 19, 1993), Huhndorf *et al.* (*MR* 108: 1384, 2004; phylogeny), Schoch *et al.* (*MR* 111: 154, 2007; phylogeny).
- Euactinomyces** Langeron (1922) nom. dub., Fungi.
- Eualectoria** (Th. Fr.) Gyeln. (1934) ≡ Alecatoria Ach.
- Euantennaria** Speg. (1918), Euantennariaceae. Anamorphs *Antennatula*, *Hormisciomyces*. 6, widespread. See Corlett *et al.* (*N.Z. Jl Bot.* 11: 213, 1973), Hughes (*N.Z. Jl Bot.* 12: 299, 1974), Hughes & Arnold (*Mem. N. Y. bot. Gdn* 49: 198, 1989; anamorph).
- Euantennariaceae** S. Hughes & Corlett ex S. Hughes (1972), Capnodiales. 9 gen. (+ 6 syn.), 28 spp.
Lit.: Batista & Ciferri (*Saccardo* 2, 1963), Reynolds (*Taxon* 20: 759, 1971; hyphal morph.), Hughes (*N.Z. Jl Bot.* 10: 225, 1972), Reynolds (*Nova Hedwigia* 26: 179, 1975; growth forms), Hughes (*Mycol.* 68: 693, 1976; gen. names, anamorphs), Reynolds (*Mycotaxon* 8: 417, 1979; stalked taxa), Sugiyama *et al.* (*Studies on Cryptogams in Southern Chile*: 169, 1984), Parbery & Brown (*Microbiology of the Phyllosphere*: 101, 1986), Reynolds (*Mycotaxon* 27: 377, 1986; status), Hughes & Arnold (*Mem. N. Y. bot. Gdn* 49: 198, 1989), Hughes & Seifert (*Sydowia* 50: 192, 1998).
- Euascomycetes**. Class for pyrenomycetes, discomycetes and laboulbeniomyces; cf. Hemiascomycetes, Loculoascomycetes.
- Euascomycetidae**. See *Ascomycota*.
- Euaspergillus** F. Ludw. (1892) = *Aspergillus* fide Raper & Fennell (*The genus Aspergillus*, 1965).
- Eubelonis** Clem. (1909) ? = *Calycina* fide Arendholz (*Mycotaxon* 36: 283, 1988).
- Eubelonis** Höhn. (1926), Helotiaceae. 2, Europe. See Arendholz (*Mycotaxon* 36: 283, 1988).
- Eucantharomyces** Thaxt. (1895), Laboulbeniaceae. 26, widespread. See Santamaría (*MR* 98: 1303, 1994; asci).
- eucarpic**, developing reproductive structures on limited portions of the thallus; residual nucleate protoplasm remaining and capable of further mitotic growth and regeneration.
- Eucaryota** (**Eucarya**), see *Eukaryota*.
- Eucasphaeria** Crous (2007), ? Sordariomycetes. Anamorph *Ascochytopsis*-like. 1. See Crous *et al.* (*Fungal Diversity* 26: 1, 2007).
- Euceramia** Bat. & Cif. (1962), Chaetothyriaceae. 1, Brazil.
- Euceratomyces** Thaxt. (1931), Euceratomycetaceae. 1, N. America. See Santamaría (*Nova Hedwigia* 61: 65, 1995).
- Euceratomycetaceae** I.I. Tav. (1980), Laboulbeniales. 5 gen., 7 spp.
Lit.: Tavares (*Mycol. Mem.* 9: 627 pp., 1985), Santamaría i del Campo (*L'ordre Laboulbenials (Fungi, Ascomycotina) a la Península Ibèrica i Illes Balears [Thesis]*: 669 pp., 1990), Santamaría (*Nova Hedwigia* 61: 65, 1995), Santamaría & Rossi (*Pl. Biosystems* 133: 163, 1999).
- euchroic**, see colour.
- Eucladoniomyces** Cif. & Tomas. (1953) = *Cladonia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Eucollema** (Cromb.) Horw. (1912) ≡ *Collema* F.H. Wigg.
- Eucorethromyces** Thaxt. (1900) = *Corethromyces* fide Thaxter (*Memoirs of the American Academy of Arts and Sciences* 16: 1, 1931).
- eucortex** (of lichens), a cortex composed of well-differentiated tissue.
- Eucyphelis** Clem. (1909) = *Chaenotheca* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Eudacnus** Raf. ex Merr. (1943) ≡ *Endacinus*.
- Eudarluka** Speg. (1908), ? Phaeosphaeriaceae. Anamorph *Sphaerellopsis*. 3 or 4 (on rusts), widespread. See Eriksson (*Bot. Notiser* 119: 33, 1966; biology, systematics), Kranz (*Nova Hedwigia* 24: 169, 1974; hosts), Yuan *et al.* (*MR* 102: 866, 1998), Liesebach & Zaspel (*Rust Diseases of Willow and Poplar*: 231, 2005; genetic diversity), Nischwitz *et al.* (*MR* 109: 421, 2005; evolution, host specialization), Pei & Yuan (*Rust Diseases of Willow and Poplar*: 243, 2005; biocontrol), Bayon *et al.* (*MR* 110: 1200, 2006; genetic diversity).
- Eudimeriolum** Speg. (1912), Pseudoperisporiaceae. c. 8, widespread (tropical). See Hansford (*Mycol. Pap.* 15, 1946), Farr (*Mycol.* 71: 243, 1979), Samuels & Rogerson (*Brittonia* 42: 105, 1990), Barr (*Mycotaxon* 64: 149, 1997), Reynolds & Gilbert (*Aust. Syst. Bot.* 18: 265, 2005; Australia).
- Eudimeromyces** Thaxt. (1918) = *Dimeromyces* fide Tavares (*Mycol. Mem.* 9, 1985).
- Euepixylon** Füsting (1867), Xylariaceae. 2, Europe; E. Russia. See Læssøe (*SA* 13: 43, 1994), Vassiljeva (*Nizshie Rasteniya, Griby i Mokhoobraznye Dalnego Vostoka Rossii* Griby 4: 210, 1998).
- euform**, see *Pucciniales* and Table 5.

eugonic, see dysgonic.

eugonidium, a bright green lichen photobiont (e.g. *Trebouxia*) (obsol.).

Euhaplomyces Thaxt. (1901), Laboulbeniaceae. 1, British Isles. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).

euhyemenium, see hymenium.

Euhypoxyton Füsting (1867) = *Hypoxyton* Bull.

Eukaryota. (**Eukarya**). The domain (empire, superkingdom) to which all **eukaryotes** belong; i.e. encompassing all organisms with one or more nuclei in their cells bounded by a nuclear membrane and with paired DNA-containing chromosomes (and also other complex organelles, e.g. Golgi bodies, mitochondria). The counterpart of the **Prokaryota** (**Prokarya**, **prokaryotes**) which is now generally divided into two separate kingdoms, *Archaea* (formerly *Archaeobacteria*) and *Bacteria* (formerly *Eubacteria*; including also *Cyanobacteria*), and the viruses that lack the above structures. See Classification, Phylogeny.

eukaryote (adj. **eukaryotic**), one of the *Eukaryota* (q.v.); cf. prokaryote.

Eumela Syd. (1925), Pseudoperisporiaceae. 1, C. America. See Hansford (*Mycol. Pap.* 15, 1946).

Eumicrocyclus, see *Eumycrocyclus*.

Eumisgomyces Speg. (1912) = *Laboulbenia* fide Spegazzini (*An. Mus. nac. Hist. nat. B. Aires* 27: 70, 1915), Tavares (*Mycol. Mem.* 9, 1985).

Eumitria Stirt. (1881) = *Usnea* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Eumonoicomycetes Thaxt. (1901), Laboulbeniaceae. 2 or 3, widespread.

eumorphic, well-formed.

Eumycetes. (**Eumycota**), true fungi; see *Fungi*.

eumycetoma, see mycetoma.

Eumycota (**Eumycophyta**), see *Eumycetes*.

Eumycrocyclus Hara (1915) = *Coccoidella*.

Euoidium Y.S. Paul & J.N. Kapoor (1986) = *Oidium* Link (1824) fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Euopsis Nyl. (1875), Lichinaceae (L.). 2, widespread. See Hafellner (*Beih. Nova Hedwigia* 79: 241, 1984), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key).

Eupelte Syd. (1924), Asterinaceae. Anamorphs *Clasterosporium*, *Septoidium*-like. 3, widespread (tropical).

Eupenicillium F. Ludw. (1892), Trichocomaceae. Anamorph *Penicillium*. 46, widespread. See Udagawa & Horie (*Antonie van Leeuwenhoek* 39: 313, 1973; ascospores), Pitt (*The genus Penicillium and its teleomorphic states Eupenicillium and Talaromyces*, 1979; keys), Stolk & Samson (*Stud. Mycol.* 23, 1983), Berbee *et al.* (*Mycol.* 87: 210, 1995; molec. data suggests affinity with *Aspergillus*), Leal *et al.* (*MR* 101: 1259, 1997; polysaccharides), Ogawa *et al.* (*Mycol.* 89: 756, 1997; DNA), Skouboe *et al.* (*MR* 103: 873, 1999; phylogeny), Ogawa & Sugiyama (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 149, 2000; phylogeny), Pitt & Samson (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 51, 2000; types), Pitt *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 9, 2000; accepted names), Prieto *et al.* (*CJB* 80: 410, 2002; cell wall polysaccharides), Tuthill (*Mycol. Progr.* 3: 3, 2004; genetic variation), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny), Horn & Peterson (*Mycol.* 100: 12,

2008; on *Aspergillus* heads).

Eupezizella Höhn. (1926) = *Hyaloscypha* fide Huhtinen (*Karstenia* 29: 45, 1989).

Euphoriomyces Thaxt. (1931), Laboulbeniaceae. 13, widespread. See Santamaría (*Revta Iberoamer. Micol.* 8: 43, 1991; key).

Euplotespora Fokin, Di Giuseppe, Erra & Dini (2008), Microsporidia. 1. See Fokin *et al.* (*J. Eukaryot. Microbiol.* 55: 214, 2008).

Eupropolella Höhn. (1917), Helotiales. 7, Europe. See Défago (*Sydowia* 21: 1, 1967), Nauta & Spooner (*Mycologist* 14: 21, 2000; UK).

Eupropolis De Not. (1863) = *Phaeotrema* fide Sherwood (*Mycotaxon* 5: 50, 1977).

Eurasina G.R.W. Arnold (1970) = *Helminthophora* fide de Hoog (*Persoonia* 18: 33, 1978).

Euricoa Bat. & H. Maia (1955) = *Cylindrocarpon* fide Kendrick & Carmichael in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 390, 1973).

European Council for Conservation of Fungi, see Conservation.

European mildew, see mildew.

European Mycological Association. Founded in 2003; recognized as the Committee for Europe within the International Mycological Association (q.v.); structure comprises individual and corporate members, an elected executive, with national representatives from European countries; organizes Congress of European Mycologists every three or four years, and various other meetings. Publications: *EMA Newsletter*. Website: www.euromould.org.

Europhium A.K. Parker (1957) = *Grosmannia* fide Benny & Kimbrough (*Mycotaxon* 12, 1980), Solheim (*Nordic J. Bot.* 6: 199, 1986), von Arx (*SA* 5: 310, 1986), Hausner *et al.* (*CJB* 78: 903, 2000), Zipfel *et al.* (*Stud. Mycol.* 55: 75, 2006).

Eurotiaceae Clem. & Shear (1931) = Trichocomaceae.

Eurotiales G.W. Martin ex Benny & Kimbr. (1980). Eurotiomycetidae. 3 fam., 49 gen., 928 spp. Stromata absent. Ascomata small, cleistothecial, usually solitary, rarely absent; peridium usually thin, membranous, usually brightly coloured, varied in structure and rarely acellular and cyst-like. Interascal tissue absent. Asci clavate or saccate, thin-walled, evanescent, sometimes formed in chains. Ascospores varied, small, aseptate, often ornamented and with equatorial thickening, without a sheath. Anamorphs prominent, many of industrial and medical importance (e.g. *Aspergillus*, *Penicillium*). Saprobic, mainly from soil or decaying plant materials.

Formerly used for ± all ascomycetes with cleistocarpic ascomata, many now placed within groups including ostiolate counterparts from which they have been derived. Fam.:

(1) **Elaphomycetaceae**

(2) **Thermoascaceae**

(3) **Trichocomaceae** (syn. *Aspergillaceae* auct., *Eurotiaceae*)

Lit.: Geiser *et al.* (*Mycol.* 98: 1051, 2006; phylogeny), Geiser & LoBuglio (in McLaughlin *et al.* (Eds), *The Mycota* 7A: 201, 2001), Guarro *et al.* (*Mycotaxon* 42: 193, 1991; key 8 spherical-spored gen.), Fennell (in Ainsworth *et al.* (Eds), *The Fungi* 4A: 45, 1973; keys gen.), Malloch (in Reynolds (Ed.), *Ascomycete systematics*: 73, 1981).

Eurotiella Lindau (1900) = *Allescheria* Sacc. & P. Syd. **Eurotiomycetes** O.E. Erikss. & Winka (1997), *Pezizomycotina*. 10 ord., 27 fam., 281 gen., 3401 spp.

Contains a morphologically high heterogenous assemblage of taxa, including *Penicillium* and its relatives, human pathogens, many of the black yeasts, and some lichenized families.

Subcl.:

(1) **Chaetothyriomycetidae**

(2) **Eurotiomycetidae**

(3) **Mycocaliciomycetidae**

Lit.: Ekman & Tønsberg (*MR* 106: 1262, 2002), Geiser *et al.* (*Mycol* 98: 1051, 2006), Lutzoni *et al.* (*Am. J. Bot.* 91: 1446, 2004).

Eurotiomycetidae Doweld (2001), Eurotiomycetes. Stromata absent. Ascomata usually small, cleistothecial, rarely absent, often brightly coloured, varied in structure. Interascal tissue absent. Asci thin-walled, evanescent, sometimes formed in chains. Ascospores varied, small, aseptate, often ornamented and with equatorial thickening, without a sheath. Anamorphs prominent. Ords:

(1) **Coryneliales**

(2) **Eurotiales**

(3) **Onygenales**

For *Lit.* see ord. and fam.

Eurotiopsis Costantin ex Laborde (1897) = *Monascus* fide Malloch (*Mycol.* 62: 738, 1970).

Eurotiopsis P. Karst. (1889) nom. dub., anamorphic *Pezizomycotina*.

Eurotites Mesch. (1892), Fossil Fungi. 1 (Oligocene), Europe.

Eurotium Link (1809), Trichocomaceae. Anamorph *Aspergillus*. 25, widespread. See Blaser (*Sydowia* 28: 1, 1976; key), Pitt in Pitt & Samson (Eds) (*Advances in Penicillium and Aspergillus systematics* 102: 383, 1985; nomencl.), Kozakiewicz (*Mycol. Pap.* 161, 1989), Chang *et al.* (*J. gen. appl. Microbiol.* Tokyo 37: 289, 1991; DNA), Pitt & Hocking (*Fungi and Food Spoilage* Edn 2: 593 pp., 1997; review), Samson (*Contributions to Microbiology* 2: 5, 1999; review), Pitt & Samson (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 51, 2000; types), Pitt *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 9, 2000; accepted names), Klich (*Identification of Common Aspergillus Species*: 116 pp., 2002; monograph), Zeng *et al.* (*FEMS Microbiol. Lett.* 237: 79, 2004; DNA probes), Butinar *et al.* (*FEMS Microbiology Ecology* 51: 155, 2005; hypersaline environments), Peterson (*Mycol.* 100: 205, 2008; 4-locus phylogeny).

Euryachora Fuckel (1870), Dothideaceae. Anamorph *Placosphaeria*-like. c. 5, widespread (temperate). See Obrist (*Phytopath. Z.* 35: 382, 1959).

Euryancale Drechsler (1939), Cochlonemataceae. 5, Japan; N. America. See Drechsler (*Mycol.* 31: 410, 1939), Drechsler (*Mycol.* 47: 364, 1955), Drechsler (*Mycol.* 51: 787, 1959), Dyal (*Sydowia* 27: 293, 1976; keys parasites of nematodes and amoebae, bibliogr.), Saikawa & Saito (*TBMS* 87: 337, 1986; zygospores), Saikawa & Aoki (*TMSJ* 32: 509, 1991), Saikawa & Katsurashima (*Mycol.* 85: 24, 1993; ultrastr.), Saikawa & Aoki (*Nova Hedwigia* 60: 571, 1995).

Euryporus Quél. (1886) = *Suillus* Gray fide Kuyper (*in litt.*).

Eurytheca De Seynes (1878), ? Myriangiaceae. 2, Europe; West Indies.

euseptate (of conidial septation), having cells separated by multilayered walls of similar structure to lateral

walls, as in *Pyricularia* (Luttrell, *Mycol.* 55: 672, 1963) (Fig. 22C); cf. distoseptate.

Eusordaria Zopf (1883) ? = *Sordaria* fide Lundqvist (*Symb. bot. upsal.* 20 no. 1: 269, 1972).

Eustegia Fr. (1823) [non *Eustegia* R. Br. 1810, *Asclepiadaceae*] = *Stegia*.

Eustilbum Arnold (1885) nom. nud. = *Dendrostilbella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

eustroma, see stroma.

Eusynaptomyces Thaxt. (1931), Ceratomycetaceae. 5, widespread. See Scheloske (*Pl. Syst. Evol.* 126: 267, 1976), Tavares (*Mycol. Mem.* 9: 627 pp., 1985), Santamaría (*Fl. Mycol. Iberica* 5, 2003; Iberian peninsula), Santamaría (*Nova Hedwigia* 82: 349, 2006; Spain).

euthecium, an ascoma (cleistothecium, perithecium, apothecium) of an euascomycete; cf. pseudothecium.

Euthrypton Theiss. (1916) = *Seuratia* fide Meeker (*CJB* 53: 2462, 1975).

euthyplectenchyma, see plectenchyma.

Euthythyrites Cookson (1947), Fossil Fungi, Asterinaeae. 3 (Oligocene, Miocene), Australia; India.

Eutorula H. Will (1916) = *Torulopsis* Berl. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Eutorulopsis Cif. (1925) ? = *Torulopsis* Berl. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

eutrophic, rich in nutrients; cf. dystrophic, oligotrophic.

eutrophication, nutrient enrichment, usually used when directly or indirectly caused by human influences.

Eutrybliidiella (Rehm) Höhn. (1959) = *Rhytidhysterion* fide Samuels & Müller (*Sydowia* 32: 277, 1979).

Eutypa Tul. & C. Tul. (1863), Diatrypaceae. Anamorphs *Libertella*, *Cytosporina*. 32, widespread (esp. temperate). See Glawe & Rogers (*Mycotaxon* 20: 401, 1984), Rappaz (*Mycol. Helv.* 2: 285, 1987; key), Carter (*Phytopath. Pap.* 32, 1991; pathology), Ju *et al.* (*Mycotaxon* 41: 311, 1991; anamorph), Larignon & Dubos (*Eur. J. Pl. Path.* 103: 147, 1997; on *Vitis*), Peros *et al.* (*Phytopathology* 87: 799, 1997), Descenzo *et al.* (*Phytopathology* 89: 884, 1999; DNA), Peros *et al.* (*MR* 103: 1385, 1999; pathology), Cortesi & Milgroom (*Journal of Plant Pathology* 83: 79, 2001; population analysis), Acero *et al.* (*Mycol.* 96: 249, 2004; phylogeny), Chacón Zapata (*Brenesia* 62: 41, 2004; Mexico), Trouillas & Gubler (*MR* 108: 1195, 2004; California, on *Vitis*), Lardner *et al.* (*MR* 109: 799, 2005; molecular diagnostics), Carmarán *et al.* (*Fungal Diversity* 23: 67, 2006; phylogeny), Rolshausen *et al.* (*Phytopathology* 96: 369, 2006; species concepts), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny), Lardner *et al.* (*Australas. Pl. Path.* 36: 149, 2007; Australia, on *Vitis*).

Eutypella (Nitschke) Sacc. (1875) nom. cons., Diatrypaceae. Anamorphs *Cytosporina*, *Libertella*. 78, widespread. See Glawe & Rogers (*Mycotaxon* 20: 401, 1984; Pacific NW, keys), Rappaz (*Mycol. Helv.* 2: 285, 1987; key), Ju *et al.* (*Mycotaxon* 41: 311, 1991; anamorph), Hyde (*MR* 99: 1462, 1995; Australia), Nordén (*Windahlia* 22: 65, 1995; Sweden), Acero *et al.* (*Mycol.* 96: 249, 2004; phylogeny), Chacón Zapata (*Brenesia* 62: 41, 2004; Mexico), Carmarán *et al.* (*Fungal Diversity* 23: 67, 2006; phylogeny).

eutypoid, having groups of perithecia in a stroma with

- the ostioles vertical and breaking through the surface individually. Cf. valsooid.
- Eutypopsis** P. Karst. (1878) = *Endoxyla* fide Barr (*Mycol. Mem.* 7: 232 pp., 1978).
- Euzodiomyces** Thaxt. (1900), Euceratormycetaceae. 2, widespread. See Weir & Rossi (*Mycol.* 93: 171, 2001; Bolivia), Santamaría (*Fl. Mycol. Iberica* 5, 2003; Iberian peninsula).
- evanescent**, having a short existence; fugacious.
- Evanidomus** Caball. (1941), anamorphic *Pezizomycotina*, St.OeP.?. 1, Spain.
- Everhartia** Sacc. & Ellis (1882), anamorphic *Pezizomycotina*, Hsp.0= hH.?. 3, widespread. See Moore (*Mycol.* 47: 90, 1955), Yanna & Ho (*J. Linn. Soc. Bot.* 134: 465, 2000; Hong Kong), Kirschner & Chen (*Stud. Mycol.* 50: 337, 2004).
- Evernia** Ach. (1809), Parmeliaceae (L). c. 10, widespread. See Ahlner (*Acta phytogeogr. suec.* 22, 1948), Bird (*CJB* 52: 2427, 1974; N. Am.), Awasthi (*Bull. bot. Surv. India* 24: 96, 1983; key 3 spp. India), Tavares (*Mycol. Mem.* 9: 627 pp., 1985), Golubkova & Shapiro (*Nov. Sist. niz. Rast.* 24: 144, 1987; 9 spp. former USSR), Feuerer & Marth (*Mitt. Inst. Allg. Botanik Hamburg* 27: 101, 1997; pseudocyphellae), Kärnefelt *et al.* (*Nova Hedwigia* 67: 71, 1998; anatomy), Mattsson & Wedin (*Lichenologist* 30: 463, 1998), Mattsson & Wedin (*Lichenologist* 31: 431, 1999), Wedin *et al.* (*MR* 103: 1152, 1999; DNA), Crespo *et al.* (*Taxon* 50: 807, 2001; genus concepts), Peršoh *et al.* (*Mycol. Progr.* 3: 103, 2004; asci, photobionts), Thell *et al.* (*Mycol. Progr.* 3: 297, 2004; phylogeny), Thell *et al.* (*Symb. bot. upsal.* 34 no. 1: 429, 2004; Scandinavia), Piercey-Normore (*New Phytol.* 169: 331, 2006; photobionts).
- Everniaceae** Tomas. (1897) = Parmeliaceae.
- Everniastrum** Hale ex Sipman (1986), Parmeliaceae (L). 33, widespread (esp. tropical). See Sipman (*Mycotaxon* 26: 235, 1986; key), Eriksson & Hawksworth (*SA* 10: 37, 1991; nomencl.), Jiang & Wei (*Lichenologist* 25: 57, 1993; key 9 spp. China), Elix (*Flora of Australia* 55: 37, 1994), Thell *et al.* (*Mycol. Progr.* 3: 297, 2004; phylogeny), Blanco *et al.* (*Mol. Phylogen. Evol.* 39: 52, 2006; phylogeny), Divakar *et al.* (*Mol. Phylogen. Evol.* 40: 448, 2006; tropical spp.).
- Everniicola** D. Hawksw. (1982), anamorphic *Pezizomycotina*, Cpd.1eH.15. 1 (on lichens, esp. *Evernia* and *Nephroma*), Europe; N. America. See Alstrup & Hawksworth (*Meddr Grønland Biosc.* 31, 1990).
- Everniomyces** Cif. & Tomas. (1953) = *Evernia*.
- Everniopsis** Nyl. (1860), Parmeliaceae (L). 2, C. & S. America. See Kärnefelt *et al.* (*Nova Hedwigia* 67: 71, 1998; anatomy), Thell *et al.* (*J. Hattori bot. Lab.* 100: 797, 2006).
- Eversia** J.L. Crane & Schokn. (1977), anamorphic *Pezizomycotina*, Hso.#eP.19. 1, widespread. See Crane & Schoknecht (*Mycol.* 69: 539, 1977).
- everted**, turned inside out.
- Evicentia** Barreno (2000), Biatorellaceae (L). 2, Italy; USA. See Barreno & Schoeninger (*The Fourth IAL Symposium Progress and Problems in Lichenology at the Turn of the Millennium*, Barcelona, 3-8 September 2000. Book of Abstracts: addendum [i], 2000).
- Evlachovaea** Borisov & Tarasov (1999), anamorphic *Pezizomycotina*, Hso.?.?. 1, Russia. See Borisov & Tarasov (*Mikol. Fitopatol.* 33: 250, 1999).
- Evlachovaia** Voronin (1986), Microsporidia. 1.
- Evolution**, see Coevolution, Fossil fungi, Kingdoms of fungi, Phylogeny.
- Evulla** Kavina (1939) ? = *Neobulgaria* fide Korf in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 249, 1973).
- ex** (1) (in citations, e.g. G. Arnaud ex M.B. Ellis), from; first validly published by the second author(s), see Nomenclature; (2) (prefix), see e-.
- ex situ** (Lat.), **ex-situ** (Engl.) (of an organism), one taken from its natural habitat; used of living cultures isolated from nature and maintained in Genetic resource collections, and also of non-viable material held in Reference collections; cf. *in situ*.
- Exarmidium** P. Karst. (1873), ? Hyponectriaceae. 9, widespread. See Barr & Boise (*Mycotaxon* 23: 233, 1985), Wang & Hyde (*Fungal Diversity* 3: 159, 1999).
- exasperate**, roughened with hard projecting points.
- excavate**, hollow out.
- excentric (eccentric)**, (1) one sided; (2) (of a stipe), at one side or not in the centre of the pileus; cf. centric.
- Excioconidium** Plunkett (1925) = *Chalara* fide Nag Raj & Kendrick (*Monogr. Chalara Allied Genera*, 1975).
- Excioconis** Clem. & Shear (1931) = *Excioconidium*.
- exciple**, see excipulum.
- Excipula** Fr. (1823) = *Pyrenopeziza* fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932), Sutton (*Mycol. Pap.* 141, 1977).
- Excipulaceae** Bonord. (1851), Helotiales.
Lit.: Petch (*TBMS* 26: 53, 1943), Sutton in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 553, 1973), Sutton (*Coelomycetes*, 1980; descr., connexion).
- Excipularia** Sacc. (1884), anamorphic *Pezizomycotina*, Hsp.= eP.10. 2, Europe; Russia. See Petrak (*Sydowia* 16: 357, 1963), Spooner & Kirk (*TBMS* 78: 247, 1982), Yurchenko (*Mycena* 1: 32, 2001; Belarus).
- Excipulariopsis** P.M. Kirk & Spooner (1982), anamorphic *Pezizomycotina*, Hsp.= eP.1. 1, India. See Kirk & Spooner (*TBMS* 78: 251, 1982).
- Excipulella** Höhn. (1915) = *Heteropatella* fide Sutton (*Mycol. Pap.* 141, 1977).
- Excipulina** Sacc. (1884) = *Heteropatella* fide Sutton (*Mycol. Pap.* 141, 1977).
- Excipulites** Göpp. (1836), Fossil Fungi. 4 (Cretaceous, Tertiary), Europe.
- excipulum** (of ascomata), tissue or tissues containing the hymenium in an apothecium, or forming the walls of a perithecium; cf. **ectal** -, **medullary** -. - **proprium**, non-lichenized excipular tissue forming the margins of an apothecium of a lichenized fungus; - **thallinum**, lichenized excipular tissue of a lecanorine apothecium, external to an excipulum proprium (which may be much reduced), usually with a structure like that of the vegetative lichen thallus. See *Lit.* under apothecium, tissue types.
- Exesisporites** Elsik (1969), Fossil Fungi. 1 (Pleistocene), USA.
- exhabitant**, see symbiosis.
- Exidia** Fr. (1822), Auriculariaceae. c. 25, widespread. See Donk (*Persoonia* 4: 166, 1966; syns), Lowy (*Fl. Neotrop.* 6, 1970), Lowy (*Nova Hedwigia* 19: 407, 1971; key), Weiss & Oberwinkler (*MR* 105: 403, 2001; phylogeny), Selosse *et al.* (*New Phytologist* 155: 183, 2002; ectomycorrhiza), Roberts (*Mycotaxon* 96: 83, 2006; Jamaica).
- Exidiaceae** R.T. Moore (1978) = Auriculariaceae.
Lit.: Wells *et al.* (*Frontiers in Basidiomycote Mycology*: 237, 2004).
- Exidiopsis** (Bref.) Möller (1895), Auriculariaceae. c. 30, widespread. See Wells (*Mycol.* 53: 317, 1962;

- key), Wells & Raitviir (*Mycol.* 69: 987, 1977; former USSR), Roberts (*MR* 97: 467, 1993; Brit. spp.), Roberts (*Mycotaxon* 87: 25, 2003; Venezuela n.sp.), Weiss *et al.* (*MR* 108: 1003, 2004; phylogeny).
- exigynous**, having the antheridial stalk arising directly from the oogonial cell above the basal septum.
- Exiliseptum** R.C. Harris (1986), Trypetheliaceae (L). 1, Brazil. See Harris (*Acta Amazon. Supl.* 14: 55, 1984).
- Exilispora** Tehon & E.Y. Daniels (1927) = *Lep-tosphaeria* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- exit tube**, extension of the sporangium, produced prior to or during sporangial discharge, which enables sporangial contents to be released outside the host or substrate.
- exo-** (prefix), outside.
- Exoascaceae** G. Winter (1884) = Taphrinaceae.
- Exoascus** Fuckel (1860) = *Taphrina* fide Mix (*Kansas Univ. Sci. Bull.* 33: 1, 1949).
- Exobasidiaceae** J. Schröt. (1888), Exobasidiales. 5 gen. (+ 1 syn.), 56 spp.
Lit.: Bauer *et al.* (*CJB* 75: 1273, 1997), Begerow *et al.* (*CJB* 75: 2045, 1998), Begerow *et al.* (*MR* 105: 809, 2001), Begerow *et al.* (*Mycol. Progr.* 1: 187, 2002), Crous *et al.* (*Australas. Pl. Path.* 32: 313, 2003), Nagao *et al.* (*Mycoscience* 45: 85, 2004).
- exobasidial** (1) having the basidia uncovered; (2) separated by a wall from the basidium; (3) (of a conidiophore in a lichenized pycnidium sporophore; obsol.), having no secondary branch (Steiner); cf. endobasidial.
- Exobasidiales** Henn. (1898). Exobasidiomycetes. 4 fam., 17 gen., 83 spp. Gall-forming plant parasites, esp. of *Ericaceae* and *Commelinaceae*. Fams:
(1) **Brachybasidiaceae**
(2) **Cryptobasidiaceae**
(3) **Exobasidiaceae**
(4) **Graphiolaceae**
Lit.: Donk (1951-63, VI: 1966: 280), Blanz (*Zeit. f. Myk.* 44: 91, 1978; posn), Gäumann (1964: 358), Cunningham *et al.* (*Mycol.* 68: 642, 1976; key).
- Exobasidiellum** Donk (1931) = *Helicogloea* fide Kirk (*in litt.*).
- Exobasidiomycetes** Begerow, Stoll & R. Bauer (2007), Ustilaginomycotina. 6 ord., 16 fam., 53 gen., 597 spp. Ords:
(1) **Doassansiales**
(2) **Entylomatales**
(3) **Exobasidiales**
(4) **Georgefischeriales**
(5) **Microstromatales**
(6) **Tilletiales**
For *Lit.* see ord. and fam.
- Exobasidiomycetidae** Jülich (1981), see *Exobasidiomycetes*.
For *Lit.* see fam.
- Exobasidiopsis** Karak. (1922) = *Kabatiella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Exobasidium** Woronin (1867), Exobasidiaceae. c. 50 (on *Ericaceae*), widespread (esp. north temperate). *E. japonicum*, *Azalea* gall. See Savile (*CJB* 37: 641, 1959; N. Am.), McNabb (*Trans. roy. Soc. N.Z. Bot.* 1: 259, 1962; NZ), Nannfeldt (*Symb. bot. upsala.* 23 no. 2: 1, 1981; Eur.), Begerow *et al.* (*Mycol. Progr.* 1: 187, 2002; phylog.), Boekhout *et al.* (*Int. J. Syst. Evol. Microbiol.* 53: 1655, 2003; probable paraphyly), Nagao *et al.* (*Mycoscience* 44: 44, 2003; Japan), Li & Guo (*Mycotaxon* 96: 323, 2006; China).
- Exochalara** W. Gams & Hol.-Jech. (1976), anamorphic *Pezizomycotina*, Hso.0eH.32. 2, widespread. See Mercado Sierra *et al.* (*Hifomicetes Demaciáceos de Cuba: Enteroblásticos* Monografie Museo Regionale di Scienze Naturali, Torino 23, 1997), Ring & Gams (*Mycotaxon* 76: 451, 2000).
- exochthonous** (of soil organisms), invaders ill-adapted to live in soil (Park, 1957); cf. autochthonous.
- exogenization**, an hypothetical process whereby endogenously formed spores become exogenously formed: a mechanism proposed to support the evolution of basidiomycetes from the ancestral ascomycetes (Clemençon, *Persoonia* 9: 363, 1977).
- exogenous**, undergoing development outside.
- Exogone** Henn. (1908) = *Agyrium* fide Höhnelt (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt. 1* 120: 8, 1911).
- exolete** (of perithecia, pycnidia, etc.), long over-mature; empty.
- Exomassarina** Teng (1940) ? = *Melchioria* fide Petrak (*Sydowia* 13: 23, 1959), Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- exomycology**, mycology of outer space.
- exo-operculation** (of sporangial dehiscence in chytrids), the operculum is hinged to the rim of the pore; 'true operculation'; cf. endo-operculation.
- exoperidium**, the outer layer of the peridium.
- Exophiala** J.W. Carmich. (1966), anamorphic *Capronia*, Hso.0-1eH-P.15. 28, widespread. See McGinnis & Ajello (*Mycol.* 66: 518, 1974; 3 on fish), de Hoog (*Stud. Mycol.* 15: 100, 1977), de Bievre *et al.* (*Bull. Soc. Fr. Myc. Med.* 16: 345, 1987; physiological basis for taxonomy), de Hoog in Sugiyama (Ed.) (*Pleomorphic Fungi: The Diversity and its Taxonomic Implications*: 221, 1987; developmental cycle), de Hoog *et al.* (*Proc. 10th ISHAM Congr., Barcelona*: 168, 1988; taxonomy *E. jeanselmei* complex), Pedersen & Langvad (*MR* 92: 153, 1989; spp. on fish), Kawasaki *et al.* (*Mycopathologia* 110: 107, 1990; mitochondrial DNA of spp.), Matsumoto *et al.* (*J. Med. Vet. Mycol.* 28: 437, 1990; synanamorph for *E. dermatitidis* as *Wangiella*), de Hoog *et al.* (*Antonie van Leeuwenhoek* 65: 143, 1994; pleoanamorphic cycle), Rogers *et al.* (*Stud. Mycol.* 43: 122, 1999; phylogeny), Untereiner & Naveau (*Mycol.* 91: 67, 1999), Kano *et al.* (*Veter. Pathol.* 76: 201, 2000; from dog), Kawasaki *et al.* (*Mycopathologia* 146: 75, 1999; mitochondrial DNA), Untereiner (*Stud. Mycol.* 45: 141, 2000; teleomorph), Wang *et al.* (*J. Clin. Microbiol.* 39: 4462, 2001; phylogeny), García-Martos *et al.* (*Revta Iberoamer. Micol.* 19: 72, 2002; human infections), Vitale & Hoog (*Medical Mycology* 40: 545, 2002; phylogeny, antifungal susceptibility), Yurlova & Hoog (*Mycoses* 45: 443, 2002; exopolysaccharides), Chee & Kim (*Mycobiology* 30: 1, 2003; molecular markers), Hoog *et al.* (*J. Clin. Microbiol.* 41: 4767, 2003; polymorphism), Matos *et al.* (*Antonie van Leeuwenhoek* 83: 293, 2003; molecular diversity), Kawasaki *et al.* (*Jap. J. Med. Mycol.* 46: 261, 2005; genetic variation, Japan), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny), Sterflinger (*The Yeast Handbook* [1]: 501, 2006; ecology).
- Exophoma** Weedon (1926), anamorphic *Pezizomycotina*. 1, N. America. See Sutton (*Mycol. Pap.* 141, 1977).
- exopropagule**, a propagule formed outside the body (medical mycology).

Exormatostoma Gray (1821) nom. dub., ? Diaporthales.

exospore, see Spore wall.

Exosporella Höhn. (1912), anamorphic *Pezizomycotina*, Hsp.0fH.?. 1, Java.

Exosporiella P. Karst. (1892), anamorphic *Pezizomycotina*, Hsp.≡ eP.19. 1 (on *Corticium*), Europe.

Exosporina G. Arnaud (1921) ≡ Arnaudina.

Exosporina Oudem. (1904) nom. dub., anamorphic *Dothideomycetes*, Hsp.0eP.?. 1, widespread (temperate). See Seifert *et al.* (*Sydowia* 50: 133, 1998; revision).

Exosporinella Bender (1932) ≡ Arnaudina.

Exosporium Link (1809), anamorphic *Pezizomycotina*, Hso/Hsp.≡ eP.26. 19, widespread. See Ellis (*Dematiaceous Hyphomycetes*, 1971), Ellis (*More Dematiaceous Hyphomycetes*, 1976).

exosporium, see Spore wall.

Exoteliospora R. Bauer, Oberw. & Vánky (1999), Melanotaeniaceae. 1 (on *Osmunda* (Pteridophyta)), N. America. See Bauer *et al.* (*Mycol.* 91: 669, 1999).

exotic (1) (adj.), of another country; not indigenous; (2) (n), an - organism.

Exotrichum Syd. & P. Syd. (1914) ? = *Crocicreas* fide Höhnelt (*Mykol. Unters.* 1: 359, 1923).

expallant (of a pileus), becoming pale on drying.

expansin, see patulin.

expersate (of oospores in *Saprolegniaceae*), having one large refractive body surrounded by a homogeneous cytoplasm (Howard, *Mycol.* 63: 684, 1971).

explanate, spread out.

explosive (of asci), see ascus.

Exserohilum K.J. Leonard & Suggs (1974), anamorphic *Setosphaeria*, Hso.≡ eP.26. 34, widespread. See Sivanesan (*Mycol. Pap.* 158: 1, 1987; keys), Alcorn (*Ann. Rev. Phytopath.* 26: 37, 1988; gen. taxonomy), Muchovej *et al.* (*Fitopatol. Brasil* 13: 211, 1988; keys), Khazanov (*Opredelitel' Gribov-Vozbul. 'Gel'mintosporiozov' Rast. iz Rodov Bipolaris, Drechslera i Exserohilum*, 1992), Borchardt *et al.* (*Eur. J. Pl. Path.* 104: 611, 1998; population analysis), Goh *et al.* (*Fungal Diversity* 1: 85, 1998; ribosomal RNA analysis), Sun *et al.* (*Mycosystema* 23: 480, 2004; phylogeny), Sun *et al.* (*Mycotaxon* 92: 173, 2005; China).

exserted, sticking out; protruding (e.g. a mature ascus of *Ascobolus*).

Exserticlava S. Hughes (1978), anamorphic *Pezizomycotina*, Hso.≡ eP.6. 3, widespread (esp. tropical). See Hughes (*N.Z. J. Bot.* 16: 332, 1978), Tsui *et al.* (*Fungal Diversity* 7: 135, 2001; revision).

exsiccatus (adj.; Latin), dried or dry, e.g. fungus (-i) exsiccatus (-i), planta (-ae) exsiccata (-ae), specimen (specimina) exsiccatum (-a); **exsiccatum** (n.; pl. -a), a dried specimen; **exsiccata** (n.; pl. -ae; preferred abbreviation, Exs.), a set of dried specimens (fide Jackson, 1928, and Stearn, 1968). Exsiccatae distributed to major reference collections are generally cited in systematic works; those with printed descriptions issued before 1 January 1953 can be the places of valid publication of new taxa (Art. 30.3; see Nomenclature), and separately published labels are acceptable after that date (note that label data were not always cited in some major nomenclators as sources of names, e.g. by Saccardo, 1882-1972).

Lit.: General, Sayre (*Mem. N.Y. bot. Gdn* 19: 1, 1969, general cryptogamic exsiccatae, lichens; 19: 277, 1975; collectors), Stafleu & Cowen (*TL-2*, 1-7,

1976-88). **Fungi**, Pfister (*Mycotaxon* 23: 1, 1985; compr. catalogue), Stevenson (*Beih. Nova Hedw.* 36, 1971; N. Am.). **Lichens**, Hawksworth (*in* Seaward, 1977: 498; issued 1969-76), Hawksworth & Ahti (*Lichenologist* 22: 1, 1990; issued 1976-89), Hawksworth & Seaward (*Lichenology in the British Isles 1568-1975*, 1977; UK), Hertel (*Mitt. Bot. StSamml., München* 18: 297, 1982; labels), Lynge (*Nyt. Mag. Naturvid.* 55-60, 1915-22; 79: 233, 1939), Sayre (1969).

extenditunicate, see ascus.

extramatrix (1) living on or near the surface of the matrix or substratum; (2) VAM structures (mycelium, spores) developing outside roots of a phytobiont.

Extrawettsteinina M.E. Barr (1972), Pleosporaceae. 4, Europe; N. America. See Barr (*Prodr. Cl. Loculoasc.*, 1987).

Extrolite, An outwardly directed chemical compound produced during differentiation of a living organism; usually excreted but sometimes accumulated in the cell wall or membrane; being outwardly directed, they are always involved in interactions between the source organisms and adjacent organisms or the abiotic environment (Samson & Frisvad, *Stud. Mycol.* 49: 1, 2004). The term includes 'secondary metabolites'. See also Chemotaxonomy, secondary metabolites.

extrusome, membrane-bound structure derived from vesicle of the Golgi system and anchored to the cell membrane by proteinaceous particles; contents extruded in response to stimuli.

Extrusothecium Matsush. (1996) ? = *Leptosphaerulina* fide Matsushima (*Matsush. Mycol. Mem.* 9: 10, 1996), Matsushima (*Matsush. Mycol. Mem.* 10, 2001).

fabiform, see reniform.

Fabisorus Zmitrovich (2001), Polyporaceae. 5. See Zmitrovich (*Mycena* 1: 93, 2001).

Fabospora Kudrjanzev (1960) = *Kluyveromyces* fide Batra *in* Subramanian (Ed.) (*Taxonomy of fungi* 1: 187, 1978), Lachance (*The Yeasts. A Taxonomic Study*: 227, 1998).

Fabosporaceae E.K. Novák & Zsolt (1961) = *Saccharomycopsidaceae*.

Fabraea Sacc. (1881) = *Leptotrochila* fide Schüepp (*Phytopath. Z.* 36, 1959).

Fabrella Kirschst. (1941), Hemiphacidiaceae. 1 (on *Tsuga*), N. America. See Korf (*Mycol.* 54: 12, 1962), Gernandt *et al.* (*Mycol.* 93: 915, 2001; phylogeny), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006; phylogeny), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).

Fabreola Kuntze (1891) ≡ *Urosporella*.

facial eczema, see sporidesmin.

facultative (1) sometimes; not necessarily; not obligate (q.v.); (2) (of a parasite), having the power of living as a saprobe; able to be cultured on laboratory media; (3) - **synonym**, see synonym.

Faerberia Pouzar (1981), Polyporaceae. 1, Europe; Mexico. See Pouzar (*Česká Mykol.* 35: 187, 1981), Estrada-Torres & Cifuentes (*Mycotaxon* 67: 433, 1998; Mexico).

Faerberiaceae Pouzar (1983) = Polyporaceae. The *Favolaschiaceae* are listed as nom. rej. against *Tricholomataceae*.

Fairmania Sacc. (1906) = *Microascus* Zukal fide Malloch & Cain (*CJB* 49: 859, 1971).

Fairmaniella Petr. & Syd. (1927), anamorphic *Pezizomycotina*, Cac.0eP.15. 1, widespread. See Sutton (*Mycol. Pap.* 123, 1971), swart (*TBMS* 90: 279, 1988; Australia), Crous *et al.* (*S. African Forestry JI* 149: 9, 1989; S Africa), Wingfield *et al.* (*S. African Forestry JI* 173: 53, 1995; Chile).

fairy butter, basidiomata of *Tremella albida*.

Fairy rings. Fungus rings, which are generally of basidiomycetes (some 60 recorded species), are very frequent in grass and grassland, and not uncommon in woods. There are three chief types: (1) those in which the development of the sporocarps has no effect on the vegetation, e.g. *Chlorophyllum molybdites*, *Lepista sordida*, myxomycete rings; (2) those in which there is increased growth of the vegetation, e.g. *Calvatia cyathiformis*, *Disciseda subterranea* (*Catastroma subterraneum*), the basidiomata of which are at the outer edge of the ring, *Lycoperdon gemmatum*, *Lepista personata*; (3) those in which the vegetation is damaged, sometimes so badly as to have an effect on its value, e.g. *Agaricus praerimosus* (*A. tabularis*), *Leucopaxillus giganteus*, *Marasmius oreades* (in British Isles), *Calocybe gambosa*. Rings of the third type are frequently made up of outer and inner rings in which the growth of the vegetation is strong with a ring of dead or badly damaged vegetation between. Rings of fungal origin are also sometimes seen as bare circles under trees with the black truffle, *Tuber melanosporum* as a mycorrhizal symbiont. These may occur because of chemicals produced by the fungus which inhibit growth of vegetation.

Rings start when mycelium grows outwards evenly from a central point of origin; the growth being at all times on the outer edge because of the band of decaying mycelium and used-up soil within the ring of active hyphae. The mean growth of a ring of *A. praerimosus* is 12 cm in radius every year (0-30 cm in any one year); that of one of *Calvatia cyathiformis* about 24 cm. From this, the ages of rings of these two fungi in Colorado, 60 and more than 200 m diam., were thought to be 250 and 420 years; parts of *A. praerimosus* rings were possibly 600 years old. A substantial but incomplete fairy ring was observed at the Roman fort of Richborough, near Sandwich, England, with its centre where the defence ditch is now located.

In European cultures, fungus rings have been attributed to supernatural causes (Hall, *Elves in Anglo-Saxon England: matters of belief, health, gender and identity*, 2007), and are often associated with various pagan beliefs (see: Ethnomycology).

Lit.: Shantz & Piemeisel (*J. Agric. Res.* 11: 191, 1917), Bayliss Elliott (*Ann. appl. Biol.* 13: 277, 1926), Parker-Rhodes (*TBMS* 38: 59, 1955), Burnett & Evans (*Nature* 210: 1368, 1966), Stevenson & Thompson (*J. theor. Biol.* 58: 143, 1976; kinetics), Gregory (*Bull. BMS* 16: 161, 1982; 'free' and 'tethered' rings).

fairy-ring champignon, the edible *Marasmius oreades*.

falcarindiol, an antifungal compound produced by carrot roots (Garrod & Lewis, *TBMS* 72: 515, 1979).

falcate (falciform), curved like the blade of a scythe or sickle (Fig. 23.10).

Falcatispora K.L. Pang & E.B.G. Jones (2003) = *Ascosalsum* fide Pang *et al.* (*Nova Hedwigia* 77: 13, 2003), Pang & Jones (*Nova Hedwigia* 78: 269, 2004).

Falciascina Beneš (1961), Fossil Fungi. 1 (Carboniferous), former Czechoslovakia.

Falciformispora K.D. Hyde (1992), Pleosporaceae. 1 (marine), Mexico. See Hyde (*MR* 96: 26, 1992).

Falcipectella Gucevič (1952) = *Heteropatella* fide Sutton (*Mycol. Pap.* 141, 1977).

Falcipectellina Gucevič (1952) = *Heteropatella* fide Sutton (*Mycol. Pap.* 141, 1977).

falciphore, see falx.

Falcispora Bubák & Serebrian. (1912) = *Selenophoma* fide Petrak (*Sydowia* 5: 328, 1951).

Falcocladium S.F. Silveira, Alfenas, Crous & M.J. Wingf. (1994), anamorphic *Nectriaceae*, Hsy/Hsp.0-1eH.15. 2, Brazil. See Crous *et al.* (*Mycotaxon* 50: 447, 1994), White & Reddy (*Mycol.* 90: 226, 1998), Somrithpol *et al.* (*Sydowia* 59: 148, 2007; review).

false membrane (of a smut), a tissue of sterile fungal cells limiting the sorus, as in *Sphacelotheca*.

false morel, see lorchel.

false truffle, see truffle.

falx, a 'fertile hypha' or conidiophore of *Zygosporium*, having the form of a bill-hook. Falces may be sessile or on special hyphae or **falciphores** (Mason, 1941).

Fanniomyces T. Majewski (1972), Laboulbeniaceae. 2, Europe; N. America. See Balazuc (*Revue Mycol.* Paris 43: 393, 1979), Tavares (*Mycol. Mem.* 9: 627 pp., 1985), Santamaria *et al.* (*Treb. Inst. Bot. Barcelona* 14: 1, 1991; Europe).

farctate (of a stipe), having the centre softer than the outer layer; stuffed.

farinaceous (farinose), like meal in form or smell.

Farinaria Sowerby (1803) = *Ustilago* fide Fries (*Syst. mycol.* 3, 1829).

Farinodiscus Svrček (1987) = *Proliferodiscus* fide Baral (*SA* 13: 113, 1994).

Farlow (William Gilson; 1844-1919; USA). Graduate student, Department of Medicine (1866-1870) then assistant in cryptogamic botany under A. Gray (1870-1872), Harvard University; student of de Bary (q.v.), Strassburg, Germany (c. 1872-1874); Assistant Professor (1874-1879) then Professor (1879 onwards), Harvard University. A pioneer plant pathologist in North America, he and Thaxter (q.v.) were responsible for training several people later important in mycology and plant pathology. His writings were on plant diseases, fungi (including lichen-forming species) and bibliography. The fungal reference collection he established in Harvard (FH) and its library, both named after him, are among the most extensive in mycology. *Publs. Bibliographical Index of North American Fungi* (1905). *Biogs, obits etc.* Clinton (*Phytopathology* 10: 1, 1920) [portrait]; Grumman (1974: 188); Pfister (*Bulletin of the Boston Mycological Club* 4: 6, 1975 [Farlow, *Icones Farlowiana*, 1927]); Stafleu & Cowan (*TL-2* 1: 813, 1976).

Farlowia Sacc. (1883) [non *Farlowia* J. Agardh 1876, *Algae*] = *Farlowiella*.

Farlowiella Sacc. (1891), Pleosporales. Anamorph *Acrogenospora*. 2, Europe; Tristan da Cunha. See Zogg (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1962), Goh *et al.* (*MR* 102: 1309, 1998; anamorph), Lumbsch *et al.* (*Mol. Phylogen. Evol.* 34: 512, 2005; phylogeny), Zhu *et al.* (*Mycotaxon* 92: 383, 2005; China), Prado *et al.* (*MR* 110: 511, 2006; phylogeny), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).

Farnoldia Hertel (1983), Lecanorales (L). 6, widespread. See Pietschmann (*Nova Hedwigia* 51: 521, 1990; posn), Buschbom & Mueller (*Mol. Phylogen.*

- Evol.* 32: 66, 2004; phylogeny).
- Farringia** Stafleu (1979) nom. nud., Fungi.
- Farriolla** Norman (1885), Pezizomycotina. 1, Norway. See Tibell (*Beih. Nova Hedwigia* 79: 597, 1984).
- Farriollomyces** Cif. & Tomas. (1953) ≡ Farriolla.
- Farrowia** D. Hawksw. (1975) = Chaetomium fide Piepenbring (*Nova Hedwigia* 70: 289, 2000; phylogeny).
- Farysia** Racib. (1909), Anthracoideaceae. c. 17 (on *Carex*, *Uncinia* (Cyperaceae)), widespread. Spore mass interspersed with elater-like fascicles of hyphae. See Vánky & McKenzie (*Fungal Diversity Res. Ser.* 8: 259 pp., 2002; New Zealand).
- Farysiaceae** Vánky (2001) = Anthracoideaceae.
- Farysporium** Vánky (1999), ? Anthracoideaceae. 1 (on Cyperaceae), Australasia. See Vánky & McKenzie (*Fungal Diversity Res. Ser.* 8: 259 pp., 2002; New Zealand).
- fasciate (fasciated)**, massed or joined side by side.
- Fasciatispora** K.D. Hyde (1991), Xylariales. 1 (on *Nypa*), pantropical. See Hyde (*Nova Hedwigia* 61: 249, 1995), Hyde & Wong (*Fungal Diversity* 2: 129, 1999; ultrastr.), Kang *et al.* (*Fungal Diversity* 2: 135, 1999; possibly an outlying member of the Xylariaceae), Lu & Hyde (*Mycotaxon* 71: 393, 1999; USA).
- fascicle** (1) (esp. of hyphae), a little group or bundle; (2) (of books or exsiccatae), one part, or collection of separate leaves, of a work issued in parts.
- fasciculate**, having growth in fascicles; - **basidium**, see basidium.
- Fassia** Dennis (1964), ? Diatrypaceae. 1, Congo. See Cannon (*SA* 5: 130, 1986), Læssøe (*SA* 13: 43, 1994), Acero *et al.* (*Mycol.* 96: 249, 2004).
- fastigate**, having parallel, massed, upright branches.
- fastigate cortex** (of lichens), made up of parallel hyphae at right angles to the axis of the thallus; cf. fibrous cortex.
- Fastigiella** Benedix (1969) ≡ Neogyromitra.
- fatiscent**, cracked or falling apart.
- fatty acids**, a class of organic compounds, and generally the hydrophobic component of many microbial cellular membrane lipids. Quantitative and qualitative differences in the fatty acid content of microbial cells can be used in classification and identification; widely used in bacteria and also of value for some yeasts (Botha & Kock, *Int. J. Food Microbiol.* 19: 39, 1993), but yet to be fully explored with filamentous fungi.
- Faurelina** Locq.-Lin. (1975), ? Chadaefaudiellaceae. Anamorph *Arthrographis*-like. 1 (coprophilous), widespread (arid regions). See Parguey-Leduc & Locquin-Linard (*Revue Mycol. Paris* 40: 161, 1976; ontogeny), Valldosera *et al.* (*Mycotaxon* 30: 5, 1987), von Arx *et al.* (*Beih. Nova Hedwigia* 94: 104, 1988).
- Fauxtylostoma** McGinty (1923) nom. inval., Agaricomycetes.
- Favaria** Raf. (1815) nom. dub., Fungi. No spp. included.
- faveolate (favose)**, honeycombed; alveolate.
- favic chandeliers**, dichotomously branched, swollen, hyphal tips, growing submerged from the edge of the colony of *Trichophyton schoenleinii*.
- Favillea** Fr. (1848), Sclerodermataceae. 1, Australia. See Fries (*Fung. Natal.*: 32, 1848).
- favoid**, like a honeycomb.
- Favolaschia** (Pat.) Pat. (1892), Mycenaceae. c. 50, widespread (esp. tropical). See Singer (*Beih. Nova Hedwigia* 50, 1974), Parmasto (*Kew Bull.* 54: 783, 1999).
- Favolaschiaceae** Singer (1969) = Mycenaceae.
- Favolus** Fr. (1828) = Polyporus P. Micheli ex Adans. fide Donk (*Persoonia* 1: 173, 1960).
- Favolus** P. Beauv. (1805), Polyporaceae. 2, widespread (esp. tropical). See Donk (*Persoonia* 1: 173, 1960; nomencl.).
- Favomicrosporon** Benedek (1967) nom. dub., Pezizomycotina. See Ajello (*Sabouraudia* 6: 153, 1968).
- Favostroma** B. Sutton & E.M. Davison (1983), anamorphic *Pezizomycotina*, Cpd.0eH.1. 1, Australia. See Sutton & Davison (*TBMS* 81: 291, 1983).
- Favotrichophyton** (Castell. & Chalm.) Neveu-Lem. (1921) = Trichophyton fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Favraea**, see *Fabraea*.
- favus**, a skin disease in humans (*Trichophyton schoenleinii*).
- Fayodia** Kühner (1930), Tricholomataceae. c. 10, widespread (north temperate). See Bigelow (*Mycotaxon* 9: 38, 1979), Antonín (*Persoonia* 18: 341, 2004; type studies European spp.), Antonín (*Mykol. Listy* 90-91: 20, 2004; key European spp.), Antonín & Noordeloos (*A monograph of the genera Hemimycena*, □, 2004), Johnston *et al.* (*N.Z. J. Bot.* 44: 65, 2006; New Zealand (*N.Z. J. Bot.* 44: 65, 2006; New Zealand).
- Fayodiaceae** Jülich (1982) nom. rej. = Tricholomataceae.
- Fechtneria** Velen. (1939) = Hymenogaster fide Svrček in Pilát (Ed.) (*Fl. ČSR B*, 1: 143, 1958).
- federation**, see Phytosociology.
- Fée** (Antoine Laurent Apollinaire; 1789-1874; France). Graduate then Professor of Botany (1832), Strasburg; died in Paris. Much early work on tropical fungi including lichen-forming species; also worked with plants. Main collection in Rio de Janeiro; other material in Paris (P), Copenhagen (C), Geneva G, and London (BM). *Publs. Nova Acta Academiae Leopoldino Carolinae Germaniae Naturae Curiosorum* 18, Suppl. 1 (1841); *Essai sur les Cryptogames des Écorces* (1824-1825) [Suppl. 1837]; *Méthode Lichénographique et Genera* (1825). *Biogs, obits etc.* Anon. (*Journal of Botany* London 12: 223, 1874); Grummann (1974: 277); Stafleu & Cowan (*TL-2* 1: 818, 1976).
- Feigeana** Mies, Lumbsch & Tehler (1995), Roccellaceae (L). 1, Socotra. See Mies *et al.* (*Mycotaxon* 54: 156, 1995), Grube (*Bryologist* 101: 377, 1998; phylogeny).
- Felisbertia** Viégas (1944), Helotiales. 1, S. America.
- Felixites** Elsik ex Janson. & Hills (1990), Fossil Fungi. 2 (Carboniferous), Europe; N. America.
- fellent**, bitter like gall.
- Fellhanera** Vězda (1986), Pilocarpaceae (L). 60, widespread (tropical). See Awasthi & Mathur (*Proc. Indian Acad. Sci. Pl. Sci.* 97: 481, 1987; key 4 spp. India), Lücking *et al.* (*Bot. Acta* 107: 393, 1994), Sérusiaux (*Lichenologist* 28: 197, 1996; key foliicolous spp.), Lücking (*Trop. Bryol.* 13: 141, 1997), Ferraro & Lücking (*Mycotaxon* 73: 163, 1999), Sparrius & Aptroot (*Lichenologist* 32: 515, 2000), Lücking & Santesson (*Lichenologist* 33: 111, 2001; key sorediate spp.), Sparrius (*Lichenologist* 34: 86, 2002), Spier *et al.* (*Lichenologist* 34: 447, 2002; chemistry), Andersen & Ekman (*MR* 109: 21, 2005; phylogeny).
- Fellhaneropsis** Sérus. & Coppins (1996), Pilocar-

- paceae (L). 4, Europe. See Sérusiaux (*Lichenologist* 28: 198, 1996), Andersen & Ekman (*MR* 109: 21, 2005; phylogeny).
- Fellneria** Fuckel (1867) = *Colletotrichum* fide Duke (*TBMS* 13: 156, 1928).
- Fellomyces** Y. Yamada & I. Banno (1984), anamorphic *Cuniculitremaeaceae*. c. 12, widespread. See Yamada *et al.* (*J. gen. appl. Microbiol.* Tokyo 32: 157, 1986; enzyme systems), Yamada *et al.* (*Agric. Biol. Chem.* 53: 2993, 1989; phylogeny), Guého *et al.* (*Int. J. Syst. Bacteriol.* 40: 60, 1990; partial rRNA sequences), Kurtzman (*Int. J. Syst. Bacteriol.* 40: 56, 1990; DNA relatedness), Suh *et al.* (*Microbiol. Culture Coll.* 12: 79, 1996; mol. phylogeny), Prillinger *et al.* (*Syst. Appl. Microbiol.* 20: 572, 1997; taxonomy), Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 1351, 2000; mol. phylogeny), Lopandic *et al.* (*Microbiological Research* 160: 160, 2005; Mexico).
- felt** (of citrus), superficial saprobic fungi, such as *Septobasidium pseudopedicellatum*; **leaf** -, *Anthina citri* and other fungi; **root** -, *Helicobasidium mompa* (Japan).
- Feltgeniomyces** Dieder. (1990), anamorphic *Pezizomycotina*, Hso.1eH.15. 1 (on lichens), widespread. See Diederichs (*Mycotaxon* 37: 304, 1990), Etayo & Breuss (*Öst. Z. Pilzk.* 7: 203, 1998; Australia), Calatayud & Etayo (*CJB* 79: 223, 2001; Spain).
- Femsjonia** Fr. (1849) = *Ditiola* Fr. fide Reid (*TBMS* 62: 474, 1974), Weiss *et al.* (*Frontiers in Basidiomycote Mycology*: 7, 2004).
- Fenestella** Tul. & C. Tul. (1863), *Fenestellaceae*. Anamorph *Pleurostromella*. 2 or 2 (on twigs), widespread (temperate). See Barr (*Rept. Kevo Subarct. Res. Stn* 11: 12, 1974), Huhndorf & Glawe (*Mycol.* 82: 541, 1990; anamorph).
- Fenestellaceae** M.E. Barr (1979), *Pleosporales*. 2 gen. (+ 3 syn.), 12 spp.
Lit.: Barr (*Prodr. Cl. Loculoasc.*, 1987), Vasil'eva (*Mikol. Fitopatol.* 21: 403, 1987), Barr (*N. Amer. Fl. ser.* 2 13: 129 pp., 1990), Huhndorf & Glawe (*Mycol.* 82: 541, 1990), Yuan & Barr (*Sydowia* 46: 338, 1994), Lumbsch & Lindemuth (*MR* 105: 901, 2001).
- fenestrate** (1) having windows or openings; (2) (of spores), muriform.
- Fenestroconidia** Calat. & Etayo (1999), anamorphic *Pezizomycotina*. 1 (lichenicolous), Spain. See Calatayud & Etayo (*Lichenologist* 31: 588, 1999).
- Fennellia** B.J. Wiley & E.G. Simmons (1973), *Trichocomaceae*. Anamorph *Aspergillus*. 3, widespread. See Kuraishi *et al.* (*NATO ASI Series A: Life Sciences* 185: 407, 1990; ubiquinones), Yaguchi *et al.* (*Mycoscience* 35: 175, 1994), Tamura *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 357, 2000; phylogeny), Peterson (*Mycol.* 100: 205, 2008; 4-locus phylogeny).
- Fennellomyces** Benny & R.K. Benj. (1975), *Syncephalastraceae*. 4, USA; Pakistan; India. See Benny & Benjamin (*Aliso* 8, 1975), Mirza *et al.* (*Mucorales of Pakistan*, 1979), Misra *et al.* (*Mycotaxon* 10: 251, 1979), Benny & Schipper (*Mycol.* 84: 52, 1992), Arambarri & Cabello (*Mycotaxon* 57: 145, 1996; *Circinella naumovii* transferred to *Fennellomyces*), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny), Kwasna *et al.* (*MR* 110: 501, 2006; phylogeny).
- Feracia** Rolland (1905) nom. dub., *Pezizomycotina*. 1, Europe. Type material is lost and affinities are unclear. See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- fermentation**, chemical changes in organic substrates caused by enzymes, generally those of living micro-organisms. See Fermented food and drinks.
- Fermented food and drinks**. Fungi (esp. yeasts) and other organisms, particularly bacteria, have been used in the preparation of fermented foods for many centuries, long before their function was recognized or understood. Every country in east Asia has indigenous fermented food, prepared on a scale that ranges from single households to large commercial operations. Often referred to as 'oriental fermentation', the process makes the starting material more digestible or palatable in terms of texture, flavour, aroma, pH and appearance, and furnishes essential nutrients in the form of vitamins, proteins, amino acids and calories.
- Fermented foods are the result of the action of specific microbial enzymes. Any enzyme used in the food industry can be manufactured if pure cultures of the appropriate micro-organism are available. Much of our understanding of the microbiology and biochemistry of oriental fermentation stems from work with pure cultures isolated from naturally fermented food products. As a result, most indigenous fermented foods can now be made from raw materials inoculated with cultures which have been obtained through a long selection process. One micro-organism or, more commonly, a combination of two or more micro-organisms work together to produce the final product.
- Various substrates are used in fermentations: the most popular are soybeans and rice. Others include cassava, coconut, corn, fish, milk and peanuts. All these foods are staples in the diets of the people who normally consume the fermented foods. A koji or starter is prepared for every fermentation. Portions of the starter culture are then used to inoculate a larger batch of the same or a different substrate. Enzymes and by-products produced by the starter culture accelerate the rate of the next fermentation and provide a better growing environment for the succeeding organism(s). Cultures selected for starters are usually highly proteolytic, lipolytic, and/or amylolytic moulds and predominantly species of *Actinomucor*, *Aspergillus*, *Monascus*, *Mucor*, *Neurospora* or *Rhizopus*. The moulds break down macromolecules to produce amino acids, small fatty acids, vitamins and sugars, which ultimately add to the flavour and digestibility of the product. These smaller fermentation by-products are then used by bacteria to produce organic acids which lower pH and provide a favourable environment for yeasts. The yeasts chosen to complete a fermentation differ according to the desired product. The relatively high alcohol, salt or sugar content of fermented food helps to prolong its shelf life in places where refrigeration is not common.
- Asian and Oriental foods and drinks based on fungal fermentations (frequently by *Aspergillus*) include: ang-kak (*Monascus purpureus*), hama-natto, lao-chao, oncom merah, ontojam, sufufu, tape, tempeh, and the Japanese sake (rice wine), shoyu (soy sauce), miso (soy cheese), scocho (a distilled spirit) and mizuma (a sugar syrup from rice). Fermented milk drinks involving fungi include kefir (central and eastern Europe, Caucasus), kumiss (Russia), leben (Egypt), mazu (Armenia) and yoghurt (Bulgaria); bread (bakers yeast), *S. cerevisiae*. People who wish to avoid eating meat, often for ethical reasons, are

increasing in numbers in developed countries, and the globalized economy has meant that these fermented foods have become popular with them as alternatives to meat (see also Mycoprotein).

Lit.: Batra & Millner (*Mycol.* 66: 942, 1974; fungi and fermentation in Asian foods and beverages), Hesseltine (*Mycologist* 5: 162, 1991; *Zygomycetes* in food fermentation), Bennett & Kuch (Eds) (*Aspergillus: biology and industrial applications*, 1992), Hesseltine & Wang (*Indigenous fermented food of non-western origin* [*Mycologia Memoir* 11], 1986), Nout (in Carroll & Wicklow, *The fungal community* edn 2, 1992: 817), Powell *et al.* (Eds) (*The genus Aspergillus from taxonomy and genetics to industrial application*, 1994), Samson (in Jones (Ed.), *Exploitation of micro-organisms*: 321, 1993), Steinkraus (Ed.) (*Industrialization of indigenous fermented foods*, 1989), Yokotsuka (in Arora *et al.* (Eds), *Proteinaceous fermented foods and condiments prepared with koji molds*. [*Handb. Appl. Mycol.*: 329], 1991). See also Brewing, Food and beverage mycology, Mycoprotein, Wine-making.

Fermentotrichon E.K. Novák & Zsolt (1961) = *Geotrichum* fide von Arx *et al.* (*Stud. Mycol.* 14: 1, 1977).

Fernaldia Lynge (1937) [non *Fernaldia* Woodson 1932, *Apocynaceae*] = *Thelignya* fide Jørgensen & Hensen (*Taxon* 39: 343, 1990).

Ferrarisia Sacc. (1919), *Parmulariaceae*. 5, widespread (tropical). See Hosagoudar & Goos (*Mycotaxon* 59: 149, 1996), Hosagoudar & Abraham (*Indian Phytopath.* 51: 389, 1999).

Ferraroa Lücking, Sérus. & Vězda (2005), *Gomphillaceae* (L). 1, Costa Rica. See Lücking *et al.* (*Lichenologist* 37: 164, 2005), Lücking *et al.* (*Lichenologist* 38: 131, 2006; checklist).

fertile hypha, see conidiophore.

fertilization, the fusion of sex nuclei; - **tube/hypha** hypha developing from an antheridial gametic cell; passing through the antheridium wall and bridging the gap between non-contiguous gametangia to penetrate the oogonium.

Fevansia Trappe & Castellano (2000), ? *Rhizopogonaceae*. 1, N. America. See Trappe & Castellano (*Mycotaxon* 75: 155, 2000).

FH, Farlow Reference Library and Herbarium of Cryptogamic Botany, Harvard University (Cambridge, Mass, USA); founded 1919; funded by endowment and the university.

Fibriciellum J. Erikss. & Ryvarden (1975), *Hydnodontaceae*. 1, Europe. See Eriksson & Ryvarden (*Cortic. N. Europ.* 3: 373, 1975).

Fibricium J. Erikss. (1958), *Hymenochaetales*. 5, widespread. Polyphyletic. See Hayashi (*Bull. Govt For. Exp. Stn* 260, 1974; 4 spp.).

fibril (1) a very small fibre; (2) (in *Usnea*), short simple branches perpendicular to the main branches.

Fibrillanosema G.M. Johanna, S. Galbreath, J.E. Smith, R.S. Terry, J.J. Becnel & A.M. Dunn (2004), *Microsporidia*. 1. See Johanna *et al.* (*Intern. J. Parasitol.* 34: 235, 2004).

fibrillar surface coat, fibrous component attached to the flagellar membrane and covering the entire surface of the flagellum.

Fibrillaria Sowerby (1803) nom. dub., *Agaricomycetes*. Based on sterile hymenomycete mycelium fide Donk (*Taxon* 11: 84, 1962).

Fibrillithecis A. Frisch (2006), *Thelotrema* *taceae* (L).

3, pantropical. See Frisch (*Bibliotheca Lichenol.* 92: 135, 2006), Frisch *et al.* (*Bibliotheca Lichenol.* 92: 517, 2006; phylogeny).

fibrillose, covered with silk-like fibres.

Fibrodontia Parmasto (1968), *Hydnodontaceae*. 5, widespread. See Langer (*Bibliotheca Mycol.* 154, 1994).

Fibropilus (Noordel.) Largent (1994) = *Entoloma* fide Kuyper (*in litt.*).

Fibroporia Parmasto (1968) = *Perenniporia* fide Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974).

fibrous cortex (of lichens), made up of loosely woven distinct hyphae parallel with the long axis of the thallus; cf. fastigate cortex.

Fibulobasidium Bandoni (1979), *Sirobasidiaceae*. 3, USA. See Bandoni (*CJB* 57: 264, 1979), Sampaio (*Frontiers in Basidiomycote Mycology*: 49, 2004).

Fibulochlamys A.I. Romero & Cabral (1989), anamorphic *Agaricomycetes*, Hso.0eH.1. 1 (with clamp connexions), Argentina. See Romero & Cabral (*Mycotaxon* 34: 430, 1989).

Fibulocoela Nag Raj (1978), anamorphic *Agaricomycetes*, St.0eH.1. 1 (with clamp connexions), India; Cuba. See Nag Raj (*CJB* 56: 1491, 1978).

Fibulomyces Jülich (1972), *Atheliaceae*. Anamorph *Taeniospora*. 4, widespread (north temperate). See Hjortstam & Larsson (*Windahlia* 21, 1994).

Fibuloporia Bondartsev & Singer (1944) = *Trechispora* fide Ryvarden (*Genera of polypores*, 1991).

Fibulorhizoctonia G.C. Adams & Kropp (1996), anamorphic *Athelia*. 3, widespread. See Adams & Kropp (*Mycol.* 88: 464, 1996).

Fibulosebacea K. Wells & Raitv. (1987), *Auriculariaceae*. 1, Europe. See Wells & Raitviir (*TBMS* 89: 344, 1987).

Fibulostilbum Seifert & Oberw. (1992), *Chionosphaeraceae*. 1, Brazil. See Seifert *et al.* (*Boln Soc. argent. Bot.* 28: 215, 1992).

Fibulotaeniella Marvanová & Bärkl. (1988), anamorphic *Agaricomycetes*. 1 (with clamp connexions, aquatic), Canada. See Marvanová & Bärlocher (*Mycotaxon* 32: 340, 1988).

field mushroom (common mushroom), basidioma of the edible *Agaricus campestris*.

filamentous (1) thread-like; filamentose; (2) (of lichens), the photobiont forms a filament of cells which is surrounded by hyphae or cells of the mycobiont (e.g. *Cystocoleus*, *Racodium*, *Coenogonium*).

Filariomyces Shanor (1952), *Laboulbeniaceae*. 1, widespread. See Shanor (*Am. J. Bot.* 39: 499, 1952), Tavares (*Mycol. Mem.* 9: 627 pp., 1985), Lee & Na (*Korean J. Mycol.* 26: 108, 1998; Korea).

Filaspora Preuss (1855) nom. rej. = *Rhabdospora* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Fillicupula Y.J. Yao & Spooner (1996), ? *Pezizales*. 1 (parasitic on liverworts), Europe. Affinities uncertain; ecology is not typical of the *Pezizales*. See Yao & Spooner (*Kew Bull.* 51: 193, 1996).

filiform, thread-like (Fig. 23.2).

Filobasidiaceae L.S. Olive (1968), *Filobasidiales*. 1 gen., 4 spp.

Lit.: Mitchell *et al.* (*J. Med. Vet. Mycol.* 30: 207, 1992), Fell & Statzell-Tallman in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 742, 1998), Kwon-Chung in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 663, 1998), Scorzetti *et al.* (*FEMS Yeast Res.* 2: 495, 2002), Sivakumaran *et al.* (*Mycopathologia* 156: 157, 2003), Guffogg *et al.*

- (*Int. J. Syst. Evol. Microbiol.* **54**: 275, 2004), Suh *et al.* (*MR* **109**: 261, 2005).
- Filobasidiales** Jülich (1981). Tremellomycetes. 1 fam., 1 gen., 4 spp. Fam.:
- Filobasidiaceae**
- Lit.*: Jülich (*Higher taxa Basid.*: 347, 1981), Fell *et al.* (*IJSEM* **50**: 1351, 2000; mol. phylogeny).
- Filobasidiella** Kwon-Chung (1976), Tremellaceae. Anamorph *Cryptococcus*. 3, widespread. See Kwon-Chung *et al.* (*Stud. Mycol.* **38**, 1995; mol. phylogeny, ultrastr.), Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* **50**: 1351, 2000; mol. phylogeny), Ginns & Malloch (*Mycol. Progr.* **2**: 137, 2003; parasitism of *Verticillium lecanii*), Sivakumaran *et al.* (*Mycopathologia* **156**: 157, 2003; genetics), Weiss *et al.* (*Frontiers in Basidiomycote Mycology*: 7, 2004), Yamada *et al.* (*Mycoses* **47**: 24, 2004; medically important spp.), Loftus *et al.* (*Science, Washington* **307**: 1321, 2005; *Cryptococcus neoformans* genome), Lin & Heitman (*Annual Review of Microbiology* **60**: 69, 2006; *Cryptococcus neoformans* species complex).
- Filobasidium** L.S. Olive (1968), Filobasidiaceae. Anamorph *Cryptococcus*. 4, Europe; N. America. See Kwon-Chung (*Int. J. Syst. Bacteriol.* **27**: 293, 1977), Kwon-Chung (*Stud. Mycol.* **38**, 1995; mol. phylogeny, ultrastr.), Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* **50**: 1351, 2000; mol. phylogeny), Guffogg *et al.* (*International Journal of Systematic and Evolutionary Microbiology* **54**: 275, 2004; n.sp. Antarctica), Weiss *et al.* (*Frontiers in Basidiomycote Mycology*: 7, 2004), Golubev *et al.* (*MR* **110**: 957, 2006; n.sp. Russia).
- Filoboletus** Henn. (1900) = *Mycena* fide Kuyper (*in litt.*).
- filoplasmodium**, see plasmodium.
- filopodium**, a slender unbranched process (pseudopodium) from a plasmodium, as in *Schizoplasmodiopsis*. Cf. rhizopodium.
- Filospora** Nawawi (1976), anamorphic *Pezizomycotina*, Hso.0fH.19. 6 (aquatic), widespread. See Dyko & Sutton (*Mycotaxon* **7**: 323, 1978), Marvanová *et al.* (*Nova Hedwigia* **54**: 151, 1992; UK), Gulis & Marvanová (*Mycotaxon* **68**: 313, 1998; Belarus), Marvanová & Bärlocher (*MR* **102**: 750, 1998; Canada).
- Fimaria** Velen. (1934) = *Pseudombrophila* fide Brummelen (*Persoonia* **13**: 213, 1986), van Brummelen (*Libri Botanici* **14**, 1995; synonymy with *Pseudombrophila*), Prokhorov (*Mikol. Fitopatol.* **32**: 14, 1998), Hansen *et al.* (*Mycol.* **97**: 1023, 2005; phylogeny).
- fimbriate**, edged; delicately toothed; fringed. Cf. fimbriate.
- fimbrillate**, having a very small fringe. Cf. fimbriate.
- Fimetaria** Griffiths & Seaver (1910) = *Sordaria*.
- Fimetariaceae** D.A. Griffiths & Seaver (1910) = *Sordariaceae*.
- Fimetariella** N. Lundq. (1964), Lasiosphaeriaceae. 1 (coprophilous), Europe; Canada. See Barr (*Mycotaxon* **39**: 43, 1990; posn), Krug (*CJB* **73**: 1905, 1995), Huhndorf *et al.* (*Mycol.* **96**: 368, 2004).
- fimicolous**, living on animal droppings. Cf. coprophilous.
- fine structure**, see ultrastructure.
- Finerania** C.W. Dodge (1971) ? = *Ramonia* fide Galoway (*in litt.*).
- finger-and-toe**, see club root.
- Finkia** Vain. (1929), Lichinaceae (L). 1, C. America. See Moreno & Egea (*Acta Bot. Barcinon.* **41**: 1, 1992).
- Fioriella** Sacc. (1905) = *Diplodina* fide Sutton (*Mycol. Pap.* **141**, 1977).
- fireplace fungi**, fungi characteristic of burnt ground, etc. See pyrophilous fungi.
- Fischer** (Edward; 1861-1939; Switzerland). Student of de Bary (q.v.) in Strasburg; Professor of Botany and General Biology at the University and Director of the Botanic Garden and Botanical Institute, Berne (1897-1933). Produced major monographs for central Europe of various ascomycete and basidiomycete groups. *Publs. Die Uredineen der Schweiz* (1904); *Tuberineae* (1897, 1938) and *Gasteromycetes* (1900, 1933) in Engler & Prantl, *Die Natürlichen Pflanzenfamilien* (eds 1 and 2); *Tuberaceae and Hemiasci* in Rabenhorst's *Kryptogamen-Flora* (1897); (with Gäumann) *Biologie der Pflanzenbewohnenden Parasitischen Pilze* (1929). *Biogs, obits etc.* Grummann (1974: 640); Rytz (*Bericht der Schweizerischen Botanischen Gesellschaft* **50**: 793, 1940); Schopper (*Revue de Mycologie Série 2* **5**: 47, 1940) [portrait]; Stafleu & Cowan (*TL-2* **1**: 834, 1976).
- Fischerula** Mattir. (1928), Pezizales. 2 (hypogeous), Italy; USA. See also *Leucangium*. See Trappe (*Mycol.* **67**: 934, 1975; key), O'Donnell *et al.* (*Mycol.* **89**: 48, 1997; ; close to *Leucangium* and a sister group of the *Morchellaceae*), Hansen & Pfister (*Mycol.* **98**: 1029, 2006; phylogeny), Venturella *et al.* (*Cryptog. Mycol.* **27**: 201, 2006; Sicily, ecology), Læssøe & Hansen (*MR* **111**: 1075, 2007; phylogeny).
- fission** (1) becoming two by division of the complete organism; cf. budding; (2) (of conidial liberation), secession by the separation of a double septum; cf. fracture, lysis.
- fissitunicate**, see ascus.
- Fissolimbus** E. Horak (1979), ? Marasmiaceae. 1, Papua New Guinea. See Horak (*Beih. Sydowia* **8**: 202, 1979).
- Fissuricella** Pore, D'Amatao & Ajello (1977), anamorphic *Pezizomycotina*, Hso.#eH.?. 1 (yeast-like), USA. See Pore *et al.* (*Sabouraudia* **15**: 71, 1977).
- Fissurina** Fée (1824), Graphidaceae (L). 1, widespread. See Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Staiger & Kalb (*Mycotaxon* **73**: 69, 1999; morphology), Staiger (*Biblthca Lichenol.* **85**, 2002; monogr.), Nakanishi *et al.* (*Bull. natn. Sci. Mus. Tokyo*, **B** **29**: 83, 2003; Japan), Aptroot (*Symb. bot. upsal.* **34** no. 1: 31, 2004; Taiwan), Kalb *et al.* (*Symb. bot. upsal.* **34** no. 1: 133, 2004), Aptroot & Rodrigues (*Cryptog. Mycol.* **26**: 273, 2005; Azores), Archer (*Te-lopea* **11**: 59, 2005; Australia), Archer (*Biblthca Lichenol.* **94**, 2006; Australia), Staiger *et al.* (*MR* **110**: 765, 2006; phylogeny), Archer (*Systematics & Biodiversity* **5**: 9, 2007; Solomon Is), Makhija & Adawadkar (*Lichenologist* **39**: 165, 2007; India, key).
- fistular** (fistulose), hollow, like a pipe.
- Fistulariella** Bowler & Rundel (1977) = *Ramalina* See Nimis (*Lichenologist* **30**: 427, 1998; generic concept), Nimis (*Lichenologist* **30**: 427, 1998).
- Fistulina** Bull. (1791), Fistulinaceae. Anamorph *Confistulina*. 6, widespread. *F. hepatica*, the edible beefsteak fungus, is the cause of brown oak (q.v.).
- Fistulinaceae** Lotsy (1907), Agaricales. 3 gen. (+ 5 syn.), 8 spp.
- Lit.*: Donk (*Taxon*: 263, 1964), Niemelä & Kotiranta (*Karstenia* **26**: 57, 1986), Guzmán (*Revta Mex. Micol.* **3**: 29, 1987), Rajchenberg & Greslebin (*Myco-*

- taxon* 56: 325, 1995), Hibbett *et al.* (*Proc. natn Acad. Sci. U.S.A.* 94: 12002, 1996), Quanten (*Op. bot. Belg.* 11: 352 pp., 1997), Binder *et al.* (*Systematics and Biodiversity* 3: 113, 2005).
- Fistulinales** = Agaricales.
- Fistulinella** Henn. (1901), Boletaceae. 15, pantropical. See Singer (*Am. midl. Nat.* 37: 527, 1946), Guzman (*Boln. Soc. mex. Micol.* 8: 53, 1974; taxonomy and geography), Pegler & Young (*TBMS* 76: 103, 1981).
- Fitzpatrick** (Harry Morton; 1886-1949; USA). Assistant (1908-1911), then Instructor (1911-1913), then Professor (1913-1949), Cornell University. A founder member of the Mycological Society of America, its first Secretary & Treasurer, later President and, finally, Historian. Highly respected as a teacher. *Publs.* Monograph of the Coryneliaceae *Mycol.* (1920); Monograph of the Nitschkiaceae *Mycol.* (1923); *The Lower Fungi. Phycomycetes* (1930). *Biogs, obits etc.* Barrus (*Mycol.* 43: 249, 1951; bibliography, portrait); Stafleu & Cowan (*TL-2* 1: 842, 1976).
- Fitzpatrickella** Benny, Samuelson & Kimbr. (1985), Coryneliaceae. 1 (on *Drimys*), Juan Fernández. See Benny *et al.* (*Bot. Gaz.* 146: 232, 1985).
- Fitzpatrickia** Cif. (1928) ? = *Acanthonitschkea* fide Nannfeldt (*Svensk bot. Tidskr.* 66: 49, 1975).
- Fixatives.** Fixation is the process by which biological tissues are preserved from decay while preserving their structure and organization. Fixed cells are killed, thereby terminating any ongoing biochemical activity, the purpose being to preserve the material in as close as possible to its natural state. Chemical fixatives:
- Formal-acet-alcohol.**
Formalin 13.0 ml
Acetic acid (glacial) 5.0 ml
Ethyl alcohol (50 per cent) 200.0 ml
- Flemming's weak solution.**
Chromic acid (1 per cent) 25.0 ml
Acetic acid (1 per cent) 10.0 ml
Water 60.0 ml
With addition of Osmic 5.0 ml
acid (2 per cent) before use.
- Other fixatives:*
Glutaraldehyde
Osmium tetroxide.
- Flabellaria** Pers. (1818) [non *Flabellaria* Cav. 1790, *Malpighiaceae*] = *Schizophyllum*.
- flabellate (flabelliform)**, like a fan; in the form of a half-circle.
- Flabelliforma** E.U. Canning, R. Killick-Kendrick & M. Killick-Kendrick (1991), Microsporidia. 3.
- Flabellimycena** Redhead (1984), ? Mycenaceae. 1, S. America. See Redhead (*CJB* 62: 886, 1984).
- Flabellocladia** Nawawi (1985), anamorphic *Pezizomycotina*, Hso.1bH.1. 1 (aquatic), Malaysia. See Nawawi (*TBMS* 85: 174, 1985).
- Flabellomyces** Kobayasi (1982) = *Coenogonium* Ehrenb. fide Kashiwadani (*Bull. natn. Sci. Mus. Tokyo*, B 9: 159, 1983).
- Flabellophora** G. Cunn. (1965), Polyporaceae. 18, widespread (pantropical). See Corner (*Beih. Nova Hedwigia* 86: 18, 1987; key with broad species concept), Ryvarden & Iturriaga (*Mycol.* 95: 1066, 2003; Venezuela).
- Flabellopilus** Kotl. & Pouzar (1957) = *Meripilus* fide Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974).
- Flabellospora** Alas. (1968), anamorphic *Pezizomycotina*, Hso.1bH.1. 3, widespread (tropical). See Alasoadura (*Nova Hedwigia* 15: 415, 1968).
- flaccid**, not stiff; limp; flabby.
- Flagelloscypha** Donk (1951), Niaceae. c. 25, widespread. See Agerer (*Sydowia* 27: 131, 1975; key), Handa & Harada (*Mycoscience* 46: 265, 2005; Japan).
- Flagellospora** Aptroot (1995), Xylariales. 1, Portugal. See Kang *et al.* (*Fungal Diversity* 2: 135, 1999; uncertain posn).
- Flagellospora** Ingold (1942), anamorphic *Nectria*, Hso.0fH.15. 3, widespread. See Petersen (*Mycol.* 55: 570, 1963; key), Jooste & van der Merwe (*S. Afr. J. Bot.* 56: 319, 1990; ultrastr. *F. penicillioides*), Webster (*Nova Hedwigia* 56: 455, 1993; telemorph), Scutari & Calvelo (*Ann. bot. fenn.* 32: 55, 1995; ecology), Belliveau & Bärlocher (*MR* 109: 1407, 2005; phylogeny).
- flagellum** (pl. **flagella**), cylindrical extension of a eukaryotic cell, bounded by a plasma membrane and containing an axoneme; two types can be distinguished by electron microscopy, the **whiplash** with a smooth continuous surface (as in *Chytridiomycota*) and the **tinsel**, characteristic of *Hyphochytriomycota*, with the surface covered with hair-like processes (**mastigonemes** or **flimmers**); **-ar apparatus**, complex consisting of one or more basal bodies which may bear flagella, may have microtubular and fibrous roots associated with their bases; **-ar fibrous roots**, roots composed of a bundle of filaments, frequently appearing cross-striated; **-ar hairs**, filamentous appendages usually arranged in one or more rows but not covering the entire surface of a flagellum; **-ar scales**, organic structures of discrete size and shape, often covering the whole surface of the flagellum external to the plasma membrane, usually assembled in the dictyosome. See Barr (*Mycol.* 84: 1, 1992; terminology flagellar apparatus). See also axoneme, blepharoplast; and cf. cilium.
- Flageoletia** (Sacc.) Höhn. (1916) = *Phomatospora* fide Reid & Booth (*CJB* 44: 445, 1966).
- Flahaultia** Arnaud (1952) nom. dub., Fungi. See Watling & Kendrick (*Naturalist Hull* 104: 1, 1979).
- Flakea** O.E. Erikss. (1992) = *Agonimia* fide Aptroot *et al.* (*Biblthca Lichenol.* 57: 19, 1995), Thor & Kashiwadani (*SA* 14: 87, 1996; chemistry).
- Flamingomyces** R. Bauer, M. Lutz, Piątek, Vánky & Oberw. (2007), Urocystidaceae. 1 (on *Ruppia maritima* (*Ruppiaceae*)), Europe (southern). See Bauer *et al.* (*MR* 111: 1199, 2007).
- Flaminia** Sacc. & P. Syd. (1902), ? Pucciniales. 1 (on *Xanthoxylon* (*Rosaceae*)), Brazil. May apply to *Aecidium* anamorph. See Sherwood (*Mycotaxon* 5: 1, 1977).
- Flammispora** Pinruan, Sakay., K.D. Hyde & E.B.G. Jones (2004), Sordariomycetes. 1, Thailand. See Pinruan *et al.* (*Stud. Mycol.* 50: 384, 2004).
- Flammopsis** Fayod (1889) = *Pholiota* fide Singer (*Agaric. mod. Tax.*, 1951).
- Flammula** (Fr.) P. Kumm. (1871) [non *Flammula* (DC.) Fourr. 1868, *Ranunculaceae*] = *Pholiota* fide Singer (*Agaric. mod. Tax.*, 1951).
- Flammulaster** Earle (1909), Inocybaceae. 20, widespread. See Vellinga (*Persoonia* 13: 1, 1986; NW Europe), Horak & Moreau (*BSMF* 120: 215, 2004).
- flammulin**, an anti-tumour antibiotic from *Flammulina velutipes* (Watanabe *et al.*, *Bull. chem. Soc. Japan*

- 37: 747, 1964).
- Flammulina** P. Karst. (1891), Physalacriaceae. 10, widespread (temperate). See Ingold (*TBMS* 75: 107, 1980; *F. velutipes* mycelium, oidia, etc.), Hughes *et al.* (*Mycol.* 91: 978, 1999; phylogeny), Methven *et al.* (*Mycol.* 92: 1064, 2000; biogeography) enokitake.
- flask fungi**, *Ascomycota* with perithecioid ascomata.
- Flaviporellus** Murrill (1905) = *Inonotus* fide Ryvarden (*Syn. Fung.* 5, 1991).
- Flaviporus** Murrill (1905), Meruliaceae. 13, widespread. See Ginns (*CJB* 58: 1578, 1980).
- Flavobathelium** Lücking, Aptroot & G. Thor (1997), Dothideomycetes. 1, Costa Rica. See Lücking *et al.* (*Lichenologist* 29: 221, 1997).
- Flavocetraria** Kärnefelt & A. Thell (1994), Parmeliaceae (L). 2, arctic-alpine; boreal. See Kärnefelt *et al.* (*Acta Bot. Fenn.* 150: 81, 1994), Thell & Miao (*Ann. bot. fenn.* 35: 275, 1998; phylogeny), Thell *et al.* (*Mycol. Progr.* 1: 335, 2002; phylogeny), Bjerke & Elvebakk (*N.Z. J. Bot.* 42: 647, 2004; biogeography, S America), Thell *et al.* (*Symb. bot. upsal.* 34 no. 1: 429, 2004; biogeography, Scandinavia), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Flavodon** Ryvarden (1973) = *Irpex* fide Hjortstam & Larsson (*Windahlia* 21, 1994).
- Flavoparmelia** Hale (1986), Parmeliaceae (L). 32, widespread. See Elix & Johnston (*Mycotaxon* 33: 391, 1988), Elix (*Flora of Australia* 55: 39, 1994), Thell *et al.* (*Cryptog. bot.* 5: 120, 1995; asci), Crespo & Cubero (*Lichenologist* 30: 369, 1998; phylogeny), Crespo *et al.* (*Lichenologist* 31: 451, 1999; morphology, chemistry, phylogeny), Schumm (*Mitteilungen der Mikroskopischen Arbeitsgemeinschaft Stuttgart* 1999: 46, 1999; key, Macaronesia), Eliasaro & Adler (*Mitteilungen aus dem Institut für Allgemeine Botanik Hamburg* 30-32: 25, 2002; Brazil), Thell *et al.* (*Mycol. Progr.* 3: 297, 2004; phylogeny), Thell *et al.* (*Symb. bot. upsal.* 34 no. 1: 429, 2004; biogeography, Scandinavia), Blanco *et al.* (*Mycol.* 97: 150, 2005; phylogeny), Blanco *et al.* (*Mol. Phylogen. Evol.* 39: 52, 2006; phylogeny, chemistry), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Flavophlebia** (Parmasto) K.H. Larss. & Hjortstam (1977) = *Radulomyces* fide Jülich (*Persoonia* 10: 325, 1979).
- Flavopunctelia** (Krog) Hale (1984), Parmeliaceae (L). 5, widespread (temperate; tropical). See Ferraro (*Phytologia* 61: 189, 1986; Argentina), Feuerer & Marth (*Mitteilungen aus dem Institut für Allgemeine Botanik Hamburg* 27: 101, 1997; vegetative reproduction), Crespo & Cubero (*Lichenologist* 30: 369, 1998; phylogeny), Lumbsch (*Chemical Fungal Taxonomy*: 345, 1998; chemistry), Crespo *et al.* (*Taxon* 50: 807, 2001; phylogeny), Thell *et al.* (*Folia cryptog. Estonica* 41: 115, 2005; phylogeography), Blanco *et al.* (*Mol. Phylogen. Evol.* 39: 52, 2006; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Flavoscypha** Harmaja (1974) = *Otidea* fide Dissing (*in litt.*), Liu & Zhuang (*Fungal Diversity* 23: 181, 2006).
- Flegographa** A. Massal. (1860) nom. rej. prop. = *Phaeographis* fide Lücking *et al.* (*Taxon* 56: 1296, 2007; nomencl.).
- Fleischeria** Penz. & Sacc. (1901) = *Hypocrella* fide Rogerson (*Mycol.* 62: 865, 1970).
- Fleischhakia** Auersw. (1869) = *Preussia* fide Clements & Shear (*Gen. Fung.*, 1931).
- Fleischhakia** Rabenh. (1878) = *Psilopezia* fide Seaver (*North American Cup Fungi* (Operculates), 1928).
- Fleming** (Alexander; 1881-1955; Scotland). Student (1901-1906) then Assistant Bacteriologist (1906-1908) then Lecturer (1908-1914 and 1918-1928) then Professor of Bacteriology (1928-1948), St Mary's Hospital, London; Captain, Army Medical Corps, Western Front (1914-1918). Discoverer of penicillin; Fellow of the Royal Society, London 1943; Nobel prize-winner (with Chain & Florey), 1945. *Publs.* On the bacterial action of cultures of a *Penicillium*, with special reference to their use in the isolation of *B. influenzae*. *The British Journal of Experimental Pathology* (1929). *Biogs, obits etc.* Brown, K. (*Penicillin Man: Alexander Fleming and the Antibiotic Revolution*, 2004); A. Maurois (*The Life of Sir Alexander Fleming*, 1959).
- flesh**, the trama, esp. of the pileus of an agaric or bolete.
- fleshy** (of sporocarp), soft, not cartilaginous-like or wood-like.
- flexuous** (**flexuose**), wavy.
- flexuous hyphae** (of *Pucciniales*), an unbranched or branched haploid hyphal projection from a pycnium, which may be diploidized by a pycniospore of opposite 'sex' (Craigie, see *Nature* 141: 33, 1938). Cf. receptive body.
- flimmergeissel**, flagellum bearing two rows of tripartite tubular hairs. Cf. straminipilous.
- Floccaria** Grev. (1827) = *Penicillium* Link fide Fries (*Syst. mycol.* 3: 409, 1832).
- floci**, cotton like groups or tufts.
- Floccomutinus** Henn. (1895) = *Mutinus* fide Demoulin & Dring (*Bull. Jard. bot. nat. Belg.* 45: 365, 1975).
- floccose**, cottony; byssoid.
- Floccularia** Pouzar (1957), Agaricaceae. 6, widespread (north temperate). Probably a separate family is justified. See Pouzar (*Česká Mykol.* 11: 49, 1957).
- flocculent** (of a liquid-culture), having small masses of cells throughout or as a deposit.
- Flocculina** P.D. Orton (1960) = *Flammulaster* fide Kuyper (*in litt.*).
- flocculose**, delicately cottony.
- flor effect** (of yeasts), formation of a pellicle; see yeasts.
- flor yeasts**, see yeast.
- flora** (1) the plants of a particular geographical area or habitat; (2) a description, catalogue or list of all or some groups of plants in a particular area. Formerly applied to fungi and lichens (i.e. **fungus** -, **lichen** -), but as fungi are not plants the term mycobiota (q.v.) is preferred.
- Florey** (Howard; 1898-1968; Australia). University of Adelaide (1917-1921); Oxford (1921-1926); Cambridge (1926-1931); Sheffield (1931-1935); Oxford (1935-1968). Pharmacologist who, with Chain (q.v.) organized the first large-scale production of penicillin, the fungal antibiotic discovered by Fleming (q.v.). *Biogs, obits etc.* Fenne (*Australian Dict. Biography* 14: 188, 2002).
- Floricola** Kohlm. & Volkm.-Kohlm. (2000), anamorphic *Mycosphaerellaceae*. 1, USA. See Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 43: 385, 2000).
- Flosculomyces** B. Sutton (1978), anamorphic *Pezizomycotina*, Hso.#eP.1. 2, widespread. See Sutton (*Mycol.* 70: 788, 1978).
- flowers of tan**, the myxomycete *Fuligo septica*.
- Fluctua** Marbach (2000), Caliciaceae (L). 1, Brazil.

- See Marbach (*Biblthca Lichenol.* 74: 207, 2000).
- Fluminicola** S.W. Wong, K.D. Hyde & E.B.G. Jones (1999), Sordariales. 1, Philippines. See Wong *et al.* (*Fungal Diversity* 2: 190, 1999), Ho & Hyde (*Fungal Diversity* 4: 21, 2000), Raja *et al.* (*Mycotaxon* 88: 1, 2003; phylogeny).
- Fluminispora** Ingold (1958) = *Dimorphospora* fide Ingold (*Guide to aquatic hyphomycetes*, 1975).
- fluorescent**, giving out light when placed in ultraviolet (or other) radiation.
- flush** (of fungal growth), the sudden development of a large quantity of mycelium or a periodic surge of basidiomata emergence, esp. in mushroom cultures.
- Fluviatispora** K.D. Hyde (1994), Halosphaeriaceae. 3 (on submerged fronds of *Livistona*), Papua New Guinea. See Hyde (*MR* 98: 719, 1994), Fryar & Hyde (*Cryptog. Mycol.* 25: 245, 2004; key).
- Fluviostroma** Samuels & E. Müll. (1980), Sordariomycetes. Anamorph *Stromatostilbella*. 1 (on rotten wood), widespread (tropical). See Seifert (*CJB* 65: 2196, 1987; anamorph), Okada *et al.* (*CJB* 76: 1495, 1998; rels).
- fly agaric** (fly fungus, fly mushroom), basidioma of *Amanita muscaria* (see soma).
- fly fungus** (house fly fungus), *Entomophthora muscae*.
- fly-speck fungi**, ascomata of *Microthyriaceae*, *Micro-peltidaceae* and conidiomata of their anamorphs.
- Foetidaria** A. St.-Hil. (1835) = *Lysurus* fide Dring (*Kew Bull.* 35: 1, 1980).
- foliicolous**, living on leaves; - **lichens**, see Santesson (*Symb. bot. upsal.* 12 (1), 1952; monogr.), Farkas & Sipman (*Trop. bryol.* 7: 93, 1993; checklist 482 spp., bibliogr.), 81; bibliogr. 83 papers 1952-85), Lücking (*Beih. Nova Hedw.* 104: 1, 1992; keys 228 spp. Costa Rica), Ferraro (*Bonplandia* 5: 191, 1983; S. Am.), Santesson & Tibell (*Austrobaileya* 2: 529, 1988; 66 spp. Australia), Sérusiaux (*Bot. J. Linn. Soc.* 100: 87, 1989; review).
- foliole**, a small leaf-like excrescence on the surface of a foliose lichen.
- Foliopollenites** Sierotin (1961), Fossil Fungi ? Fungi. 1, widespread.
- foliose** (1) leaf-like; (2) (of lichens), having a layered (stratose) thallus, usually with a lower cortex, and attached to the substratum either by rhizines or at the base, but not by the whole lower surface (e.g. *Parmelia*, *Peltigera*) (Fig. 21D).
- Follmannia** C.W. Dodge (1967) = *Caloplaca* fide Kärnefelt (*Cryptog. Bot.* 1: 147, 1989).
- Follmanniella** Peine & B. Werner (1995), Roccellaceae (L). 1, Atacama Desert. See Peine & Werner (*Flechten Follmann Contributions to Lichenology in Honour of Gerhard Follmann*: 289, 1995), Follmann (*J. Hattori bot. Lab.* 90: 251, 2001; key), Follmann (*Mitteilungen aus dem Institut für Allgemeine Botanik Hamburg* 30-32: 61, 2002; biogeography).
- Fomes** (Fr.) Fr. (1849), Polyporaceae. 3, widespread. See Gilbertson & Ryvarden (*N. Amer. Polyp.* 1: 263, 1986) Traditionally used for perennial species (e.g. Overholts, *The genus Fomes*, 97 pp.); see also *Heterobasidion*, *Fomitopsis*, *Phellinus*, Medical uses of fungi.
- Fomesporites** T.C. Huang (1981), Fossil Fungi. 1 (Miocene), Taiwan.
- Fominia** Girz. (1927) = *Colletotrichum* fide Sutton (*Mycol. Pap.* 141, 1977).
- Fomitaceae** Jülich (1982) = Polyporaceae.
- Fomitella** Murrill (1905) = *Fomitopsis* fide Ryvarden (*Bull. Jard. Bot. Belg.* 48: 102, 1978).
- Fomites** Locq. & Koeniguer (1982), Fossil Fungi. 1, Libya.
- Fomitiporella** Murrill (1907), Hymenochaetaceae. 5, widespread. See Wagner & Fischer (*Mycol.* 94: 998, 2002).
- Fomitiporia** Murrill (1907), Hymenochaetaceae. 11, widespread. See Wagner & Fischer (*Mycol.* 94: 998, 2002).
- Fomitopsidaceae** Jülich (1982), Polyporales. 24 gen. (+ 33 syn.), 197 spp.
Lit.: Carranza-Morse & Gilbertson (*Mycotaxon* 25: 469, 1986), Larsen & Lombard (*Mycotaxon* 26: 271, 1986), Hjortstam & Ryvarden (*Mycotaxon* 28: 553, 1987), Blanchette *et al.* (*Mycol.* 84: 119, 1992), Hibbett & Donoghue (*CJB* 73: S853, 1995), Rajchenberg (*Nordic Jl Bot.* 15: 105, 1995), Chang *et al.* (*Mycol. Monogr.* 10: 126 pp., 1996), Högborg & Stenlid (*Mol. Ecol.* 8: 703, 1999), Thorn (*Karstenia* 40: 181, 2000), Parmasto (*Harvard Pap. Bot.* 6: 179, 2001), Kauserud & Schumacher (*MR* 107: 155, 2003), Kim *et al.* (*Antonie van Leeuwenhoek* 83: 81, 2003), Larson *et al.* (*MR* 108: 983, 2004), Kim *et al.* (*Mycol.* 97: 812, 2005).
- Fomitopsis** P. Karst. (1881), Fomitopsidaceae. 32, widespread. See Pegler (*The polypores [Bull. BMS Suppl.]*, 1973), Kim *et al.* (*Mycol.* 97: 812, 2005; phylogeny).
- Fonsecaea** Negroni (1936), anamorphic *Herpotrichiellaceae*. 1 (human pathogen), widespread. See Schol-Schwarz (*Antonie van Leeuwenhoek* 34: 119, 1968), Ibrahim-Granet *et al.* (*Sabouraudia* 23: 253, 1985; numerical taxonomy), Wang *et al.* (*Acta Mycol. Sin.* 5: 14, 1986; conidial ontogeny), Wang *et al.* (*Mycopathologia* 98: 105, 1987; SEM), Ramos & Borghi (*Bol. Micol. Valparaíso* 4: 135, 1989; morphology), Ramos & Borghi (*Bol. Micol. Valparaíso* 4: 141, 1989; biochemistry, ultrastr.), Denetiere *et al.* (*J. Mycol. Médic.* 1: 302, 1991; dimorphism), Spatafora *et al.* (*J. Clin. Microbiol.* 33: 1322, 1995; DNA), Attili *et al.* (*Medical Mycology* 36: 219, 1998; phylogeny), Haase *et al.* (*Stud. Mycol.* 43: 80, 1999; phylogeny), Untereiner & Naveau (*Mycol.* 91: 67, 1999; phylogeny), Abliz *et al.* (*J. Clin. Microbiol.* 41: 873, 2003; molecular identification), Hoog *et al.* (*Medical Mycology* 42: 405, 2004; molecular ecology), Tanabe *et al.* (*Jap. J. Med. Mycol.* 45: 105, 2004; strain typing), Surash *et al.* (*Medical Mycology* 43: 465, 2005; phaeohyphomycosis), Huang *et al.* (*J. Clin. Microbiol.* 44: 3299, 2006; arrays).
- Fontanospora** Dyko (1978), anamorphic *Pezizomycotina*, Hso.1bH.1. 2 (aquatic), USA. See Dyko (*TBMS* 70: 411, 1978), Marvanová *et al.* (*Czech Mycol.* 50: 3, 1997; UK).
- Food and beverage mycology**. Fungi are important in the food and drinks industry as both positive and negative factors (see Food spoilage). Filamentous fungi and yeasts are used commercially in the manufacture of a large variety of foods and drinks. Perhaps the most well known use of fungi is in cheese making, notably *Penicillium camembertii* in camembert cheese and *P. roquefortii* for the manufacture of blue-veined cheeses such as roquefort, stilton, and Danish blue. They can also be eaten as themselves (see Edible fungi, Mushroom culture, Truffles), and more recently as mycoprotein (q.v.). However, in S.E. Asia particularly, fungi have been used for centuries for the production of various food fermenta-

tions (see Fermented food and drinks). The most well-known of these products is soya sauce, produced by seeding soy beans with *Aspergillus oryzae*.

Yeasts are used for the manufacture of bread, beer and wine (see Brewing, Wine making). In most cases *Saccharomyces cerevisiae* is involved, causing a fermentation of sugar to alcohol (production of wine and beer) and carbon dioxide (in bread, the alcohol evaporates during the baking process). *S. carlsbergensis* is used in the manufacture of lager. Occasionally strongly-flavoured or aromatic fungi are used to produce sauces, such as truffle-oil, or specialist drinks such as truffle-liqueurs. The IUMS has an International Commission on Food Mycology (see Societies and organizations).

Lit.: Beuchat (Ed.) (*Food and beverage mycology*, edn 2, 1987), Pitt & Hocking (*Fungi and food spoilage*, 1985), Querol & Fleet (Eds) (*Yeasts in food and beverages. The yeast handbook 2*, 2006), Samson *et al.* (*Introduction to food-borne fungi*, edn 4, 1995), Hui & Khachatourians (Eds) (*Food biotechnology*, 1995). See also Mycotoxicoses, Yeasts.

Food spoilage. Can be caused by many fungi which invade and decompose harvested and processed foods and beverages, change their biochemical composition, hyper- (over-) synthesize enzymes, or produce health related effects due to various toxic metabolites. In general, fungi are responsible for a loss of 5-10% of food production in developing countries and up to 40% in some countries. Fungal contamination of food usually results in accumulation of several mycotoxins (e.g. viomellein, zearalenon, aflatoxins, ochratoxins, aurofusarin, fusarin, etc.). Most fungal toxins are not acutely toxic in low amounts, but have severe long-term effects causing cancer, nephro- or hepato-toxicoses (see Mycotoxicoses); some toxic metabolites have immuno-suppressive effects in humans and animals assisting in development of bacterial infections. Legislation exists in some countries to control mycotoxin levels in susceptible imported food commodities, e.g. ochratoxin A in coffee.

Development of food spoilage depends on intrinsic characteristics of the fungus and on external factors such as water, temperature, pH, preservatives, composition of the gaseous atmosphere, etc. Interactions of spoilage organisms with the environment and with each other determine conditions for food safety and quality (Roller, *Journal of Food Microbiology* 50: 151-153, 1999). In most fresh, moist foods, fungi do not grow well due to competition from bacteria. In foods which have conditions such as lowered water activity (q.v.), pH or refrigerated temperatures, filamentous fungi and yeasts may proliferate. Fungi can contaminate dried foods such as nuts, spices, cereals, dried milk and meat, as well as salted fish, fruit, vegetables, meats, jams, confectionery and dairy products. Mycotoxins of contaminated products can withstand different types of processing, including heat treatment, and can persist, e.g. in flour and bread, even after the fungal source has been killed by milling and baking. Only a limited number of fungal species (spoilage consortia) can inhabit a given food type and cause spoilage there by secondary metabolites (Filtenborg *et al.*, *Int. J. Food Microbiol.* 33: 85, 1996). It is thus possible to predict the number and identity of mycotoxins that can be found in a particular food product or feed stuff (Andersen & Thrane, *Mycotoxin Res.* 12: 54, 1996; Frisvad *et al.*, *Chemical*

Fungal Taxonomy : 289, 1998; Larsen *et al.*, *Biochem. Syst. Ecol.* 26: 463, 1998). Common food spoiler fungi include *Absidia*, *Aspergillus*, *Botrytis cinerea*, *Byssoschlamys*, *Fusarium*, *Mucor*, *Paecilomyces*, *Penicillium* (and their teleomorphs), *Rhizopus*, *Sclerotinia sclerotiorum*, *Syncephalastrum*, with *Aspergillus* and *Penicillium* dominating. Food-borne fungi which do not produce phytotoxic or herbicidal compounds or mycotoxins may serve as biological control agents. E.g. non-aflatoxigenic *Aspergillus parasiticus* and *A. flavus* strains out compete toxigenic strains of the same species in the field (Dorner & Cole *J. Stored Prod. Res.* 38: 329, 2002).

Some fungi can resist pasteurization, e.g. *Byssoschlamys*, *Neosartorya* and *Talaromyces*, which can be found in canned and bottled fruits, vegetables and juices. Yeasts are particularly preservative resistant and are found in beers, wines, cider, and soft drinks (*Saccharomyces cerevisiae*, *Brettanomyces bruxellensis*, *Zygosaccharomyces bailii*), and pickles and sauces (*Candida krusei*, *Pichia membranaefaciens*). Annual losses to the food industry caused by yeast spoilage are rather high (James *et al.*, *Methods in Biotechnology* 14: 37, 2000). Techniques which attempt to preserve food and beverages by restricting oxygen entry into these products, which are rich in nutrients, are not promising strategies against yeasts, particularly in respect of growth and gas formation by *Z. bailii* (Rodrigues *et al.*, *Applied and Environmental Microbiology* 67: 2123, 2001).

Lit.: Beuchat (Ed.) (*Food and beverage mycology*, edn 2, 1987), Blackburn (Ed.) (*Food spoilage microorganisms*, 736 pp., 2006), Cannon (in Robinson (Ed.), *Developments in food microbiology* 3: 141, 1988), Deak & Beuchat (*Handbook of Food Spoilage Yeasts (CRC Series in Contemporary Food Science)*, 1996), Dijksterhuis & Samson (*Food Mycology: A Multifaceted Approach to Fungi and Food. Mycology series* 25: 1, 2007), Fassatová (*Moulds and filamentous fungi in technical microbiology*, 1986), *Food Science and Technology Abstracts* (1969 on; abstracts), Hocking *et al.* (Eds) (*Advances in Food Mycology*, 2005), Pitt & Hocking (*Fungi and food spoilage*, edn 2, 1997), Samson *et al.* (Eds) (*Introduction to food- and airborne fungi*, edn 7, 2004), Samson *et al.* (Eds) (*Modern Methods in Food Mycology (Developments in Food Science)*, 1992), Spencer & Ragout-Spencer (Eds) (*Environmental Microbiology: Methods and Protocols (Methods in Biotechnology)*, 2004). See also Beer, Fermented foods and drinks, Food and beverage mycology, Mycotoxins, Wine making, Yeasts.

foot cell (1) a basal cell supporting the conidiophore in *Aspergillus*; (2) the basal cell of the conidium in *Fusarium*. See Sutton (*TBMS* 86: 1, 1986; occurrence in anamorphic fungi).

Foraminella S.L.F. Mey. (1982) $\equiv$ Parmeliopsis.

forate (of 'gasteromycete' basidiomata), invagination of the primordial tissue resulting in a series of pits; the type of development generally known as 'coralloid' of which it is the opposite (Dring, 1973).

Forensic mycology. Although a still scarcely developed tool, fungi can be of great value in forensic science. In addition to their importance in cases of poisoning, other examples of use include: determining the minimum interval since death (Hitosugi *et al.*, *Legal medicine* 8: 240, 2006; Turner & Wiltshire, *Forensic Sci. Internat.* 101: 113, 1999); or locating

clandestine burial sites such as mass graves (Carter & Tibbett, *J. Forensic Sci.* **48**: 4, 2003); determining the presence of illegal hallucinogenic substances in fungi (Nugent & Saville, *Forensic Sci. Internat.* **140**: 147, 2004). As fungal toxins have allegedly been used in biological warfare (Pearce, *New Scientist* **174**: 13, 2002), forensic mycology may also be potentially relevant in international law. See also Mycotoxins.

form (pl. -a) [f.; ff., pl.], the lowest formal taxonomic rank regulated by the Code (see Classification, Nomenclature); - **category**, see Fossil fungi; - **genus**/ - **species**, one used for anamorphs (q.v.); - **a specialis** [f. sp.; -ae speciales, f. spp., pl.], see special form.

-form (suffix), shape.

fornicate, arched; (of *Geastrum*), having the fibrous and fleshy layers of the fruit body becoming arched over the cup-like mycelial layer.

Forssellia Zahlbr. (1906) = *Pterygiopsis* fide Henssen (*Bryologist* **73**: 617, 1970).

Fossil fungi (Fungi fossiles). Although fungal fossils are probably not rare, rather little is known about fungi as fossils. The fossil record of Fungi extends back to the early Phanerozoic, and no doubt well into the Proterozoic (see Pirozynski, *Ann. Rev. Phytopath.* **14**: 237, 1976), with chytrid-like forms being recorded from the late Precambrian, and *Glomus*-like forms from the early Paleozoic (see Mycorrhiza). Some, such as the remarkable 9 m high *Prototaxites* have only recently been recognized, tentatively, as fungi (Kibby, *Field Mycology* **9**: 48, 2008); the reported survival of viable fungal spores in glacial ice about 140,000 years old has blurred the edges between fossil and living fungi (see Longevity). Substantial portions of larger soft and fleshy fruitbodies are very rarely found (mainly embedded in amber), and most fungal fossil material comprises spores and other microscopic structures such as hyphae. This has meant that it is not even easy to assess how many extant species are also represented as fossils. Some fossil fungi are assigned extant generic names (or sometimes names of higher taxa) modified by a suffix, usually -ites (e.g. *Pleosporites*, *Pleosporonites*, but n.b. names of some genera which are not fossils may also terminate in these letters, e.g. *Muellerites*), or are given new form-generic names. In addition, fossil fungi (typically dispersed spores) may be given terminological names denoting suprageneric form – **form categories** (f. cat.) within morphographic classifications developed by palynologists or coal petrologists.

Meschinelli (in Saccardo, *Syll. Fung.* **10**: 741, 1892; **11**: 657, 1895) and in his *Fungorum fossilium hucusque cognitorum iconographia* (1902; edn 1, 1898) described numerous species of fossil fungi, as sporocarps, spores and symptoms like those caused by extant parasitic fungi.

Gilled fungi have been reported from amber (Hibbett *et al.*, *Nature* **377**: 487, 1995; Cretaceous *Marasmius*-like basidiome). For basidiomycete fossils, see also: Dennis (*Mycol.* **62**: 578, 1970).

A fungus similar to *Beauveria* was found overgrowing an ant in Dominican amber (Poinar & Thomas, *Cellular and molecular life sciences* **40**: 578, 1984). A species of *Aspergillus* has been described from Eocene Baltic amber in association with a collembolan insect (Dörfelt & Schmidt, *MR* **109**: 956, 2005). Carnivorous fungi been found from Creta-

ceous amber (Schmidt *et al.*, *Science* **318**: 1743, 2007) cannot be assigned to known extant genera, and it has been surmised that fungal devices for trapping prey, such as hyphal rings, may therefore have evolved more than once. For ascomycete fossils, see also: Sherwood-Pike & Gray (*Lethaia* **18**: 1, 1985), Stubblefield & Taylor (*Am. J. Bot.* **70**: 387, 1983).

There is little information about fossil lichens, but few who are familiar with these organisms have searched for them as fossils. Because cyanobacteria are well represented in Precambrian biotas and most groups of fungi were highly diversified during the Paleozoic, it seems likely that lichens were also components of the early terrestrial ecosystems. As many have a relatively durable thallus morphology and organization one might expect lichens to be preserved. There is some suggestion that certain Silurian and Devonian and even earlier enigmatic fossils may represent lichens (Retallack, *Palaebiol.* **20**: 523, 1994; Stein, *Am. J. Bot.* **80**: 93, 1993), but reports of Precambrian lichens appear to be based on abiotic features (see *Thuchomyces*). To date the best records are from Tertiary sediments (e.g. Sherwood-Pike, *Lichenologist* **17**: 114, 1985; Richardson & Green, *Lichenologist* **3**: 89, 1965). There are reports of lichens preserved in amber (Mägdefrau, *Ber. dtsh. bot. Ges.* **70**: 433, 1957, Baltic; Poinar *et al.*, *Science* **259**: 222, 1993).

There is even less information about chytrid-like (Taylor *et al.*, *Amer. J. Bot.* **79**: 1233, 1992; *Mycol.* **84**: 901, 1992), zygomycete-like (Pirozynski & Dalpé, *Symbiosis* **7**: 1, 1989) and myxomycete-like (Waggoner & Poinar, *J. Protozool.* **39**: 639, 1992) fossils.

Lit.: General: Elsik *et al.* (*Annotated glossary of fungal polynomorphs*, AASP **11**, 1983; terminology), Graham (*J. Palynol.* **36**: 60, 1962; spores), Pia (*Arch. Hydrobiol.* **31**: 264, 1937; microborings in calcareous substrates), Pirozynski (*Ann. Rev. Phytopath.* **14**: 237, 1976 [general review], *Geosci. Canada* **16**: 183, 1989; methods of study), Sherwood-Pike (*Biosystems* **25**: 121, 1991; evolution), Stubblefield & Taylor (*New Phytol.* **108**: 3, 1988; paleomycology), Taylor (*in: The Fossil Record* **2**: 9, 1993; geologic ranges). See amber.

Interactions: Animal Interactions, White & Taylor (*Mycol.* **81**: 643, 1989), Grahni (*Lethaia* **14**: 135, 1981). *Geological Interactions*, Wright (*Sedimentology* **33**: 831, 1986). *Mutualism*, Stubblefield *et al.* (*Am. J. Bot.* **74**: 1904, 1987). *Parasitism*, Hass *et al.* (*Am. J. Bot.* **81**: 29, 1994), Stidd & Cosentino (*Science* **190**: 1092, 1975), Daghljan (*Palaentology* **21**: 171, 1978). *Saprophytism*, Stubblefield *et al.* (*Am. J. Bot.* **72**: 1765), Taylor & White (*Am. J. Bot.* **76**: 389, 1989).

Regional: Africa, Wolf (*Bull. Torrey bot. Cl.* **93**: 104, 1966). *Antarctica*, Stubblefield & Taylor (*Bot. Gaz.* **147**: 116, 1986). *Argentina*, Singer & Archangelsky (*Am. J. Bot.* **45**: 194, 1958). *Australia*, Selkirk (*Proc. Linn. Soc. NSW* **100**: 70, 1975). *Brazil*, Martill (*Merc. Geol.* **12**: 1, 1989). *Canada*, Currah & Stockey (*Nature* **350**: 698, 1991). *Germany*, Kretzschmar (*Facies* **7**: 237, 1982). *India*, Kalgutkar (*Rev. Palaebot. Palynol.* **77**: 107, 1993), Kar *et al.* (*Curr. Sci.* **89**: 257, 2005). *Mexico*, Magallon-Puebla & Cevallos-Ferriz (*Am. J. Bot.* **80**: 1162, 1993). *N. America*, Dilcher (*Palaentographica* **B116**: 1, 1965), Wagner & Taylor (*Rev. Palaebot. Palynol.*

- 37: 317, 1982). **Russia**, Krassilov (*Lethaia* 14: 235, 1981). **United Kingdom**, Taylor *et al.* (*Am. J. Bot.* 79: 1233, 1992, *Mycol.* 87: 560, 1995; arbuscular fungi), Smith (*Palaeontology* 23: 205, 1980), Kidston & Lang (*Trans. R. Soc. Edinb.* 52: 855, 1921). **W. Indies**, Poinar & Singer (*Science* 248: 1099, 1990).
- Fouragea** Trevis. (1880) = *Opegrapha* Ach. fide Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952).
- foveate**, having small holes or cavities; pitted (Fig. 20.11).
- Foveodiporites** C.P. Varma & Rawat (1963), Fossil Fungi. 1 (Tertiary), India.
- foveolate**, delicately pitted; dimpled, dim. of foveate.
- Foveoletisporonites** Ramanujam & Rao (1979), Fossil Fungi. 1 (Miocene), India.
- Foveostroma** DiCosmo (1978), anamorphic *Pezizomycotina*, St. = eH.15. 6, widespread. See Hosagoudar & Balakrishnan (*J. Econ. Taxon. Bot.* 15: 477, 1989), Abbas *et al.* (*Pakist. J. Bot.* 33: 1, 2001; Pakistan).
- Foxia** Castell. (1908) = *Exophiala* fide de Hoog (*Stud. Mycol.* 15, 1977), Haase *et al.* (*Stud. Mycol.* 43: 80, 1999).
- Fracchiaea** Sacc. (1873), Nitschkiaceae. 1, widespread. See Nannfeldt (*Svensk bot. Tidskr.* 69: 49, 1975), Nannfeldt (*Svensk bot. Tidskr.* 69: 289, 1975), Subramanian & Sekar (*Kavaka* 18: 19, 1990), Huhndorf *et al.* (*MR* 108: 1384, 2004; phylogeny), Schoch *et al.* (*MR* 111: 154, 2007; phylogeny).
- Fractisporonites** R.T. Clarke (1965), Fossil Fungi. 3 (Cretaceous, Eocene), USA.
- fracture** (of conidial liberation), secession involving the rupture of the wall of an adjacent vegetative or degenerate cell at a point removed from the septum; cf. fission, lysis, rhexolytic.
- fragmentation spores**, conidia produced by hyphae breaking up into separate cells.
- Fragosia** Caball. (1928), Saccharomycetales. 1, Europe.
- Fragosoa** Cif. (1926) ? = *Hysterographium* fide Clements & Shear (*Gen. Fung.*, 1931).
- Fragosoella** Petr. & Syd. (1927) ? = *Scleropycnium* fide Clements & Shear (*Gen. Fung.*, 1931).
- Fragosphaeria** Shear (1923), Cephalothecaceae. Anamorph *Acremonium*-like. 2 (on rotten wood), widespread. Position uncertain; DNA indicates a possible link with the *Ophiostomatales*. See Malloch & Cain (*CJB* 48: 1815, 1970), Suh & Blackwell (*Mycol.* 91: 836, 1999; phylogeny).
- Frankia** Brunch. (1886) = *Frankiella* Speschnew fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Frankiella** Speschnew (1900) = *Greeneria* fide Sutton (*Mycol. Pap.* 141, 1977).
- Franzpetrakia** Thirum. & Pavgi (1957), ? Ustilaginaceae. 2 (on *Poaceae*), S. & E. Asia. See Guo *et al.* (*Mycosystema* 3: 57, 1990), Vánky (*Mycotaxon* 95: 1, 2006).
- Fraseria** Bat. (1962) = *Microcallis* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Fraseriella** Cif. & A.M. Corte (1957), anamorphic *Xeromyces*, Hso.0-1eH.1. 1, widespread. See Ciferri & Corte (*Atti Ist. bot. Univ. Lab. crittog. Pavia sér.* 5 14: 109, 1957).
- Fraserula** Syd. (1938) = *Inocyclus* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- free** (of lamellae or tubes), not joined to the stipe (Fig. 19A); cf. remote, seceding.
- free cell formation**, the process by which the 8 nuclei, each with some adjacent cytoplasm, are cut off by walls in the immature ascus to become ascospores.
- freeze drying**, see Genetic resource collections, Preservation.
- Fremineavia** Nieuwl. (1916), Melanconidaceae. 1 (from bark), N. America. See Wehmeyer (*Revision of Melanconis*, 1941).
- Frematomyces** P.F. Cannon & H.C. Evans (1999), Phyllachoraceae. 2, E. Africa; Seychelles. See Cannon & Evans (*MR* 103: 585, 1999).
- Fresenia** Fuckel (1866) [non *Fresenia* DC. 1836, *Compositae*] = *Graphiothecium*.
- Freynella** Kuntze (1891) = *Coccosporium*.
- friable**, readily powdered.
- Friedman** (Emerich Imre; 1921-2007; Hungary, later Israel, USA). Professor, Hebrew University, Jerusalem (1951-1968); Associate Professor then Professor and Director of the Polar Desert Research Center, Florida State University, Tallahassee (1968 onwards). A pioneer in the study of fungi in extreme environments, particularly of hyphomycetes living inside rocks, particularly in Antarctica and Chile; also involved in astrobiology, the search for extraterrestrial life. *Publs. Antarctic Microbiology* (1993). *Biogs, obits etc.* Anon. (*Daily Telegraph* [UK], 22 June 2007).
- Friedmanniomyces** Onofri (1999), anamorphic *Capnodiales*, Hso.???. 2 (cryptoendolithic), Antarctica. See Onofri *et al.* (*Nova Hedwigia* 68: 176, 1999), Selbmann *et al.* (*Stud. Mycol.* 51: 1, 2005; revision).
- Fries** (Elias Magnus; 1794-1878; Sweden). Born in Småland and went to school in Wexiö; an only child, Fries was first interested in flowering plants, following his father, but at age 12 his attention was taken by fungi; within five years he had knowledge of more than 300 species, to which he gave names; studied under Acharius (q.v.); student, University of Lund (1811-1814) [although he was awarded his degree for a thesis on flowering plants, at Lund was able to see the works of Persoon q.v.) and other mycologists and to get current names for some of his fungal specimens]; Associate Professor (1814-1824) then full Professor (1824-1834), University of Lund; Professor of Botany, Uppsala University (1834 onwards). With Persoon, the founder of Mycology. The *Systema Mycologicum*, though produced without the help of a compound microscope, is still one of the most important books on systematic mycology. It is specially important for hymenomycetes, but takes in all groups of fungi (e.g. there are more than 500 pyrenomycetes, in good order), and it advanced taxonomy of most fungi far more than any earlier work. With the exceptions of 'gasteromycetes', lichen-forming fungi, *Mycetozoa*, *Pucciniales* and *Ustilaginales*, names of all fungi mentioned in his *Systema Mycologicum* and *Elenchus Fungorum* have protected sanctioned status in nomenclature (q.v.). *Publs. Observationes mycologicae* (1815-1818) [index, Petersen, *Mycotaxon* 17: 87-147, 1983]; *Systema Mycologicum* 3 vols (1821-1832) [reprint 1952]; *Elenchus Fungorum* (1828); *Lichenographia Europaea Reformata* (1831); *Epicrisis Systematis Mycologici* (June 1838) [edn 2 as *Hymenomycetes Europaei*, 1874 (reprinted 1963)]; *Summa Vegetabilium Scandinaviae* (1846-1849); *Monographia Hymenomycetum Sueciae* (1853) [reprint 1963]; in addition, he distributed 450 numbers of his *Scleromyceti Sueciae* exsiccati [pyrenomycetes and coelomycetes; see Holm & Nannfeldt (*Friesia* 7:

- 10, 1964) and Pfister (*Mycotaxon* 3: 185, 1975) for annotated check list], directed production of a series of *Icones Fungorum*, and produced various works on vascular plants. *Biogs, obits etc.* Dudley (*Journal of Mycology* 2: 91, 1886); Eriksson (*Elias Fries och den Romantiska Biologien*, 1962); T.M. Fries & R. Fries (*Friesia* 5: 135, 1955) [English translation of Fries' autobiography]; Grumann (1974: 474); Holm (*Symbolae Botanicae Upsalienses* 30 (3): 21, 1995); Krok (*Bibliotheca Botanica Suecicana*, 1925 [bibliography, 171 titles]); Lloyd (*Mycological Writings* 1: 161, 1904); Lloyd (*Mycological Writings* 3: 413, 1909); Lundström (*Trans. bot. Soc. Edinb.* 13: 383, 1879); Nannfeldt (*Symbolae Botanicae Upsalienses* 22 (4): 24, 1979); Stafleu & Cowan (*TL-2* 1: 878, 1976); Strid (*Catalogue of Fungus Plates Painted under the Supervision of Elias Fries*, 1994).
- Fries** (Theodore Magnus: 1832-1913; Sweden). Son of E.M. Fries (q.v.); Docent of Botany (1837-1862) then Assistant Professor of Botany and Practical Economy (1862-1877) then Professor of Botany and Practical Economy (1877-1899), University of Uppsala. Edited correspondence of Linnaeus and wrote some 170 publications on many aspects of biology and geography; probably responsible for accelerating acceptance of the concept of Schwendener (q.v.) that lichens are composed of at least two organisms; described many new species of lichen-forming fungi, especially from Europe. Specimens in the fungal reference collection in Uppsala (UPS). *Publs. Lichenes Arctoi* (1860); *Lichenographia Scandinavica* (1, 1871; 2, 1874). *Biogs, obits etc.* Grumann (1974: 475); Hemmen-dorff (*Svensk Botanisk Tidskrift* 8: 109, 1914); Stafleu & Cowan (*TL-2* 1: 889, 1976).
- Friesia** Lázaro Ibiza (1916) [non *Friesia* Spreng. 1818, *Euphorbiaceae*] = *Ganoderma* fide Donk (*Verh. K. ned. Akad. Wet.* tweede sect. 62: 1, 1974).
- Friesites** P. Karst. (1879) = *Hericium* Pers. fide Donk (*Taxon* 5: 69, 1956).
- Friesula** Speg. (1880) nom. dub., Thelephorales. See Singer (*Lilloa* 23: 152, 1950).
- Frigidisporea** K.D. Hyde & Goh (1999), Pezizomycotina. 1 (aquatic), British Isles. See Hyde & Goh (*MR* 103: 1564, 1999).
- Frigidopyrenia** Grube (2005), Xanthopyreniaceae (L.). 1, subarctic. See Grube (*Phyton* 45: 305, 2005).
- Fritzea** Stein (1879) ? = *Psora* Hoffm. (1796) fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- frog cheese**, young puff-balls.
- Frommea** Arthur (1917) = *Phragmidium* fide Laundon (*Mycotaxon* 3: 155, 1975).
- Frommeëlla** Cummins & Y. Hirats. (1983), Phragmidaceae. 2 (on *Duchesnea*, *Potentilla* (*Rosaceae*)), widespread. See McCain & Hennen (*Mycotaxon* 39: 249, 1990), Helfer (*Nova Hedwigia* 81: 325, 2005; Europ. spp.).
- Frondicola** K.D. Hyde (1992), ? Hyponectriaceae. 1 (on *Nypa*), Brunei. See Hyde (*Sydowia* 45: 204, 1993; posn).
- Frondisphaeria** K.D. Hyde (1996), ? Dothideomycetes. 2, Brunei. See Hyde (*Mycoscience* 37: 169, 1996), Fröhlich & Hyde (*Fungal Diversity Res. Ser.* 3, 2000).
- Frondispora** K.D. Hyde (1993), Xylariales. 1 (on *Palmae*), Europe. See Kang *et al.* (*Mycoscience* 40: 151, 1999).
- Frostiella** Murrill (1942) nom. nud. = *Boletellus* fide Singer (*Farlowia* 2: 223, 1945).
- fruticolous**, living on fruit.
- fructification**, see fruit-body.
- fruit-body** (fructification), a general term for spore-bearing organs in both macrofungi and microfungi. The more precise terms apothecium, ascoma (ascocarp), basidioma (basidiocarp), conidioma, perithe-cium, sporocarp, etc. are preferred usage.
- fruticulous**, living on shrubs.
- fruticose** (1) shrub-like; (2) (of lichens), having an upright or hanging thallus of radiate structure (e.g. *Cladonia*, *Ramalina*, *Usnea*) (Fig. 21E).
- fruticulose** (of lichens), having a minutely shrubby habit (e.g. *Ephebe*, *Polychidium*).
- Frutidella** Kalb (1994), Ramalinaceae (L.). 1, Europe; Australasia. See Sipman *et al.* (*Australasian Lichenology* 43: 10, 1998).
- Fuckel** (Karl Wilhelm Gottlieb Leopold; 1821-1876; Germany). A pharmacist (1836-1852; later of independent means; died of typhus in Vienna. Applied the ideas of the Tulasne brothers (q.v.) regarding asexual and sexual stages of ascomycetes; his collections provided a foundation for a mycota of the Rhine region; also associated with early exploration of arctic fungi. Collections are in l'Herbier Boissier, Geneva (G. *Publs. Symbolae Mycologicae, Beiträge zur Kenntniss der Rheinischen Pilze* (1870) [for which exsiccata were distributed; supplements 1871, 1873, and 1875; for publication dates, see Rogers (*Mycol.* 46: 533, 1954); the types for the new species he made in this work are also in Geneva (G), with mass iso-types distributed among the 2,700 colls in his *Funghi Rhenani Exsiccata* (1863-1874)]. *Biogs, obits etc.* Stafleu & Cowan (*TL-2* 1: 896, 1976).
- Fuckelia** (Nitschke ex Sacc.) Cooke (1869) ? = *Euepixylon* See Læssøe (*SA* 13: 43, 1994; ? synonym of *Xylaria*), Læssøe & Spooner (*Kew Bull.* 49: 1, 1994).
- Fuckelia** Bonord. (1864), anamorphic *Godronia*, St.1eH.15. 1, Europe.
- Fuckelia** Niessl (1875) nom. conf., Fungi. See Holm (*Taxon* 24: 275, 1975).
- Fuckelina** Kuntze (1891) = *Macropodia*.
- Fuckelina** Sacc. (1875) = *Stachybotrys* fide Hughes (*CJB* 36: 727, 1958).
- Fucus** L. (1753), Algae. Algae.
- fugacious**, see evanescent.
- Fugomyces** Sigler = *Quambalaria* fide Kolařík *et al.* (*Czech Mycol.* 58: 81, 2006; clinical aspects).
- Fujimycos** Minter & Caine (1980), anamorphic *Pezizomycotina*, Ccu.0fH.1. 1 (on *Pinus*), British Isles. See Minter & Caine (*TBMS* 74: 434, 1980).
- fulcrum** (of lichens), a conidiophore within a pycnidium (obsol.).
- Fulgensia** A. Massal. & De Not. (1853), Teloschista-ceae (L.). 8, widespread. See Klement (*Nova Hedwigia* 11: 495, 1965; key), Poelt (*Mitt. bot. StSamml., München* 5: 571, 1965), Poelt & Hinteregger (*Biblthca Lichenol.* 50, 1993; Himalaya), Westberg & Kärnefelt (*Lichenologist* 30: 515, 1998), Kasalicky *et al.* (*CJB* 78: 1215, 2000; phylogeny), Gaya *et al.* (*Am. J. Bot.* 90: 1095, 2003; phylogeny, polyphyly), Gaya *et al.* (*MR* 112: 528, 2008; phylogeny).
- Fulgia** Chevall. (1822) = *Coniocybe* fide Trevisan (*Flora* 45: 1, 1862).
- Fuligomyces** Morgan-Jones & Kamal (1984), anamorphic *Pezizomycotina*, Hso.#eP.1. 1, India. See Morgan-Jones & Kamal (*Mycotaxon* 20: 595, 1984), Khan *et al.* (*Mycotaxon* 49: 477, 1993).

Fulminaria Gobi (1900) = Harpochytrium fide Atkinson (*Ann. mycol.* 1: 479, 1903).

Fulminariaceae Gobi (1900) = Harpochytriaceae.

Fulvia Cif. (1954) = Passalora fide von Arx (*Proc. K. ned. Akad. Wet. Ser. C, Biol. Med. Sci.* 86: 15, 1983), Curtis *et al.* (*Curr. Genet.* 25: 318, 1994; phylogeny), Okada *et al.* (*FEMS Immunol. Med. Microbiol.* 16: 39, 1996; ubiquinones), Crous *et al.* (*Mycol.* 93: 1081, 2001; phylogeny), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003; review).

Fulvidula Romagn. (1936) nom. nud. = Gymnopilus fide Singer (*Agaric. mod. Tax.*, 1951).

Fulvifomes Murrill (1914), Hymenochaetaceae. 6, widespread. See Wagner & Fischer (*Mycol.* 94: 998, 2002).

Fulvisporium Vánky (1997), Ustilentylomataceae. 1 (on *Poaceae*), Australia. See Vánky *et al.* (*Mycotaxon* 64: 59, 1997), Aime *et al.* (*Mycol.* 98: 896, 2006; phylogeny).

Fulvoflamma Crous (2006), anamorphic *Rhytismatales*. 1. See Crous (*Stud. Mycol.* 55: 56, 2006).

fumagillin, an antibiotic (epoxide) from *Aspergillus fumigatus*; an amoebicide (McCowen *et al.*, *Science*, N.Y. 113: 202, 1951).

Fumago Pers. (1822) nom. conf., anamorphic *Pezizomycotina*. See Friend (*TBMS* 48: 371, 1965).

Fumagopsis Speg. (1910), anamorphic *Pezizomycotina*. See Kendrick & Carmichae in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 390, 1973), van der Aa & van Oorschot (*Persoonia* 12: 415, 1985), Wu & Sutton (*MR* 99: 1450, 1995).

Fumagospora G. Arnaud (1911), anamorphic *Capnodium*, Cpd.#eP.?. 2, Europe. See Hughes (*Mycol.* 68: 693, 1976).

fumigatin, a benzoquinone antibiotic from *Aspergillus fumigatus*; antibacterial (Anslow & Raistrick, *Biochem. J.* 32: 687, 1938).

Fumiglobus D.R. Reynolds & G.S. Gilbert (2006), Capnodiaceae. 1, Panama. See Reynolds & Gilbert (*Cryptog. Mycol.* 27: 252, 2006).

fumitremorgin, a tremorgenic metabolite (indole derivative) of *Aspergillus fumigatus* (Yamazaki *et al.*, *Tetrahedron Lett.* 14: 1241, 1975).

fumonisin, B1, B2 (B1, B2), toxic metabolites of *Fusarium moniliforme* (ear rot of maize). Infected maize eaten by horses causes equine leukocephalomalacia (Plattner *et al.*, *Mycol.* 82: 698, 1990).

Funalia Pat. (1900) = Trametes fide Ryvarden (*Gen. Polyp.*: 150, 1991).

fungaemia (fungemia), fungi in the blood.

funga (1) (n.), a fungus (obsol.); (2) (adj.), see fungous.

FUNGI. 36 class., 140 ord., 560 fam., 8283 gen. (+ 5101 syn.), 97861 spp. (Carpomycetes, Eumycota, Eumycophyta, Eumycetes, Fungales, Hysterophyta, Inophyta, Mycota, Mycetes, Mycetoideum, Mycetales, Mycetalia, Mycophyta, Mycophytes, Mycophycophytes). Kingdom of *Eukaryota*; the true fungi. 6 phyla. Eukaryotic organisms without plastids, nutrition absorptive (osmotrophic), never phagotrophic, lacking an amoeboid pseudopodial phase; cell walls containing chitin and β -glucans; mitochondria with flattened cristae and peroxisomes nearly always present; Golgi bodies or individual cisternae present; unicellular or filamentous and consisting of multicellular coenocytic haploid hyphae (homo- or heterokaryotic); mostly non-flagellate, flagella when present always lacking mastigonemes; reproducing

sexually or asexually, the diploid phase generally short-lived, saprobic, mutualistic, or parasitic.

The organisms studied by mycologists, fungi, are mostly placed here, but other belong to the kingdoms *Chromista* and *Protozoa* (see Kingdoms of fungi, Phylogeny). Some authors use *Eumycota* as the kingdom name which has the advantage of avoiding confusion with 'fungi' (e.g. Barr, 1992). The kingdom name *Fungi* is retained by Cavalier-Smith (1993) and Corliss (1994); as most fungi belong here, and as the name *Fungi* is immediately familiar to most students, we retain that here.

Various arrangements and ranks have been proposed for the main groupings of *Fungi*. The rank of phylum is adopted here as that is currently almost universally used (Barr, 1992; Bruns *et al.*, 1992; Corliss, 1994; Kendrick, 1992) and was already advocated by von Arx (*Sydowia* 37: 1, 1984); some authors nevertheless prefer lower ranks, e.g. classes (Nishida & Sugiyama, *Molec. Biol. Evol.* 10: 431, 1993). The 6 phyla accepted here are:

- (1) **Ascomycota**
- (2) **Basidiomycota**
- (3) **Chytridiomycota**
- (4) **Glomeromycota**
- (5) **Microsporidia**
- (5) **Zygomycota**

The *Deuteromycotina* is not accepted as a formal taxonomic category, as in the previous edition of the *Dictionary*; they are not a monophyletic unit, but are fungi which have either lost a sexual phase or which are anamorphs of other phyla (mainly *Ascomycota*; some *Basidiomycota*); with modern molecular or ultrastructural techniques such fungi can be assigned to existing taxa; see under Anamorphic fungi. See Classification, Kingdoms of fungi, Literature, Phylogeny.

Fungi fossiles, see Fossil fungi.

Fungi Imperfecti, see Anamorphic fungi; fungi having no sexual state, presumptively mitotic.

fungi suilli, see cep.

fungi, higher, see higher fungi.

fungi, lower, see lower fungi.

fungicidal, able to kill fungus spores or mycelium.

Fungicides. Substances which are able to kill fungi s.l., esp. if lethal at low concentration. The term is sometimes loosely applied to fungistatic and genestatic substances. **contact** -, those which kill fungi when applied to a substratum surface; **eradicant** -, those applied to a substratum in which a fungus is already present, or used in disease control after infection has been established; **protective** -, those used to protect an organism against infection by a fungal pathogen (*TBMS* 33: 155, 1950); **systemic** -, substances which are fungicidal (or fungistatic) when taken up systemically by an infected organism, usually a plant (see below). Heat, light, and other radiations have fungicidal properties, see sterilization.

Many chemical substances are fungicidal or inhibit fungal growth. Even pure water sometimes inhibits spore germination (e.g. of *Sclerotinia fructicola*) while conversely very low concentrations of some fungicides may stimulate spore germination or even be a prerequisite for fungal growth by supplying an essential trace element (see Nutrition). Today hundreds of fungicides are available in thousands of formulations for specific uses. Sulphur (elemental or in combination) and inorganic compounds of copper and mercury were the first fungicides employed and

these three elements, frequently in organic combination, are still ingredients of important fungicides. Some of the more important fungicides (with indications of their main uses) are:

Sulphur: elemental sulphur (as flowers of sulphur, colloidal sulphur, wettable sulphur, etc.), lime sulphur.

Copper: bordeaux and burgundy mixtures (q.v.), cheshunt compound (q.v.), copper sulphate, basic copper sulphates, chlorides and carbonate, copper oxides (seed treatment), organo-coppers (copper oleate and resinate) (plant protection).

Mercury: mercuric chloride (corrosive sublimate) (wood preservation, soil treatment), mercurous chloride (calomel) (seed and soil treatment). Organo-mercurials are not now used in agriculture because of non-target effects.

Other inorganic compounds: borax and boric acid (storage decay of fruit), calcium hypochlorite (bleaching powder) (surface sterilization of biological material), potassium iodide (sporotrichosis), potassium dichromate, sodium fluoride, zinc chloride, and arsenic compounds (wood preservation), triphenyl tin salts (crop protection).

Organic compounds: formaldehyde (formalin) (seed and soil disinfection), 5-fluorocytosine (candidiasis, cryptococcosis), guanidines (dodine), dithiocarbamates (thiram, mancozeb, propineb), carboximides (iprodione), imidazoles (prochloraz, imazalil), chlorinated hydrocarbons (chlorathalonil, didoran), methyl bromide and cresylic acid (soil sterilization), propionic acid (food preservation), propylene oxide (sterilization of biological materials), salicylanide (Shirlan) (plant protection, textile spoilage); see also antibiotics, copper, mercury, sulphur, systemic fungicides above and below.

Antibiotics: amphotericin (systemic mycoses), kasugamycin (systemic; rice blast), cycloheximide (crop protection and differential isolation of fungi), nystatin (candidiasis).

Systemic fungicides: (against plant diseases) acylalanines (furaxyl, metalaxyl), benzimidazoles (benomyl, carbendazim, thiabendazole), oxathiins (carboxin), pyrimidine derivatives (dimethirimol, ethirimol), triazoles (triadimefon, propiconazole). See Marsh (Ed.) (*Systemic fungicides*, 1972 [edn 2, 1977]).

Use of fungicides should be sparing, no more than necessary, and managed, ideally within the context of an integrated scheme, to avoid unnecessary pollution and the development of resistance. Methyl bromide is now rapidly being phased out of use from most countries because of its toxicity and effect on the ozone layer, although some use continues, notably in the USA. Alternating two different fungicides greatly lowers the risk of resistance development in a crop, as fungal strains which tolerate one fungicide are usually unable to survive the other (see Fungicide Resistance Action Committee, www.frac.info).

Lit.: Martin (*The scientific principles of plant protection* edn 6, 1973), *Guide to the chemicals used in crop protection* (edn 4, 1961; Canada Dep. Agric., Publ. Res. Branch 1093), Horsfall (*Fungicides and their action*, 1945; *Principles of fungicidal action*, 1956), Torgeson (Ed.) (*Fungicides, an advanced treatise*, 1, *Agricultural and industrial applications. Environmental interactions*, 1967; 2, *Chemistry and physiology*, edn 2, 1983), Waller & Lenné (*Plant pa-*

thologist's pocketbook, 2001), Smith (Ed.) (*Fungicides in crop protection. 100 years of progress*. 2 vol., 1985 [BCPC Monogr. 31], Nene & Thapliyal (*Fungicides in plant disease control*. edn 3, 1993), Whitehead (Ed.) (*The UK Pesticide Guide 2001*). For 'Definitions of fungicide terms' and 'Recommended methods' for testing fungicides, see *Phytopath.* (33: 624, 1943; 34: 401, 1944); also Zehr (Ed.) (*Methods for evaluating plant fungicides, nematocides and bactericides*, 1978).

Fungicolous fungi. Fungi growing on other fungi as parasites ('mycoparasites') commensals, or saprobes; fungicoles. Reliable estimates of the total number of fungi involved are not available; Hawksworth (1981) traced records of 1100 spp. of anamorphic fungi alone on 2500 other spp. of fungi. The fungi may be 'necrotrophic' (destructive), or 'biotrophic' (forming balanced relationships). Destructive effects may be mediated at a distance, by contact and coiling via antibiotics or hyphal-wall degrading enzymes, or hyphal interference (contact necrotrophs) or by penetration of the hyphae of the host (invasive necrotrophs). Biotrophic mycoparasitism occurs externally via haustoria (haustorial biotrophs), or via specialized contact cells which may produce colacosomes (Bauer & Oberwinkler, *Bot. Acta* 104: 53, 1991) and which achieve direct cytoplasmic continuity with the host through fine interhyphal channels (fusion biotroph), or internally by entry of the complete thallus of the mycoparasite into the host (intracellular biotrophs). For a description of these host-parasite interfaces see Jeffries & Young (*Interfungal parasitic relationships*, 1994). Fungicolous fungi are an excellent source of novel biologically active and chemically interesting compounds (Schmidt *et al.*, *J. Nat. Prod.* 70: 1317, 2007).

Particularly destructive mycoparasites are *Trichoderma* spp. (also of value in biocontrol; see esp. Papavizas (*Ann. Rev. Phytopathol.* 23: 23, 1985, Kubicek & Harman (*Trichoderma and Gliocladium* 1. Basic biology, taxonomy and genetics, 1998), Harman & Kubicek (*Trichoderma & Gliocladium* 2. Enzymes, biological control and commercial applications, 1998); both have very wide host ranges (Domsch *et al.*, 1980). Others are restricted to particular host taxa, usually fams., gen. or spp. Examples (host: fungi) are: **Mycetozoa:** *Aphanocladium album*, *Polycephalomyces* spp., *Leucopenicillifer*, *Nectria myxomyceticola* anamorph *Verticillium rexi* (anamorph). See Ing (*Bull. BMS* 8: 25, 1974; key), Rogerson & Stephenson (*Mycol.* 85: 456, 1993). **Oomycota:** esp. other Oomycota. e.g. *Pythium oligandrum* on *Pythium ultimum* (Whipps & Lumsden, *Biocontrol Sci. Technol.* 1: 75, 1991). **Chytridiomycota:** chytrids esp. other Chytridiales, e.g. *Allomyces* by *Catenaria allomyces* (Sykes & Porter, *Mycol.* 72: 288, 1980; Powell, *Bot. Gaz.* 143: 176, 1982), *Allomyces* and *Polyphagus* by *Rozella* and *Rozellopsis* (Held, *Bot. Rev.* 47: 451, 1981; Powell, *Mycol.* 76: 1039, 1984). **Zygomycota:** *Chaetocladium*, *Piptocephalis*, *Dimargaris* etc. On other Mucorales (Benjamin, *Aliso* 4: 321, 1959; Jeffries, *Bot. J. Linn. Soc.* 91: 135, 1985); *Stachybotrys chartarum* and *Anguillospora pseudolongissima* on spores of *Glomus* and *Gigaspora* (Paulitz & Menge, *Phytopathol.* 76: 351, 1986). **Ascomycota:** the zenith for fungicolous fungi. *Ampelomyces quisqualis* on numerous *Erysiphales*; *Cordyceps ophioglossoides* on *Elaphomyces*; *Gona-*

tobotrys simplex; *Hansfordia pulvinata* on *Cercospora* etc.; *Nectria magnusiana* (anamorph *Fusarium epistromum*) on *Diatrypella* spp.; *Nematogonum ferrugineum* on *Nectria coccinea*; *Coniothyrium minitans* on *Botryotinia* and *Sclerotinia sclerotia*; *Pseudofusidium hansfordii* on *Mycovellosiella*; *Sphaerulomyces coralloides* on aquatic hyphomycetes; *Syspastospora parasitica* on *Beauveria*, *Hirsutella*, *Paezilomyces* and *Verticillium* (Tribe, *TBMS* 40: 489, 1957; Huang, *CJB* 55: 289, 1977); *Tremella karstenii* on *Colpoma juniperi*; *Tympanosporium parasiticum* on *Nectria cinnabarina*; trop. foliicolous spp. (esp. *Meliolaceae*) support a vast array of fungi (Hansford, *Mycol. Pap.* 15, 1946; Deighton & Pirozynski, *Mycol. Pap.* 128, 1972); Pirozynski, *Kew Bull.* 31: 595, 1977; Hughes, *Mycol. Pap.* 166, 1993). See also Lichenicolous fungi. **Basidiomycota**: *Eudarlucacaricis* (anamorph *Sphaerellopsis filum*) on 226 spp. *Pucciniales* (Kranz, *Nova Hedw.* 24: 169, 1974); *Tuberculina persicina* on 26 spp. *Uredinales*; *Hypomyces* spp. (anamorphs *Apiocrea*, *Cladobotryum*) esp. common on decaying Agaricales and Boletales (Arnold, *Bibliogr. Mill. Univ. bibliotek Jena* 25, 1976; bibliogr. host index; Rogerson & Samuels, *Mycol.* 86: 839, 1994, on agarics); *Mycogone perniciosa* (wet bubble disease) on cult. mushrooms (*CMI Descr.* 499, 1976); *Asterophora* spp. on *Russula*; *Amblyosporium spongiosum* esp. on *Lactarius* (Nicot & Durand, *BSMF* 81: 623, 1965); *Helminthosphaeria* spp. on *Clavariaceae*; *Pseudoboletus parasiticus* on *Scleroderma*. See Nicot (*BSMF* 31: 393, 1967); key spp. on agarics, Tubaki (*Nagaoa* 5: 11, 1955), de Hoog (*Persoonia* 10: 33, 1978, keys), *Verticillium biguttatum* on *Rhizoctonia solani* (Boogert *et al.*, *Soil Biol. Biochem.* 24: 159, 1992) and mushroom culture.

Lit.: (*Ann. Rev. Phytopathol.* 28: 59, 1990), Barnett & Binder (*Ann. Rev. Phytopath.* 11: 273, 1973), Buller (3), Burge (*Fungi in biological control systems*, 1988), Cooke (*The biology of symbiotic fungi*, 1977), Domsch *et al.* (*Compendium of soil fungi*, 2 vols., 1980), Fletcher *et al.* (*Mushrooms- pest and disease control*, 1986), Gams *et al.* (*in Mueller et al.* (Eds), *Biodiversity of fungi: inventory and monitoring methods*, 2004), Hashioka (*Forsch. Geb. Pflanzenkrankh.* 8: 179, 1973; *Rep. Tottori Mycol. Inst.* 10: 473, 1973; SEM), Hawksworth (*in Cole & Kendrick* (Eds), *The biology of conidial fungi* 1: 171, 1981, conidial spp.), Helfer (*Pilze auf Pilzfruchtkörpern. Libri Botanici* 1: 1, 1991), Jeffries & Young (*Inter-fungal parasitic relationships*, 1994), Lumsden (*in Carroll & Wicklow* (Eds), *The fungal community*: 275, 1992; review, examples), Madelin (*The Fungi* 3: 253, 1968; review), Rudakov (*Mycol.* 70: 150, 1978; physiol. groups), Seeler (*Farlowia* 1: 119, 1943), Weindling (*Bot. Rev.* 4: 475, 1938).

See also Ecology, Lichenicolous fungi.

fungiform, mushroom-shaped.

fungistasis (1) see mycostasis; (2) (**fungistatic**) (of a substance, or of a concentration of a fungicide), inhibiting fungus growth but not fungicidal. Cf. *genes-tasis*.

Fungites Casp. (1907), Fossil Fungi (mycel.) Fungi. 4 (Oligocene), Baltic Sea; Pacific Ocean.

Fungites Hallier (1865), Fossil Fungi (mycel.) Fungi. 1 (Tertiary), Germany.

fungivorous, using fungi as food; **fungivore**, an organism which does this.

fungizone, trade name for amphotericin B (q.v.).

Fungodaster Haller ex Kuntze (1891) = *Leotia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

fungoid, fungus-like.

Fungoidaster P. Micheli (1729) nom. inval. = *Craterellus* fide Pegler (*in litt.*).

Fungoides Tourn. (1719) nom. inval., Fungi. Used for a wide range of fungi (Ascomycota & Basidiomycota) with cup-like fruits, including discomycetes and *Nidulariales*.

fungology, mycology (obsol.).

fungoma, fungus ball formation.

fungophobia, a horror or dread of fungi (Hay, *British Fungi*: 6, 1887) (obsol.).

fungous, of, or having to do with, fungi; fungal.

funguria, the presence of fungi, particularly yeasts, in urine.

fungus (pl. **fungi**), (Lat. **fungus**, orig. *sfungus*, cognate with *spongia* from Gk *sphongis*, a sponge), champignon (Fr.), ciupercă (Rumanian), cogumelo (Port.), fungo (Ital.), gljiva and guba (Croat.), goba (Slovene), gomba (Hung.), grybas (krembllys) (Lith.), grzyb (Pol.), hongo (Span.), houba (Czech.), huba (Slovak), 真菌 (jun, chün) (Chin.), kavak (Hindi), kavaka (Sanskrit), këphurdhe (Albanian), 菌類 (kin-rui) (Jap.), μύκης (Gk), makunã (Kikuyu), Pilz (Germ.), poonjalām (Tamil), seen (Estonian), sņne (Latvian), sienī (Fin.), svamp (Scand.), zwam (Dutch), ГРИБ (Russ.), ГРИБ ; (Byeloruss.), ГЪБИБА and ГЪБА (Serb.), ГЪБА (Bulgar.); 582.28 (Universal Decimal Classification); MACR.003 (semantic code; Perry & Kent, *Tools for machine literature searching*, 1958), one of the *Fungi*; [in Medicine: an abnormal sponge-like growth].

Fungus Adans. ex Kuntze (1898) = *Agaricus* L. fide Kirk (*in litt.*).

fungus ball, see aspergilloma.

fungus gnats, the *Mycetophilidae* (Insecta); see Mushroom culture.

fungus root, see mycorrhiza.

Fungus Tourn. ex Adans. (1763) ≡ *Agaricus* L.

fungus, ray, see ray fungi.

funicular, cord-like.

funicular cord (funiculus), the cord of hyphae by which the peridioles in *Nidulariaceae* (e.g. *Cyathus*) are at first fixed to the inner wall of the peridium; see splash cup.

Funicularius K.K. Baker & Zaim (1979), anamorphic *Pezizomycotina*, Hso.0eH.10. 1 (on mosquito), USA. See Baker & Zaim (*J. Invert. Path.* 34: 200, 1979), Samson *et al.* (*Atlas of Entomopathogenic Fungi*: 187 pp., 1988).

funiculose (of hyphae), aggregated into rope-like strands, plectonematogenous (q.v.).

Funiliomyces Aptroot (2004), *Amphisphaeriaceae*. 1, Brazil. See Aptroot (*Stud. Mycol.* 50: 309, 2004).

funoid, composed of rope-like strands or fibres; funicular (q.v.).

Furcaspora Bonar (1965), anamorphic *Pezizomycotina*, St.1bH.10. 3, USA. See Bonar (*Mycol.* 57: 391, 1965), Punithalingam (*MR* 107: 917, 2003).

furcate, forked.

Furcuncinula Z.X. Chen (1982) = *Erysiphe* fide Braun & Takamatsu (*Schlechtendalia* 4: 3, 2000).

Furculomyces Lichtw. & M.C. Williams (1992), *Legeriomycetaceae*. 3 (*in Diptera*), Australia; USA. See Lichtwardt & Williams (*CJB* 70: 1196, 1992),

- White (MR 110: 1011, 2006; phylogeny).
- furfuraceous**, covered with bran-like particles; scurfy.
- Furia** (A. Batko) Humber (1989), Entomophthoraceae. 17, widespread.
- Fusamen** (Sacc.) P. Karst. (1890), anamorphic *Pezizomycotina*, Cac.0eH.19+10. 5 (on *Salix*), Europe. See von Arx (*Bibliotheca Mycol.* 24, 1970), Sutton (*The Coelomycetes*, 1980).
- Fusariaceae** Nann. (1934) = Nectriaceae.
- fusaric acid** (Fusarinsäure, Germ.), a pyridine-carboxylic acid from *Fusarium bulbigenum* var. *lycopersici*, *F. vasinfectum* and other *Hypocreaceae* able to induce wilt symptoms in tomato (Gäumann, *Phytopath.* 47: 342, 1948, review; 48: 670, 1958, mechanism of action). Cf. lycomarasmin.
- Fusariella** Sacc. (1884), anamorphic *Pezizomycotina*, Hso.≡ eP.15. 13, widespread (temperate). See Hughes (*Mycol. Pap.* 28, 1949), Liu & Zhang (*Mycosystema* 25: 145, 2006; China).
- Fusariellites** Babajan & Tasl. (1977), Fossil Fungi. 1 (Tertiary), former USSR.
- Fusariopsis** Horta (1919), anamorphic *Pezizomycotina*, Hsy.0eH.?. 1 (on humans), France. See Dodge (*Medical Mycology*: 860, 1935).
- Fusarium** Link (1809), anamorphic *Gibberella*, *Haematonectria*, Hso.≡ eH.15. c. 111 (saprobes and parasites), widespread. This important genus has fusoid, curved, septate macroconidia in slimy masses (sporodochia) on branched conidiophores. Smaller 0- or 1-septate microconidia and chlamydospores are common. A third conidial type, the mesoconidium, is recognized by some authors. The mycelium and spores are generally bright in colour. Important pathogens: *F. avenaceum* and *F. culmorum* (cereal foot rots), *F. bulbigenum* (*Narcissus* basal rot), *F. caeruleum* (dry rot of potato tubers), *F. conglutinans* (cabbage yellows), *F. oxysporum* (potato wilt) and its var. *cubense* (Panama disease of banana), *F. vasinfectum* (cotton wilt), and others. *F. solani* is phylogenetically distinct. See Wollenweber & Reinking (*Die Fusarien*, 1935), Toussoun & Nelson (*A Pictorial Guide to the Identification of Fusarium Species*, 1969), Gerlach & Ershad (*Nova Hedwigia* 20: 725, 1970; Iran), Booth (*The genus Fusarium*, 1971), Joffe (*Mycopath. Mycol. Appl.* 53: 201, 1974), Sen Gupta (*Nova Hedwigia* 25: 699, 1974; India), Nirenberg (*Mitt. biol. BundAnst. Ld- u. Forstw.* 169, 1976; sect. *Liseola*), Booth (*Fusarium. Laboratory guide to the identification of the major species*, 1977), Gerlach in Subramanian (Ed.) (*Taxonomy of Fungi* 1: 115, 1978), Pattin (*Acta Phytotox.* 6, 1978; toxigenic spp.), Gerlach & Nirenberg (*Mitt. biol. BundAnst. Ld- u. Forstw.* 209, 1982; revision), Teetor-Barsch & Roberts (*Mycopathologia* 84: 3, 1983; entomogenous spp.), Gams (*Toxigenic Fungi: their toxins and health hazard*: 129, 1984; synanamorphs), Burgess *et al.* (*Mycol.* 77: 212, 1985; *F. scirpi*), Marasas *et al.* (*Mycol.* 77: 971, 1985; S Africa), Puhalla (*CJB* 63: 179, 1985; *F. oxysporum*, VCGs), Raabe (*Pl. Dis.* 69: 450, 1985; on *Hebe*), Szécsi & Dobrovolszky (*Mycopathologia* 89: 89, 1985; DNA reassociation), Ye & Wu (*Acta phytopath. sin.* 15: 87, 1985; esterases, graminicolous spp.), Burgess & Trimboli (*Mycol.* 78: 223, 1986; *F. nygamai*), Correll *et al.* (*Phytopathology* 76: 396, 1986; *F. oxysporum* f.sp. *apii*), Hatai *et al.* (*Journal of Wildlife Diseases* 22: 570, 1986; in fish), Joffe (*Fusarium species: their biology and toxicology*, 1986), Marasas *et al.* (*Mycol.* 78: 242, 1986; moniliformin production), Marasas *et al.* (*Mycol.* 78: 678, 1986; *F. polyphialidicum*), Naiki (*Research Bulletin of the Faculty of Agriculture, Gifu University* 51: 29, 1986; DNA content), Rubidge (*TBMS* 87: 463, 1986; DNA plasmids), Tiedt *et al.* (*TBMS* 87: 237, 1986; ultrastr.), Tiedt *et al.* (*TBMS* 87: 237, 1986; ultrastr.), Ylimäki & Jamalainen (*Annales Agriculturae Fenniae* 25: 9, 1986; Finland), Bosland & Williams (*CJB* 65: 2067, 1987; *F. oxysporum*, *Brassicaceae*), Brayford (*TBMS* 89: 347, 1987; *F. bugnicourtii*), Corley *et al.* (*Journal of Natural Products* 50: 897, 1987; trichothecenes), Hocking & Andrews (*TBMS* 89: 239, 1987; identification methods), Kim & Kim (*Korean Jl Pl. Path.* 3: 137, 1987; pathogenicity on banana), Logrieco *et al.* (*Abstracts of the European Seminar 'Fusarium - Mycotoxins, Taxonomy, Pathogenicity'* Warsaw, 8-10 September 1987: no. 13, 1987; from potato), Marasas *et al.* (*Bothalia* 17: 97, 1987; S Africa, bibliography), Okuda *et al.* (*J. Med. Vet. Mycol.* 25: 177, 1987; clinical strain), Wasfy *et al.* (*Mycopathologia* 99: 9, 1987; biochemistry, physiology), Wyk *et al.* (*TBMS* 88: 347, 1987; ontogeny), Baayen & Gams (*Neth. Jl Pl. Path.* 94: 273, 1988; on carnation), Blumenthal-Yonassi *et al.* (*Proceedings of the Japanese Association of Mycotoxicology Supplement* no. 1: 232, 1988; zearalenone production), Bottalico *et al.* (*Proceedings of the Japanese Association of Mycotoxicology Supplement* no. 1: 228, 1988; mycotoxins), Ellis (*Mycol.* 80: 255, 1988; sect. *Liseola*), Ellis (*Mycol.* 80: 734, 1988; sect. *Liseola*), Gerlach & Blok (*Neth. Jl Pl. Path.* 94: 17, 1988; on *Cucurbitaceae*), Lamprecht *et al.* (*Bothalia* 18: 189, 1988; *F. tricinctum*), Logrieco & Bottalico (*TBMS* 90: 215, 1988; on maize), Nelson *et al.* (*Mycol.* 79: 884, 1987; *F. beomiforme*), Tiedt & Jooste (*TBMS* 90: 531, 1988; ultrastr.), Tivoli (*Agronomie* 8: 211, 1988; on potato, France), Visconti *et al.* (*Proceedings of the Japanese Association of Mycotoxicology Supplement* no. 1: 230, 1988; trichothecenes), Wyk *et al.* (*Phytophyllactica* 20: 73, 1988; on wheat, S Africa), Wyk *et al.* (*TBMS* 91: 611, 1988; macroconidial development), Wyk *et al.* (*S. Afr. J. Bot.* 54: 118, 1988; conidial development, cytology), Brayford (*Journal of Applied Bacteriology Symposium Supplement Series* no. 18 67: 47S, 1989; review), Burgess *et al.* (*Mycol.* 81: 818, 1989; Australia), Chelkowski *et al.* (*J. Phytopath.* 124: 155, 1989; on cereals), Cunfer (*Fusarium. Mycotoxins, Taxonomy and Pathogenicity* [Topics in Secondary Metabolism vol. 2]: 387, 1989; on *Claviceps*), Logrieco *et al.* (*Mycotoxin Research Supplement*: 9, 1989; mycotoxin production), Manka *et al.* (*J. Phytopath.* 124: 143, 1989; *F. graminearum*), Nirenberg (*Fusarium. Mycotoxins, Taxonomy and Pathogenicity* [Topics in Secondary Metabolism vol. 2]: 179, 1989; Europe), Thrane (*Fusarium. Mycotoxins, Taxonomy and Pathogenicity* [Topics in Secondary Metabolism vol. 2]: 199, 1989; mycotoxins), Thrane & Frisvad (*Mycotoxin Research Supplement*: 21, 1989; mycotoxins), Jacobson & Gordon (*MR* 94: 734, 1990; population biology), Leslie *et al.* (*Mycol. Soc. Amer. Newsl.* 41: 24, 1990; sect. *Liseola*), Nelson *et al.* (*Mycol.* 82: 99, 1990; morphology, physiology), Nirenberg (*Stud. Mycol.* 32: 91, 1990; review), Ploetz (*Fusarium Wilt of Banana*, 1990), Thrane (*J. Microbiol. Meth.* 12: 23, 1990; chemistry), Burgess *et al.* (*Australas. Pl. Path.* 20: 86, 1991; identification media), Correll (*Phytopa-*

- thology 81: 1061, 1991; *F. oxysporum*), Das & Chatopadhyay (*Journal of Mycopathological Research* 29: 51, 1991; mating populations), Leslie (*Phytopathology* 81: 1058, 1991; *Gibberella fujikuroi*), Liddell (*Phytopathology* 81: 1044, 1991; review), Logrieco *et al.* (*Exp. Mycol.* 15: 174, 1991; sect. *Sporotrichiella*), Miller *et al.* (*Mycol.* 83: 121, 1991; trichothecenes), Peterson (*Phytopathology* 81: 1051, 1991; phylogeny), Samson (*Fungi and Mycotoxins in Stored Products* ACIAR Proceedings no. 36: 39, 1991; food-borne spp.), Wyk *et al.* (*MR* 95: 284, 1991; development of microconidia), Gordon & Okamoto (*Exp. Mycol.* 16: 245, 1992; VCGs), Gordon & Okamoto (*CJB* 70: 1211, 1992; *F. oxysporum*), Guarro & Gené (*Mycoses* 35: 109, 1992; mycoses), Nelson (*Mycopathologia* 117: 29, 1992; *F. moniliforme*), Nelson *et al.* (*Appl. Environm. Microbiol.* 58: 984, 1992; fumonisin production), Thrane *et al.* (*Modern Methods in Food Mycology* Developments in Food Science vol. 31: 285, 1990; diagnostic methods), Tiedt & Jooste (*MR* 96: 187, 1992; ultrastr.), Abramson *et al.* (*Can. J. Pl. Path.* 15: 147, 1993; trichothecenes, Canada), Bridge *et al.* (*Pl. Path.* 42: 264, 1993; physiology), Campbell & Leslie (*Phytopathology* 83: 1413, 1993; genetic diversity), Elias *et al.* (*Molecular Plant-Microbe Interactions* 6: 565, 1993; on *Lycopersicon*), Nelson *et al.* (*Ann. Rev. Phytopath.* 31: 233, 1993; fumonisins), O'Donnell (*The Fungal Holomorph: Mitotic, Meiotic and Pleomorphic Speciation in Fungal Systematics*: 225, 1993; review), O'Donnell *et al.* (*Phytopathology* 83: 1346, 1993; *F. solani*), Parisi *et al.* (*Phytopathology* 83: 533, 1993; Australia), Summerell *et al.* (*MR* 97: 1015, 1993; Australia), Wing *et al.* (*MR* 97: 1441, 1993; toxigenic spp., Australia), Appel & Gordon (*Phytopathology* 84: 1097, 1994; IGS diversity), Kelly *et al.* (*Phytopathology* 84: 1293, 1994; RAPDs, *F. oxysporum*), McGinnis *et al.* (*J. Mycol. Médic.* 4: 45, 1994; endocarditis), Mes *et al.* (*Pl. Path.* 43: 362, 1994; on *Gladiolus*), Nelson *et al.* (*Clin. Microbiol. Rev.* 7: 479, 1994; clinical aspects), Edel *et al.* (*Phytopathology* 85: 579, 1995; molecular methods), Hagen & Hagen (*Mycopathologia* 129: 143, 1995; morphometrics), Logrieco *et al.* (*Mycopathologia* 129: 153, 1995; *F. sambucinum*), Thrane & Hansen (*Mycopathologia* 129: 183, 1995; *F. sambucinum*), Brayford (*Sydowia* 48: 163, 1996; species concepts), Burgess *et al.* (*Sydowia* 48: 1, 1996; biodiversity), Leslie (*Sydowia* 48: 32, 1996; genetics), O'Donnell (*Sydowia* 48: 57, 1996; phylogeny), Rheeder *et al.* (*Mycol.* 88: 509, 1996; *F. globosum*), Waalwijk *et al.* (*Sydowia* 48: 90, 1996; DNA analysis), Gordon & Martyn (*Ann. Rev. Phytopath.* 35: 111, 1997; evolution), Huang *et al.* (*Pl. Path.* 46: 871, 1997; *F. moniliforme*), Kistler (*Phytopathology* 87: 474, 1997; *F. oxysporum*), Leslie & Zeller (*Cereal Research Communications* 25: 539, 1997; mutant strains), Nirenberg & Aoki (*Mycoscience* 38: 329, 1997; *F. nivikadoi*), O'Donnell & Cigelnik (*Mol. Phylogen. Evol.* 7: 103, 1997; rDNA variation), Sands *et al.* (*Pl. Dis.* 81: 501, 1997; on *Erythroxylum*), Aoki & O'Donnell (*Mycoscience* 39: 1, 1998; *F. kyushuense*), Hyun & Clark (*MR* 102: 1259, 1998; *F. lateritium*), Marasas *et al.* (*Mycol.* 90: 505, 1998; sect. *Arthrosporiella*), Mulè *et al.* (*Bulletin of the Institute for Comprehensive Agricultural Sciences, Kinki University* 6: 23, 1998; trichothecenes), Nirenberg & O'Donnell (*Mycol.* 90: 434, 1998), O'Donnell *et al.* (*Fungal Genetics Biol.* 23: 57, 1998; Quorn fungus), O'Donnell *et al.* (*Mycol.* 90: 465, 1998; phylogeny), Schütt *et al.* (*Mycotoxin Research* 14: 35, 1998; moniliformins), Aoki & O'Donnell (*Mycol.* 91: 597, 1999; *F. pseudograminearum*), Arie *et al.* (*Mycoscience* 40: 311, 1999; mating types), O'Donnell *et al.* (*J. Phytopath.* 147: 445, 1999; *F. oxysporum*), Baayen *et al.* (*Phytopathology* 90: 891, 2000; *F. oxysporum*), O'Donnell *et al.* (*Proc. natn Acad. Sci. U.S.A.* 97: 7905, 2000; *F. graminearum*), O'Donnell *et al.* (*Mycoscience* 41: 61, 2000; *G. fujikuroi*), Suga *et al.* (*MR* 104: 1175, 2000; *F. solani*), Wikler & Gordon (*CJB* 78: 709, 2000; *F. circinatum*), Aoki *et al.* (*Mycoscience* 42: 461, 2001; *G. fujikuroi*), Backhouse *et al.* (*Fusarium* Paul E. Nelson Memorial Symposium: 122, 2001; biogeography), Kistler (*Fusarium* Paul E. Nelson Memorial Symposium: 70, 2001; host specificity), Steenkamp *et al.* (*Mycol.* 94: 1032, 2002; cryptic speciation), Yli-Mattila *et al.* (*MR* 106: 655, 2002; phylogeny), Skovgaard *et al.* (*Mycol.* 95: 630, 2003; *F. commune*), Summerell *et al.* (*Pl. Dis.* 87: 117, 2003; identification), Geiser *et al.* (*Eur. J. Pl. Path.* 110: 473, 2004; molecular identification), Leslie *et al.* (*Eur. J. Pl. Path.* 110: 611, 2004; mating populations), O'Donnell *et al.* (*J. Clin. Microbiol.* 42: 5109, 2004; human pathogens), Geiser *et al.* (*Mycol.* 97: 191, 2005; *F. xylarioides*), Leslie *et al.* (*Mycol.* 97: 718, 2005; *F. sacchari*), Akinsanmi *et al.* (*Pl. Path.* 55: 494, 2006; Australia), Desjardins (*Fusarium Mycotoxins* Chemistry, Genetics and Biology, 2006; mycotoxins), Leslie & Summerell (*Fusarium Labor. Manual*, 2006; identification manual), Scott & Chakraborty (*MR* 110: 1413, 2006; *F. pseudograminearum*), Bentley *et al.* (*Phytopathology* 98: 250, 2008; Australia), Suga *et al.* (*Phytopathology* 98: 159, 2008; Japan).
- Fuscidea** V. Wirth & Vězda (1972), Fuscideaceae (L.) c. 34, widespread (esp. temperate). See Inoue (*Hikobia, Suppl.* 1: 161, 1981), Inoue (*Hikobia, Suppl.* 1: 177, 1981), Oberhollenzer & Wirth (*Beih. Nova Hedwigia* 79: 537, 1984; 9 spp.), Oberhollenzer & Wirth (*Stuttg. Beitr. Naturk.*, 1985), Brodo & Wirth in Glenn *et al.* (Eds) (*Lichenogr. Thomsoniana*: 149, 1998), Kantvilas (*Biblthca Lichenol.* 78: 169, 2001; Tasmania), Kantvilas & McCarthy (*Lichenologist* 35: 397, 2003), Wedin *et al.* (*MR* 109: 159, 2005; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Bylin *et al.* (*Biblthca Lichenol.* 96: 49, 2007; phylogeny).
- Fuscideaceae** Hafellner (1984), Umbilicariales (±L). 6 gen. (+ 3 syn.), 55 spp.
Lit.: Oberhollenzer & Wirth (*Biblthca Lichenol.* 38: 363, 1990), Farkas (*Biblthca Lichenol.* 58: 97, 1995), Ihlen & Tønsberg (*Bryologist* 99: 32, 1996), Kantvilas & Vězda (*Nordic J. Bot.* 16: 325, 1996), Ihlen & Ekman (*Biol. J. Linn. Soc.* 77: 535, 2002), Reeb *et al.* (*Mol. Phylogen. Evol.* 32: 1036, 2004), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Bylin *et al.* (*Biblthca Lichenol.* 96: 49, 2007; phylogeny).
- Fuscoboletinus** Pomerl. & A.H. Sm. (1962) = *Suillus* Gray fide Singer *et al.* (*Mycol.* 55: 362, 1963).
- Fuscocerrena** Ryvar den (1982), Polyporaceae. 1, widespread. See Gilbertson & Ryvar den (*N. Amer. Polyp.* 1: 279, 1987).
- Fusoderma** (D.J. Galloway & P.M. Jørg.) P.M. Jørg. & D.J. Galloway (1989), Pannariaceae (L.). 3, south

- temperate. See Jørgensen (*N.Z. Jl Bot.* 37: 257, 1999), Jørgensen & Sipman (*Lichenologist* 34: 33, 2002; New Guinea).
- Fuscolachnum** J.H. Haines (1989), Hyaloscyphaceae. 7 (on leaves), Europe; N. America. See Haines (*Mem. N. Y. bot. Gdn* 49: 315, 1989).
- Fuscopannaria** P.M. Jørg. (1994), Pannariaceae (L). 33, widespread (esp. temperate). See Jørgensen (*Op. Bot.* 45, 1978; Eur. spp., as *Pannaria*), Jørgensen (*N.Z. Jl Bot.* 37: 257, 1999), Jørgensen (*J. Hattori bot. Lab.* 89: 247, 2000; E Asia), Jørgensen (*Bryologist* 103: 670, 2000; N America), Jørgensen (*Bryologist* 103: 104, 2000; sorediate taxa), Jørgensen (*Biblthca Lichenol.* 78: 109, 2001; Australia), Ekman & Jørgensen (*CJB* 80: 625, 2002; phylogeny), Jørgensen (*N.Z. Jl Bot.* 40: 327, 2002; New Zealand), Jørgensen (*J. Hattori bot. Lab.* 92: 225, 2002; Asia), Jørgensen & Zhurbenko (*Bryologist* 105: 465, 2002; Arctic), Jørgensen (*Lichenologist* 36: 207, 2004; Asia), Jørgensen (*Lichenologist* 37: 221, 2005; Europe, key), Jørgensen (*Bryologist* 108: 255, 2005; N America), Jørgensen & Sipman (*J. Hattori bot. Lab.* 100: 695, 2006; New Guinea), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Jørgensen (*Lichenologist* 39: 235, 2007; SE Asia).
- Fuscophialis** B. Sutton (1977), anamorphic *Pezizomycotina*, Hso.≡ eP.16. 3, widespread (tropical). See Sutton (*Boln Soc. argent. Bot.* 17: 158, 1977).
- Fuscoporella** Murrill (1907) = *Phellinus* fide Pegler (*The polypores [Bull. BMS Suppl.]*, 1973).
- Fuscoporia** Murrill (1907) = *Phellinus* fide Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974).
- Fuscoscypha** Svrček (1987), Hyaloscyphaceae. 1, Europe. See Huhtinen (*Karstenia* 29: 45, 1990).
- fuscous**, dusky; too brown for a grey (Corner, 1958).
- Fusculina** Crous & Summerell (2006), anamorphic *Pleosporales*. 1, Australia. See Crous & Summerell (*Fungal Diversity* 23: 334, 2006).
- fuseau**, a fusoid macroconidium of a dermatophyte (e.g. *Microsporum*); a spindle (obsol.).
- Fusella** Sacc. (1886), anamorphic *Pezizomycotina*, Hso.0eP.?. 3, Europe; Africa.
- Fusellites** Babajan & Tasl. (1977), Fossil Fungi. 1 (Tertiary), former USSR.
- Fusicatena** K. Matsush. & Matsush. (1996), anamorphic *Pezizomycotina*, Hso.?.?. 1, Japan. See Matsushima & Matsushima (*Matsush. Mycol. Mem.* 9: 32, 1996).
- Fusichalara** S. Hughes & Nag Raj (1973), anamorphic *Pezizomycotina*, Hso.≡ eP.15. 4, widespread. See Hughes & Nag Raj (*N.Z. Jl Bot.* 11: 662, 1973), Davydkina (*Mikol. Fitopatol.* 25: 26, 1991; Russia).
- Fusicladiella** Höhn. (1919), anamorphic *Mycosphaerella*, Hso.1eH.1. 5, widespread (tropical). See Deighton (*Mycol. Pap.* 101, 1965), Schubert *et al.* (*Schlechtendalia* 9, 2003).
- Fusicladiites** Babajan & Tasl. (1973), Fossil Fungi. 1 (Tertiary), former USSR.
- Fusicladina** Arnaud (1952) nom. inval., anamorphic *Pezizomycotina*, Hso.1eH.?. 1, Europe.
- Fusicladiopsis** Karak. & Vassiljevsky (1937) ≡ *Karakulinia*.
- Fusicladiopsis** Maire (1907) = *Stemphylium* fide Hughes (*CJB* 36: 727, 1958).
- Fusicladium** Bonord. (1851), anamorphic *Acantharia*, *Venturia*, Hsp.1eP.10. 87, widespread. See Hughes (*CJB* 31: 560, 1953), Ondřej (*Česká Mykol.* 25: 165, 1971), Sutton & Pascoe (*Aust. Syst. Bot.* 1: 79, 1988; on *Parahebe*), Braun *et al.* (*Taxon* 51: 557, 2002; nomencl.), Braun *et al.* (*Mycol. Progr.* 2: 3, 2003; phylogeny), Partridge & Morgan-Jones (*Mycotaxon* 85: 357, 2003), Schubert *et al.* (*Schlechtendalia* 9, 2003; monograph), Beck *et al.* (*Mycol. Progr.* 4: 111, 2005; phylogeny), Schubert & Braun (*Mycol. Progr.* 4: 101, 2005), Ruskiewicz-Michalska (*Acta Mycologica Warszawa* 41: 285, 2006; Poland), Crous *et al.* (*Stud. Mycol.* 58: 185, 2007; phylogeny).
- Fusicladosporium** Partr. & Morgan-Jones (2003) = *Fusicladium* fide Partridge & Morgan-Jones (*Mycotaxon* 85: 360, 2003), Schubert *et al.* (*Schlechtendalia* 9, 2003).
- fusicoccin**, a tricarboxylic terpene from *Fusicoccum amygdali* which induces stomatal opening (Turner & Granati, *Nature* 223: 1070, 1969) and promotes spore germination and cell elongation. See also Chain *et al.* (*Physiol. Pl. Path.* 1: 495, 1971; toxicity).
- Fusicoccum** Corda (1829), anamorphic *Botryosphaeria*, St.0eH.1. c. 91, widespread. *F. putrefaciens* (cranberry (*Vaccinium*) end rot). See Morgan-Jones & White (*Mycotaxon* 30: 117, 1987; redescr. anamorph of *Botryosphaeria ribis*), Rayachhetry *et al.* (*Mycol.* 88: 239, 1996; biocontrol), Gardner (*Mycol.* 89: 298, 1997; Hawaii), Crous & Palm (*Sydowia* 51: 167, 1999; review), Denman *et al.* (*Stud. Mycol.* 45: 129, 2000; review), Phillips (*Mycotaxon* 76: 135, 2000; on *Populus*), Smith *et al.* (*Mycol.* 93: 277, 2001; on *Eucalyptus*), Zhou & Stanosz (*MR* 105: 1033, 2001; phylogeny), Phillips (*Phytopath. Mediterr.* 41: 3, 2002; on *Vitis*), Slippers *et al.* (*Mycol.* 96: 1030, 2004; phylogeny), Slippers *et al.* (*Mycol.* 96: 83, 2004; phylogeny), Crous *et al.* (*Stud. Mycol.* 55: 235, 2006; phylogeny).
- Fusicolla** Bonord. (1851), anamorphic *Pezizomycotina*, Hsp.0eH.?. 5, widespread.
- Fusicytopora** Gutner (1934) = *Phomopsis* (Sacc.) Bubák. fide Petrak (*Sydowia* 1: 61, 1947).
- fusidic acid**, an antibacterial antibiotic from *Fusidium coccineum* (Godfredsen, *Nature* 193: 987, 1962); = ramycin (from *Micromucor ramanniana*).
- Fusidites** Mesch. (1902), Fossil Fungi. 1 (Oligocene), Europe.
- Fusidium** Link (1809) nom. rej., anamorphic *Pezizomycotina*. 1, widespread. See Booth (*Mycol. Pap.* 104, 1966), Cooper (*N.Z. Jl Bot.* 43: 323, 2005; New Zealand).
- Fusidomus** Grove (1929) = *Fusarium* fide Sutton (*Mycol. Pap.* 141, 1977).
- fusiform**, spindle-like; narrowing toward the ends (Fig. 23.1).
- fusiform rust** (of pine), *Cronartium quercuum* (Czabator, *U.S. For. Serv. Res. Pap.* 65, 1971).
- Fusiformisporites** Rouse (1962), Fossil Fungi. 8 (Tertiary), India; N. America.
- Fusispora** Fayod (1889) = *Lepiota* fide Singer & Smith (*A monograph on the genus Galerina Earle*, 1964).
- Fusisporella** Speg. (1910), anamorphic *Pezizomycotina*, Hsp.1eH.?. 1 or 2, America (tropical).
- Fusisporium** Link (1809) = *Fusarium* fide Wollenweber & Reinking (*Die Fusarien*: 5, 1935), Hughes (*CJB* 36: 727, 1958).
- Fusithea** Bonord. (1864) nom. dub., ? Fungi.
- fusoid**, somewhat fusiform.
- Fusoidispora** Vijaykr., Jeewon & K.D. Hyde (2005), Annulatascaceae. 1, Hong Kong. See Vijaykrishna *et al.* (*Sydowia* 57: 272, 2005).
- Fusoma** Corda (1837) nom. dub., anamorphic *Pezizo-*

- mycotina*. See Hughes (*CJB* 36: 727, 1958).
- Fusticeps** J. Webster & R.A. Davey (1980), anamorphic *Pezizomycotina*, Hso.≡ eP.1. 1 (aquatic), Malaysia. See Webster & Davey (*TBMS* 75: 341, 1980), Hyde & Goh (*Mycoscience* 39: 199, 1998).
- fuzz-ball**, see puff-ball.
- fuzzy coat**, the outer gelatinous coat of an ascus, esp. of one staining blue in iodine; see ascus.
- G**, Conservatoire et Jardin Botanique de la Ville de Genève (Geneva, Switzerland); founded 1817; funded by the city.
- Gabarnaudia** Samson & W. Gams (1974), anamorphic *Ceratocystidaceae*, Hso.0eH.15. 5, Europe; Asia. See Samson & Gams (*Stud. Mycol.* 6: 88, 1974), Hausner & Reid (*CJB* 82: 752, 2004; phylogeny), Gao *et al.* (*Mycosystema* 24: 603, 2005; China).
- Gabura** Adans. (1763) nom. rej. = *Collema* F.H. Wigg. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Gaertneriomyces** D.J.S. Barr (1980), *Spizellomycetaceae*. 3 (from soil), N. America; Europe. See Barr (*CJB* 58: 2386, 1980).
- Gaeumannia** Petr. (1950) = *Melchioria* fide Müller & von Arx in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 87, 1973).
- Gaeumanniella** Petr. (1952), *Pezizomycotina*. 1, USA. See Petrak (*Sydowia* 6: 162, 1952).
- Gaeumannomyces** Arx & D.L. Olivier (1952), *Magnaporthaceae*. Anamorph *Harpophora*. c. 11 (on grass roots), widespread. *G. graminis* (with 3 vars.; whiteheads and take-all (q.v.) of cereals). See Simonsen (*Friesia* 9: 361, 1971; anamorph), Walker (*TBMS* 58: 427, 1972), Weste (*TBMS* 59: 133, 1972; root infection), Walker (*Mycotaxon* 11: 1, 1980; taxonomy), Bryan *et al.* (*Appl. Environm. Microbiol.* 61: 681, 1995), Fouly *et al.* (*Mycol.* 89: 590, 1997; restriction analysis), Augustin *et al.* (*J. Phytopath.* 147: 109, 1999; RAPDs), Bryan *et al.* (*MR* 103: 319, 1999; DNA, host range), Ward & Bateman (*New Phytol.* 141: 323, 1999; DNA), Gams (*Stud. mycol.* 45: 187, 2000; anam.), Rachdawong *et al.* (*Pl. Dis.* 86: 652, 2002; molecular identification), Wong (*MR* 106: 857, 2002), Freeman & Ward (*Molecular Plant Pathology* 5: 235, 2004; review), Saleh & Leslie (*Mycol.* 96: 1294, 2004; phylogeny).
- Gaillardiiella** Pat. (1895), *Nitschkiaceae*. 1 (from wood), S. America. See Petrak (*Sydowia* 4: 158, 1950), Subramanian & Sekar (*Kavaka* 18: 19, 1993), Huhndorf *et al.* (*MR* 108: 1384, 2004).
- Galactinia** (Cooke) Boud. (1885) = *Peziza* Fr. fide Seaver (*North American Cup Fungi* (Operculates), 1928).
- Galactiniaceae** Berthet ex Le Gal (1969) = *Pezizaceae*.
- Galactomyces** Redhead & Malloch (1977), *Dipodasceae*. 6, widespread. See de Hoog *et al.* (*Stud. Mycol.* 29, 1986; key), de Hoog *et al.* in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 209, 1998), Naumova *et al.* (*Antonie van Leeuwenhoek* 80: 263, 2001; sibling species), Hoog & Smith (*Stud. Mycol.* 50: 489, 2004; phylogeny), Pimenta *et al.* (*Int. J. Syst. Evol. Microbiol.* 55: 497, 2005), Romano *et al.* (*The Yeast Handbook* 2: 13, 2006; review), Suh & Blackwell (*MR* 110: 220, 2006; in beetle guts), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Galactopus** Earle (1909) = *Mycena* fide Singer (*Agaric. mod. Tax.*, 1951).
- galeate**, hooded; hat-shaped or helmet-shaped.
- Galeoscypha** Svrček & J. Moravec (1989), *Pyrone-mataceae*. 1, Europe. See Svrček & Moravec (*Česká Mykol.* 43: 210, 1989).
- Galera** (Fr.) P. Kumm. (1871) [non *Galera* Blume 1825, *Orchidaceae*] = *Galerina* fide Kuyper (*in litt.*).
- Galeraicta** Preuss (1852) ? = *Rabenhorstia* fide Saccardo (*Syll. fung.* 3: 1, 1884), Sutton (*Mycol. Pap.* 141, 1977).
- Galerella** Earle (1909), *Bolbitiaceae*. 7, widespread. See Hausknecht & Contu (*Öst. Z. Pilzk.* 12: 31, 2003).
- Galerina** Earle (1909), *Strophariaceae*. c. 250 (freq. bryophilous), widespread. See Kühner (*Le Genre Galera*, 1935), Smith & Singer (*A monograph on the genus Galerina Earle*, 1964), Barkman (*Coolia* 14: 49, 1969; key 50 Dutch spp.), Wells & Kempton (*Lloydia* 32: 369, 1969; Alaskan spp.), Pegler & Young (*Kew Bull.* 27: 483, 1972; basidiospore form), Kühner (*BSMF* 88: 41, 1973; alpine spp.), Kühner (*BSMF* 88: 119, 1973; alpine spp.), Gulden *et al.* (*MR* 105: 432, 2001; *G. marginata* complex), Wood (*Aust. Syst. Bot.* 14: 615, 2001; Australia spp.), Gulden (*Mycol.* 97: 823, 2005; polyphyly).
- Galeromycena** Velen. (1947) = *Macrocyttidia* fide Pegler (*in litt.*).
- Galeropsidaceae** Singer (1962) nom. rej. = *Bolbitiaceae*. The *Galeropsidaceae* are listed as nom. rej. against *Cortinariaceae*.
- Galeropsina** Velen. (1947) = *Psilocybe* (Fr.) P. Kumm. fide Singer (*Agaric. mod. Tax.* 4th ed, 1986).
- Galeropsis** Velen. (1930), *Bolbitiaceae*. 16 (xerophytic), widespread. Perhaps *Agaricaceae*. See Singer (*Proc. K. ned. Akad. Wet. Ser. C, Biol. Med. Sci.* 66: 106, 1963; key), Sarasini (*Gasteromiceti Epigei*: 406 pp., 2005).
- Galerula** P. Karst. (1879) nom. dub. ? = *Galerina* fide Singer & Smith (*A monograph on the genus Galerina Earle*, 1964).
- Galiella** Nannf. & Korf (1957), *Sarcosomataceae*. 8, widespread (north temperate). See Korf (*Mycol.* 49: 107, 1957), Cabello (*Boln Soc. argent. Bot.* 25: 395, 1988), Li & Kimbrough (*CJB* 74: 1651, 1995; spore ontogeny), Zhuang & Wang (*Mycotaxon* 67: 355, 1998; spp. China), Harrington *et al.* (*Mycol.* 91: 41, 1999; phylogeny), Pant (*Mycotaxon* 79: 315, 2001; India), Köpcke *et al.* (*Phytochem.* 60: 709, 2002; chemistry), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny).
- Gall**. A predictable and consistent plant deformation that occurs in response to the stimulus of a foreign organism, often a swelling or outgrowth; a cecidium.
- Fungi producing galls directly on plants include some *Exobasidiales* (Ing, *in Williams*, 1994: 67; key 35 Eur. sp.), *Pucciniales* (Preece & Hicks, *in Williams* (Ed.), 1994: 57; 87 Br. spp.) and *Plasmodiophorales* (Preece, *Mycologist* 16: 27, 2002). The gall midges (*Cecidomyiidae*) have mycophagous larvae implicated in the gall reaction (Harris, *in Williams* (Ed.), 1994: 201); some are only mycophagous and do not cause galls; **ambrosia-s** are caused by *Macrophoma* and anamorphs of *Botryosphaeria* (Bisset & Borkent, *in Pirozynski & Hawksworth* (Eds), 1988: 203).
- Lichens have been interpreted as galls induced by an alga in a fungus (Moreau & Moreau, *BSMF* 34: 84, 1918; see also cephalodium) but there are significant differences (Hawksworth & Honegger, *in Williams* (Ed.), 1994: 77); **-s on lichens**, may be caused by some lichenicolous fungi (e.g. *Biatoropsis*, *Plec-*

- tocarpon*, *Polycoccum*, *Thamnogalla*), nematodes (Siddiqi & Hawksworth, *Lichenologist* 14: 175, 1982), mites (Gerson & Seaward, in Seaward (Ed.), *Lichen ecology*: 69, 1977), or be of unknown origin (Grumann, *Bot. Jb.* 80: 101, 1960).
- See Mani (*Ecology of plant galls*, 1964), Redfern & Shirley (*British plant galls*, 2002), Williams (Ed.) (*Plant galls: organisms, interactions, populations*, 1994), Coevolution.
- Gallacea** Lloyd (1905), Gallaceaceae. 6, Australia; New Zealand. See Trappe & Claridge (*Australasian Mycologist* 22: 27, 2003).
- Gallaceaceae** Locq. ex P.M. Kirk (2008), Hysterangiales. 2 gen., 9 spp.
- Gallaicolichen** Sérus. & Lücking (2007), Pezizomycotina (L). 1, Australasia; Hawaii. See Sérusiaux & Lücking (*Bibliotheca Lichenol.* 95: 509, 2007).
- Gallowaya** Arthur (1906), Coleosporiaceae. 3 (on *Pinus* (0, III, microcyclic) (*Pinaceae*)), N. America; Siberia. *G. crowellii* on *Pinus*. See Dodge (*J. Agric. Res.* 31: 641, 1925; morphology), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983; syn. of *Coleosporium*).
- Galorrhoeus** (Fr.) Fr. (1825) [non *Galorrhoeus* Haw. 1812, *Euphorbiaceae*] = *Lactarius*.
- Galzinia** Bourdot (1922), Corticiaceae. 9, widespread. See Rogers (*Mycol.* 36: 70, 1944), Olive (*Mycol.* 46: 794, 1954), Boidin & Gilles (*BSMF* 110: 185, 1994; key).
- Galziniella** Parmasto (1968) = *Sistotrema* Fr. fide Eriksson *et al.* (*Cortic. N. Europ.* 7, 1984).
- Gambleola** Masee (1898), Pucciniosiraceae. 1 (on *Berberis* (*Berberidaceae*)), India; Nepal. Sometimes included in *Pucciniosira*. See Buriticá (*Rev. Acad. Colomb. Cienc.* 18 no. 69: 131, 1991; as syn. of *Pucciniosira*).
- gametangium** (pl. -ia) (gametange), cell containing gametes or gametic nuclei; the gametangium may initially be diploid and is the site of meiosis, or haploid. See zygangium.
- gamete**, naked uninucleate haploid cell with the sole function of fusing with another gamete to produce a zygote; sometimes used for the sex-nuclei of coenogametes.
- gametogenesis**, the development of gametes.
- gametophyte**, a haploid or sexual plant; haplont or haplophase. Cf. sporophyte.
- gametothallus**, a thallus producing gametes; cf. sporothallus.
- gamma particle**, a DNA-containing cytoplasmic organelle in the zoospore of *Blastocladiella emersonii* (Myers & Cantino, *The gamma particle*, 1974; Barstow & Lovett, *Mycol.* 67: 518, 1975).
- Gamolpidium** Vlădescu (1892), ? Chytridiales. 2, Rumania.
- Gamonaemella** Fairm. (1922) = *Gamosporella* fide Clements & Shear (*Gen. Fung.*, 1931), Sutton (*Mycol. Pap.* 141, 1977).
- Gamosphaera** Dumort. (1822) = *Nemania*.
- Gamosporella** Sacc. (1885) ? = *Wiesneriomyces* fide Sutton (*Mycol. Pap.* 141, 1977).
- Gamosporella** Speg. (1888) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Gampsonema** Nag Raj (1975), anamorphic *Pezizomycotina*, St. = eH.10. 1, widespread. See Nag Raj (*CJB* 53: 1621, 1975).
- Gamsia** M. Morelet (1969), anamorphic *Pezizomycotina*, Hso.0eP.19. 2, widespread. See Morelet (*Annales de la Société des Sciences Naturelles et d'Archéologie de Toulon et du Var* 21: 105, 1969).
- Gamsiella** (R.K. Benj.) Benny & M. Blackw. (2004), Mortierellaceae. 1, USA. See Benny & Blackwell (*Mycol.* 96: 147, 2004), White *et al.* (*Mycol.* 98: 872, 2006; phylogeny).
- Gamsylella** M. Scholler, Hagedorn & A. Rubner (1999), anamorphic *Orbiliaceae*, Hso.???. 6, widespread. See Scholler *et al.* (*Sydowia* 51: 108, 1999), Li *et al.* (*Mycol.* 97: 1034, 2005; phylogeny, synonymy with *Dactylellina*).
- Gamundia** Raithelh. (1979), Tricholomataceae. 6, Europe; S. America (temperate). See Raithelhuber (*Metrodiana* 8: 34, 1979), Antonín (*Persoonia* 18: 341, 2004; type studies European spp.), Antonín (*Mycol. Listy* 90-91: 20, 2004; key European spp.), Antonín & Noordeloos (*A monograph of the genera Hemimycena*, □, 2004).
- gangliform**, having knots; knotted.
- Gangliophora** Subram. (1992), anamorphic *Pezizomycotina*, Hso. = eP.19. 1, Taiwan. See Subramanian (*Proc. Indian natn Sci. Acad. Part B. Biol. Sci.* 58: 188, 1992).
- Gangliophragma** Subram. (1978) = *Dactylella* fide Subramanian (*Kavaka* 5: 94, 1977), Rubner (*Stud. Mycol.* 39, 1996).
- gangliospore**, Subramanian's (*Curr. Sci.* 31: 410, 1962) term for aleuriospore in the sense of 'holoblastic conidium'.
- Gangliostilbe** Subram. & Vittal (1976), anamorphic *Pezizomycotina*, Hsy. = eP.1. 2, pantropical. See Subramanian & Vittal (*Kavaka* 3: 70, 1975), Petrini (*Sydowia* 37: 238, 1984; Ethiopia), Subramanian & Bhat (*Kavaka* 15: 41, 1987; India), Mercado-Sierra *et al.* (*Nova Hedwigia* 64: 455, 1997; Costa Rica).
- Ganoderma** P. Karst. (1881), Ganodermataceae. Anamorph *Thermophymatospora*. c. 80, widespread (esp. tropical). *G. applanatum* (wood decay); *G. lucidum* (wood decay); *G. philippii* (syn. *G. pseudoferreum*; root rot of cacao, coffee, rubber, tea, etc.); *G. orbiformum* (syn. *G. boninense*; root rot of palms). See Moncalvo & Ryvarden (*Syn. Fung.* 11: 114 pp., 1997), Ryvarden (*Mycol.* 92: 180, 2000), Hong & Jung (*Mycol.* 96: 742, 2004; phylogeny).
- Ganodermataceae** Donk (1948), Polyporales. 4 gen. (+ 9 syn.), 117 spp.
- Lit.*: Steyaert (*Persoonia* 7: 55, 1972; SE Asian spp.), Steyaert (*Bull. Jard. Bot. Nat. Belg.* 50: 135, 1980; subgen. classif.), Zhao (*Bibliotheca Mycol.* 132: 176 pp., 1989), Moncalvo *et al.* (*Ganoderma: Systematics, Phytopathology and Pharmacology* Proceedings of Contributed Symposium 59A, B, 5th International Mycological Congress, Vancouver, August 14-21, 1994: 31, 1995), Moncalvo *et al.* (*MR* 99: 1489, 1995), Moncalvo *et al.* (*Mycol.* 87: 223, 1995), Moncalvo & Ryvarden (*Syn. Fung.* 11: 114 pp., 1997), Gottlieb *et al.* (*MR* 104: 1033, 2000), Miller *et al.* (*Ganoderma Diseases of Perennial Crops*: 159, 2000), Moncalvo (*Ganoderma Diseases of Perennial Crops*: 23, 2000), Pilotti *et al.* (*Ganoderma Diseases of Perennial Crops*: 195, 2000), Kim & Jung (*Mycobiology* 29: 73, 2001), Smith & Sivasithamparam (*Aust. Syst. Bot.* 16: 487, 2003), Hong & Jung (*Mycol.* 96: 742, 2004), Ryvarden (*Syn. Fung.* 18: 57, 2004), Wang & Yao (*Can. J. Microbiol.* 51: 113, 2005).
- Ganodermatales** = Polyporales.
- Ganodermites** A. Fleischm., M. Krings, H. Mayr & R.

Agerer (2007), Fossil Fungi, Ganodermataceae. 1.

Garethjonesia K.D. Hyde (1992), Sordariomycetidae. 1 (aquatic), Australia. See Hyde (*Aust. Syst. Bot.* 5: 407, 1992).

gari, a fermentation product of manioc, bacteria and *Geotrichum candidum* in west Africa.

Garnaudia Borowska (1977), anamorphic *Pezizomycotina*, Hso.1eP.1. 2, Cuba; Poland. See Borowska (*Acta Mycologica Warszawa* 13: 169, 1977).

Garovaglia Trevis. (1853) = *Polychidium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Garovagliana Trevis. (1880) = *Garovaglia*.

Gasparrinia Tornab. (1848) [non *Gasparinia* Bertol. 1839, *Umbelliferae*] nom. rej. = *Caloplaca* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Kärnefelt (*Cryptog. Bryol.-Lichénol.* 19: 93, 1998).

Gassicurtia Fée (1824) nom. rej., Caliciaceae (L). 1, mostly neotropical. See Aptroot (*Taxon* 36: 474, 1987; nomencl., synonymy with *Buellia*), Kalb & Elix (*Mycotaxon* 68: 465, 1998; chemistry), Marbach (*Bibliotheca Lichenol.* 74, 2000).

Gasterella Zeller & L.B. Walker (1935), Gasterellaceae. 1, USA.

Gasterellaceae Zeller (1948), Boletales. 1 gen., 1 spp.
Lit.: Zeller & Walker (*Mycol.* 27: 573, 1935), Zeller (*Mycol.* 40: 639, 1948).

Gasterellopsis Routien (1940), Agaricaceae. 1, USA.

Gasteroagaricoides D.A. Reid (1986), Psathyrellaceae. 1, Australasia. See Reid (*TBMS* 86: 431, 1986).

gasteroconidium, see gasterospore.

Gasterohymeniales. See *Hymenogastrales* and *Podaxales*.

gasteroid, of a form resembling a member of the gasteromycetes (q.v.); specifically, a fruit body enclosing the hymenium.

Gasteromycetes. Morphological category of *Basidiomycota*, traditionally based on homobasidiomycetes that do not actively discharge their spores (statismospores). The polyphyletic nature of the group has for a long time been known. Epigeous and hypogeous gasteromycetes occur in 4 of the 8 clades of the homobasidiomycetes recognized by Hibbett & Thorn (*The Mycota* 7B, 2001). Gasteromycetes have been regarded as conspecific (*Gastrosuillus laricinus*), congeneric (*Hydnangium*, *Podohydnum*), confamilial (*Chamonixia*, *Arcangeliella*) or conordinal (*Sclerodermataceae*, *Lycoperdaceae*) with taxa in the other *Basidiomycota*, while affinities of some groups have not yet been established; for recent information see under these taxa. Integration of gasteromycetes in a natural system of *Basidiomycota* inevitably leads to a taxonomic reduction of many higher taxa; these new placements are not yet universally accepted, particularly at the generic level.

The single-celled basidium (q.v.) is generally 4-spored but the basidiospores are not forcibly discharged and sterigmata may be absent. The basidia and basidiospores mature within the basidioma, which typically has a peridium (sometimes multi-layered) covering a ± fleshy mycelial tissue ('gleba') in which the basidia are borne, eventually lining hymenial cavities. The gleba is frequently crossed by a columella and/or veins. After the decay of the gleba, the columella and capillitium (q.v.) may facilitate spore dispersal.

Gasteromycetes are mainly terrestrial and epigeous or hypogeous, partly saprobic and partly ectomy-

corrhizal; they are cosmopolitan, occurring especially in warm, dry areas.

Lit.: **General**: Reijnders (*MR* 104: 900, 2000; morphogenesis), Heim (*Evolution of the higher Basidiomycetes*, 505, 1971), Singer (*Agaricales mod. taxon.*, 4th ed., 1986), Dring (*in* Ainsworth *et al.* (Eds), *The Fungi* 4B: 421, 1973; keys orders, fams., gen.), Fischer (*Nat. Pflanzenfam.* edn 2, 7A, 1933; unless otherwise stated, synonymies follow this work), Ponce de Léon (*in* Parker, 1982, 1: 256), Zeller (*Mycol.* 40: 639, 1948; 41: 36, 1949; keys orders, fams., gen.), Miller & Miller (*Gasteromycetes. Morphological and developmental features*, 1988).

Regional: **Africa**, South, Bottomley (*Bothalia* 4: 473, 1948; keys), East, Demoulin & Dring (*Bull. Jard. bot. Belg.* 45: 339, 1975), West, Dring (*Mycol. Pap.* 98, 1964; keys). **Canary Islands**, Beltrán Tejera & Wildpret (*Vieraea* 7: 49, 1977). **China**, Liu Bo (*The Gasteromycetes of China* [Beih. Nova Hedw. 76], 1984). **Congo**, Dissing & Lange (*Fl. Icon. Champ. Congo* 12-13, 1963-64; keys). **Zaire**, Dissing & Lange (*Bull. Jard. bot. Etat. Brux.* 32: 325, 1962). **America**, North, Burk (*A bibliography of North American gasteromycetes. I Phallales*, 1980), Coker & Couch (*The gasteromycetes of the eastern United States and Canada*, 1928 [reprint 1968]), Smith (*Puffballs and their allies in Michigan*, 1951); **South**, Wright (*Holmbergia* 5: 45, 1956; key), Fries (*Ark. Bot.* 8 (11), 1909). **Argentina**, Wright (*Lilloa* 21: 191, 1949). **Brazil**, Homrich (*Rev. Mycol.* 34: 3, 1969; Rio Grande do Sul). **Mexico**, Herrera (*An. Inst. Biol. Univ. Mex.* 35: 9, 1965; keys), Guzmán & Herrera (*An. Inst. Biol. Univ. nat. autón. Mex., Bot.* 40, 1969). **Uruguay**, Lohwag & Swoboda (*Rev. Sudam. Bot.* 7: 1, 1942). **West Indies**, Dennis (*Kew Bull.* 1953: 307), Reid (*Kew Bull.* 31: 657, 1977). **Asia**, Iran, Saber (*Iran. J. Plant Pathol.* 22: 25, 1986). **Israel**, Dring & Rayss (*Israel J. Bot.* 12: 147, 1964). **Middle East**, Eckblad (*Nytt Mag. Bot.* 17: 129, 1970; *Iranian J. Bot.* 1: 65, 1976). **Mongolia**, Kreisel (*Feddes Rep.* 86: 321, 1975), Dörfelt & Bumžaa (*Nova Hedw.* 43: 87, 1986). **Nepal**, Kreisel (*Khumbu Himal.* 6: 25, 1969; *Feddes Rep.* 87: 83, 1976). **Pakistan**, Ahmad (*Publ. Dept. Bot. Univ. Punjab* 11, 1952). **Surinam**, Fischer (*Ann. Myc.* 31: 113, 1933). **Thailand**, Ellingsen (*Nordic J. Bot.* 2: 283, 1982), Phanichapol (*Thai For. Bull.* 16: 233, 1986). **Former USSR**, Sosin (*Opredelitel' Gasteromitsetov SSSR*, 1973), Järva (*Folia crypt. Eston.* 2: 15, 1973; Estonia), Shvartsman & Filimonova (*Fl. Spor. Rast. Kazakhstana* 6, 1970; Kazakhstan). **Australasia**, Cunningham (*The Gasteromycetes of Australia and New Zealand*, 1944 [reprint 1979]). **Europe**, **Belgium**, Demoulin (*Les gasteromycètes Belgique*, edn 2, 1975; *Bull. Jard. Bot. nat. Belg.* 38: 1, 1968). **British Isles**, Palmer (*Nova Hedw.* 25: 65, 1968; bibliogr.), Demoulin & Marriott (*Bull. BMS* 15: 37, 1981; key), Pegler *et al.* (*Puffballs, Earthstars & Stinkhorns*, 1995). **Former Czechoslovakia**, Pilát (Ed.) (*Fl. CSR B* 1, *Gasteromycetes*, 1958). **Germany**, Gross *et al.* (*Beih. Z. Mykol.* 2, 1980). **Greenland**, Lange (*Meddr Grønland* 147(4), 1948). **Hungary**, Hollós (*Die Gasteromyceten Ungarns*, 1904). **Italy**, Petri (*Fl. Ital. Crypt.* 1(5), 1909). **Netherlands**, Mass Geesteranus (*Coolia* 15: 49, 1971). **Norway**, Eckblad (*Nytt Mag. Bot.* 4: 19, 1955; *As-tarte* 4: 7, 1971, Finland). **Portugal**, Almeida (*Port. Acta Biol. B* 11: 205, 1972). **Spain**, Calonge & De-

- moulin (*BSMF* 91: 247, 1975). See also *Lit.* under Macromycetes.
- gasterospore (gasteroconidium)**, a thick-walled, globose, chlamydospore of *Ganoderma*; probably apomictic (see Bose, *Mycol.* 25: 432, 1933; Sydowia, *Beih.* 1: 176, 1957).
- Gastroboletaceae** Singer (1962) = Boletaceae.
- Gastroboletus** Lohwag (1926), Boletaceae. 13, widespread (temperate). See Thiers (*Mem. N. Y. bot. Gdn* 49: 355, 1989), Nouhra *et al.* (*Mycotaxon* 83: 409, 2002; key).
- Gastrocybe** Watling (1968) = *Galeropsis* fide Moreno *et al.* (*Mycotaxon* 36: 63, 1989).
- Gastrolactarius** R. Heim ex J.M. Vidal (2005) = *Lactarius* fide Kuyper (*in litt.*).
- Gastroleccinum** Thiers (1989), Boletaceae. 1, N. America. See Thiers (*Mem. N. Y. bot. Gdn* 49: 357, 1989).
- Gastromyces** R. Ludw. (1861), Fossil Fungi ? Agaricomycetes. 1 (Carboniferous), former USSR.
- Gastropila** Homrich & J.E. Wright (1973), Agaricaceae. 4, America. See Demoulin (*in litt.*; ? = *Calvatia*), Ponce de Leon (*Phytologia* 33: 455, 1976).
- Gastrosporiaceae** Pilát (1934), Phallales. 1 gen. (+ 1 syn.), 2 spp.
Lit.: Zeller (*Mycol.* 40: 639, 1948), Domínguez de Toledo & Castellano (*Mycotaxon* 64: 443, 1997), Iosifidou & Agerer (*Feddes Repert.* 113: 11, 2002), Kreisel & Hausknecht (*Öst. Z. Pilzk.* 11: 191, 2002).
- Gastrosporium** Mattir. (1903), Gastrosporiaceae. 2, widespread. See Monthoux & Röllin (*Candollea* 31: 119, 1976), Iosifidou & Agerer (*Feddes Repert.* 113: 11, 2002; systematic position).
- Gastrosuillus** Thiers (1989) = *Suillus* Gray. Gastroid form recently derived from *Suillus*. fide Baura *et al.* (*Mycol.* 84: 592, 1992; recently derived from *Suillus grevillei*), Kretzer & Bruns (*Mycol.* 89: 586, 1997).
- Gastrotylopilus** T.H. Li & Watling (1999) = *Fistulinella* fide Trappe *et al.* (*Muelleria* 18: 75, 2003).
- Gaubaea** Petr. (1942), anamorphic *Pezizomycotina*, St.0eP.19. 2, central Asia.
- Gäumann** (Ernest Albert; 1893-1963; Switzerland). PhD, Bern (1917); Botanist, Agricultural Experiment Station, Zürich-Oerlikon (1922-1927); Professor of botany, Institut für Spezielle Botanik, Eidgenössische Technische Hochschule, Zürich (1927-1963). Carried out outstanding and extensive research in plant pathology (including antibiotics, defence reactions, immunity and resistance), rust biology and taxonomy of downy mildews. Editor-in-chief, *Phytopathologische Zeitschrift* (1937-1963). *Publs. Vergleichende Morphologie der Pilze* (1926); *Die Pilze* (1949, 1964); *Pflanzliche Infektionslehre* (1946, 1951); *Die Rostpilze Mitteleuropas* (1959). *Biogs, obits etc.* *Arx* (*Netherlands Journal of Plant Pathology* 70: 99, 1964); Gardner & Kern (*Mycol.* 57: 1, 1965) [portrait]; Brown (*Annals of Applied Biology* 53: 297, 1964); Landholt (*Verhandlungen der Schweizerischen Naturforschenden Gesellschaft* 1963: 194) [bibliography, portrait]; Minkiaivicius ([*Mikologiya i Fitopatologiya*] 3: 393, 1969, portrait [in Russian]); Stafleu & Cowan (*TL-2* 1: 903, 1976); Zobrist *et al.* (*Herrn Professor Dr. Ernst Gäumann zum siebzigsten Geburtstag*, 1963).
- Gausapia** Fr. (1825) nom. rej. = *Septobasidium* fide Berndt (*in litt.*).
- Gauthieromyces** Lichtw. (1983), Legeriomycetaceae. 3 (in *Ephemeroptera*), China; France; India; Mexico. See Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986), Strongman & Xu (*Mycol.* 98: 479, 2006; China), Valle *et al.* (*Mycol.* 100: 149, 2008; Mexico).
- Gautieria** Vittad. (1831) nom. cons., Gomphaceae. 25, widespread. See Rauschert (*Hercynia* N.F. 12: 217, 1975), Beaton *et al.* (*Kew Bull.* 40: 193, 1985; key Austral. spp.).
- Gautieriaceae** Zeller (1948) = Gomphaceae.
- Gautieriales** = Gomphales.
- GC, ratio; GC content**; see base ratio, molecular biology.
- Geaster** P. Micheli ex Fr. (1829) = *Geastrum* fide Demoulin (*Taxon* 36: 498, 1984).
- Geasterites** Pia (1927), Fossil Fungi. 1 (Miocene), USA. But see Tiffney (*TBMS* 76: 493, 1981).
- Geasteroides** Long (1917), Geastraceae. 1, USA. See Long (*Mycol.* 37: 601, 1945).
- Geasteropsis** Hollós (1903) = *Geastrum* fide Ponce de Leon (*Fieldiana, Bot.* 31: 311, 1968).
- Geastraceae** Corda (1842), Geastrales. 7 gen. (+ 13 syn.), 64 spp.
Lit.: Ponce de Leon (*Fieldiana, Bot.* 31: 303, 1968; world monogr., broad spp. concept), Ingold (*TBMS* 58: 179, 1972), Boiffard (*Docums Mycol.* 6 no. 24: 1, 1976; France), Dörfelt (*Die Erdsteine Geastraceae und Asteraceae*: 385 pp., 1985; centr. Eur.), Miller & Miller (*Gasteromycetes. Morphological and Development Features with Keys to the Orders, Families, and Genera*: 157 pp., 1988), Sunhede (*Geastraceae (Basidiomycotina) [Synopsis Fungorum 1]*, 1989; monogr. esp. N. Eur.), Domínguez & Castellano (*Mycol.* 88: 863, 1996), Hibbett *et al.* (*Proc. natn Acad. Sci. U.S.A.* 94: 12002, 1996), Coetzee *et al.* (*Bothalia* 27: 117, 1997), Calonge (*Fl. Mycol. Iberica* 3: 271 pp., 1998), Krüger *et al.* (*Mycol.* 93: 947, 2001), Binder & Bresinsky (*Mycol.* 94: 85, 2002), Hibbett & Binder (*Proc. R. Soc. Lond. B. Biol. Sci.* 269: 1963, 2002), Kreisel & Hausknecht (*Öst. Z. Pilzk.* 11: 191, 2002), Baseia *et al.* (*Mycotaxon* 85: 409, 2003), Esqueda *et al.* (*Mycotaxon* 87: 445, 2003), Estrada-Torres *et al.* (*Mycol.* 97: 139, 2005), Geml *et al.* (*Mol. Phylogen. Evol.* 35: 313, 2005), Geml *et al.* (*Mycol.* 97: 680, 2005).
- Geastrales** K. Hosaka & Castellano (2007). Phallomycetidae. 1 fam., 7 gen., 64 spp. Fam.:
- Geastraceae**
For *Lit.* see under fam.
- Geastrum** Pers. (1794), Geastraceae. c. 50, widespread. The earth stars. See Sunhede (*Syn. Fung.* 1, 1990), Zhou & Yan (*Mycosystema* 21: 485, 2002; China).
- Geastrumia** Bat. (1960), anamorphic *Pezizomycotina*, Ccu.1bH.1. 1, widespread. See Pirozynski (*Mycol.* 63: 897, 1971), Williamson & Sutton (*Pl. Dis.* 84: 714, 2000).
- Geisleria** Nitschke (1861) = *Strigula* fide Ernst (*Herzogia* 9: 321, 1993), Roux *et al.* (*Biblthca Lichenol.* 90: 96 pp., 2004).
- Geisleriomycetes** Cif. & Tomas. (1953) = *Geisleria*.
- Geissodea** Vent. (1799) = *Cetraria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- gel tissue**, a mixture of gel and hyphae found in members of the *Leotiales* and *Tremellales*; the gel may arise either by direct secretion or by disintegration of hyphae: see Moore (*Mycol.* 57: 114, 1965; *Am. J. Bot.* 52: 389, 1965, ontogenesis; *Stain Technol.* 40: 23, 1965, staining). Cf. gliatope.

- Gelasinospora** Dowding (1933), Sordariaceae. 24 (from dung, soil etc.), widespread. Placed into synonymy with *Neurospora* by some authors. See Cailleux (*BSMF* 87: 536, 1972; key), von Arx (*Persoonia* 11: 443, 1982; key), Khan & Krug (*Mycol.* 81: 226, 1989), Beatty *et al.* (*MR* 98: 1309, 1994; genetics), Stchigel *et al.* (*MR* 102: 1405, 1998; Argentina), Dettman *et al.* (*Fungal Genetics Biol.* 34: 49, 2001; phylogeny), García *et al.* (*MR* 108: 1119, 2004; phylogeny, synonymy with *Neurospora*), Miller & Huhndorf (*Mol. Phylogen. Evol.* 35: 60, 2005; phylogeny, anatomy), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Gelasinosporites** P. Briot, Lar.-Coll. & Locq. (1983), Fossil Fungi. 1, Australia.
- gelatin**, product obtained by boiling collagen, soluble in water above c. 40°C. Gels of c. 4-12% used to test ability of some microorganisms to liquefy or hydrolyse gelatin.
- Gelatina** Raf. (1806) = *Tremella* Pers. fide Merrill (*Index Rafinesq.*: 68, 1949).
- Gelatinaria** Flörke ex Wallr. (1831) nom. inval. ? = *Nostoc* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Gelatinaria** Raf. (1815) nom. dub., Fungi. No spp. included.
- Gelatinipulvinella** Hosoya & Y. Otani (1995), Leotiaceae. Anamorph *Aureohyphozyma*. 1, Japan. Perhaps better placed in the *Leotiaceae*, but both apothecial anatomy and ascus apex are atypical of this family.
- Gelatinocrinis** Matsush. (1995), anamorphic *Pezizomycotina*, Hsp.0eH.15. 1, Japan. See Matsushima (*Matsush. Mycol. Mem.* 8: 20, 1995).
- Gelatinodiscaceae** S.E. Carp. (1976) = *Leotiaceae*.
- Gelatinodiscus** Kanouse & A.H. Sm. (1940), Helotiaceae. 1, USA. See Carpenter (*Mycotaxon* 3: 209, 1976).
- Gelatinopsis** Rambold & Triebel (1990), Helotiaceae. 2 (on lichens and other fungi), Europe; N. America. Perhaps better placed in the *Leotiaceae*. See Rambold & Triebel (*Notes R. bot. Gdn Edinb.* 46: 375, 1990), Aptroot *et al.* (*Nova Hedwigia* 64: 155, 1997; France), Etayo *et al.* (*Lichenologist* 33: 473, 2001; Spain).
- Gelatinopycnis** Dyko & B. Sutton (1979), anamorphic *Pezizomycotina*, St.0fH.15. 1, Germany. See Dyko & Sutton (*CJB* 57: 375, 1979).
- Gelatinosporis** Clem. & Shear (1931) ≡ *Gelatinosporium*.
- Gelatinosporium** Peck (1873), anamorphic *Durandiella*, St.1eH.15. 1, USA. See DiCosmo (*CJB* 56: 1665, 1978), Verkley (*Nova Hedwigia* 75: 433, 2002).
- gelatinous**, jelly-like; used for the hyphae of tissues which become partly dissolved and glutinous with moisture.
- Gelatoporia** Niemelä (1985), Meruliaceae. 3, widespread (north temperate). See Niemelä (*Karstenia* 25: 22, 1985), Spirin & Zmitrovich (*Karstenia* 43: 67, 2003; Russia).
- Gelatosphaera** Bat. & H. Maia (1959) = *Rhizosphaera* fide Sutton (*Mycol. Pap.* 141, 1977).
- Geleenites** Dijkstra (1949), Fossil Fungi. 1 (Cretaceous), Canada; Netherlands. See Jansonius *et al.* (*Pollen et Spores* 23: 557, 1981; ? = *Ascotricha* (Xylar.)).
- Gelidium** J.V. Lamour. (1813), Algae. Algae.
- Gelimycetes**. Class within the *Orthomycotina* (q.v.) including *Auriculariales* p.p., *Dacrymycetales*, *Tremellales* p.p. and *Tulasnellales* (Cavalier-Smith in Rayner *et al.* (Eds), *Evolutionary biology of the fungi*: 339, 1987).
- Gelineostroma** H.J. Swart (1988), Rhytismatales. 2 (on *Arthrotaxis*), Australia. See Swart (*TBMS* 90: 445, 1988), Johnston (*Aust. Syst. Bot.* 5: 507, 1992), Johnston (*Aust. Syst. Bot.* 14: 377, 2001).
- Gelona** Adans. (1763) nom. rej. = *Pleurotus* fide Donk (*Beih. Nova Hedwigia* 5, 1962).
- Gelopellaceae** Zeller (1939) = *Claustulaceae*.
- Gelopellis** Zeller (1939), *Claustulaceae*. 6, S. America; Japan; Australia. See Homrich (*Revue Mycol. Paris* 34: 6, 1969), Beaton & Malajczuk (*TBMS*: 478, 1986; Australia).
- Geltingia** Alstrup & D. Hawksw. (1990), *Odontotremataceae*. 2 (on lichens), widespread (esp. Arctic). See Rambold & Triebel (*Notes R. bot. Gdn Edinb.* 46: 375, 1990), Diederich & Etayo (*Lichenologist* 32: 423, 2000).
- Geminaginaceae** Vánky (2001), *Ustilaginales*. 1 gen., 1 spp.
Lit.: Vánky (*Mycoscience* 37: 173, 1996), Piepenbring *et al.* (*Protoplasma* 204: 202, 1998), Vánky (*MR* 102: 513, 1998), Vánky (*Fungal Diversity* 6: 131, 2001).
- Geminago** Vánky & R. Bauer (1996), *Geminaginaceae*. 1 (on *Sterculiaceae*), Africa (tropical). See Vánky & Vánky (*Lidia* 5: 157, 2002; southern Africa).
- Geminella** J. Schröt. (1870) [non *Geminella* Turpin 1828, *Algae*] = *Schroeteria* fide Vánky (*in litt.*).
- Geminispora** Pat. (1893), ? *Phyllachoraceae*. 2 (on *Leguminosae*), Africa; S. America. See Cannon (*Mycol. Pap.* 163, 1991).
- Geminoarcus** K. Ando (1993), anamorphic *Pezizomycotina*. 2, Japan. See Ando (*TMSJ* 34: 110, 1993).
- gemma** (pl. -ae), (1) an asexual propagule borne singly or in chains at the ends of hyphae, referred to in older literature as a chlamydospore (*Saprolegniaceae*); (2) another term for oidia in *Agaricomycotina* (Gäumann, *The Fungi*: 449, 1928), rejected for this usage by Kendrick & Watling (*in* Kendrick (Ed.), *The whole fungus* 2: 477, 1979).
- Gemmamyces** Casagr. (1969) = *Cucurbitaria* fide Petrak (*Sydowia* 23: 265, 1970), Yuan & Wang (*Mycotaxon* 53: 371, 1995; accepted genus).
- Gemmaspora** D. Hawksw. & Halici (2007), *Verrucariales*. 1 (lichenicolous), Middle East. See Hawksworth & Halici (*Lichenologist* 39: 121, 2007).
- Gemmina** Raitv. (2004), *Hyaloscyphaceae*. 1, Europe. See Raitviir (*Scripta Mycologica Tartu* 20: 44, 2004).
- Gemmophora** Schkorb. (1912) nom. dub., anamorphic *Pezizomycotina*. Probably based on chlamydospores and sterile mycelium.
- Gemmularia** Raf. ex Steud. (1824) ≡ *Pachyma* fide Donk (*Taxon* 11: 85, 1962).
- Gemmulina** Descals & Marvanová (1999), anamorphic *Pezizomycotina*, Hso.?.?. 1 (aquatic), British Isles. See Descals *et al.* (*CJB* 76: 1657, 1998).
- Genabea** Tul. & C. Tul. (1844), *Pyronemataceae*. 1 (hypogeous, mycorrhizal), Europe; N. America. See Zhang (*MR* 95: 986, 1991), Pegler *et al.* (*British truffles*, 1993), Smith *et al.* (*Mycol.* 98: 699, 2006; phylogeny, ecology), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- gene probes**, see Molecular biology: DNA fingerprint-

ing.

Genea Vittad. (1831), Pyronemataceae. c. 32 (hypogeous, mycorrhizal), N. America; Europe. See Pfister (*Mycol.* 76: 170, 1984; posn), Lazzara & Montecchi (*Revista Micol.* 34: 44, 1991; 5 spp., Italy), Zhang (*MR* 95: 986, 1991; concept, key 3 spp. China), Zhang (*SA* 11: 31, 1992; nuclei), Pegler *et al.* (*British truffles*, 1993), Li & Kimbrough (*Int. J. Pl. Sci.* 155: 235, 1994; ultrastr.), Gross (*Z. Mykol.* 62: 176, 1996), Moreno-Arroyo *et al.* (*Boll. Gruppo Micol. 'G. Bresadola'* 44: 31, 2001; Spain), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Smith *et al.* (*Mycol.* 98: 699, 2006; phylogeny, ecology), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny), Erős-Honti *et al.* (*Mycorrhiza* 18: 133, 2008; mycorrhizas, Hungary).

Geneaceae Trappe (1979) = Pyronemataceae.

gene-for-gene (in host-parasite relationships), the correspondence for each gene determining resistance in the host of a specific and related gene determining virulence in the pathogen; first described by Flor in 1955 for *Melampsora lini* on flax (*Linum usitatissimum*), which has 29 resistance genes each of which the pathogen has avirulent counterparts (Lawrence *et al.*, *Phytopath.* 71: 12, 1981). See Person (*CJB* 37: 1101, 1959), Person *et al.* (*Nature* 194: 561, 1962), Flor (*Ann. Rev. Phytopath.* 9: 275, 1971), Parlevliet (*in* Pirozynski & Hawksworth (Eds), 1988: 19), Co-evolution.

Geneosperma Rifai (1968) = *Scutellinia* fide Korf & Zhuang (*Acta Mycol. Sin.* Suppl. 1: 90, 1986; 2 spp.), Moravec (*Mycotaxon* 58: 233, 1996), Moravec (*Czech Mycol.* 50: 85, 1997), Wang (*Bull. natn. Mus. Nat. Sci.* Taiwan 11: 119, 1998; Taiwan).

genera, see genus.

generative hyphae, see hyphal analysis.

genestasis, inhibition of sporulation; **genistat**, a substance preventing or reducing sporulation in fungi without materially affecting vegetative growth; 'anti-sporulator' (Horsfall, 1947); cf. fungistatic.

Genetic engineering. The insertion or removal of inheritable genetic material from an organism so that its properties are transformed. The topic has a political dimension. Genetic engineering has been used to increase pathogenicity of nematophagous fungi (Ahman *et al.*, *Appl. and environmental microbiol.* 68: 3408, 2002), to alter *Laccaria bicolor* for use as a biocontrol agent (Bills *et al.* (*Mycol.* 91: 237, 1999). Genes from fungi can also be inserted into plasmid genomes and expressed through *Escherichia coli* or *Saccharomyces cerevisiae*. Genetic engineering of plants to enhance their resistance to fungal diseases is also possible (e.g. transferring genes resistant to *Phytophthora infestans* from *Solanum bulbocastaneum* to *S. tuberosum*, see Song *et al.*, *Proc. nat. acad. sci.* 100: 9128, 2003). See Bennett & Lasure (Eds) (*Gene manipulations in fungi*, 1985; *More gene manipulation in fungi*, 1991), Fincham (*Microbiol. Rev.* 53: 148, 1989; review), Kinghorn & Turner (Eds) (*Applied molecular genetics of filamentous fungi*, 1992), Timberlake & Marshall (*Science* 244: 1313, 1989), Biotechnology.

Genetic resource collections. Genetic resource collections which include fungal cultures are catalogued in Takishima *et al.* (Eds) (*Guide to World Data Center on Microorganisms with a list of culture collections worldwide*, 1989), and Sugawara *et al.* (Eds) (*World directory of collections of cultures of microorgan-*

isms, edn 4, 1993). In 2008, these collections were maintaining some 476,299 fungal strains representing around 25,085 species or subspecies (<http://wdcm.nig.ac.jp/statistics.html>). Collections are given standard acronyms or abbreviations by the World Data Center, and a selection of those for the larger collections are included in this edn of the *Dictionary*. See also Reference collections. The chief collections of fungal cultures by region are as follows. **Africa**. South Africa (Plant Protection Research Institute, Pretoria); **Asia**. China (University of Hong Kong Culture Collection, Hong Kong); Japan (Institute for Fermentation, Osaka); South Korea (Center for Fungal Genetic Resources, Seoul National University, Seoul). **Australasia**. Australia (Mycology Culture Collection, Women's and Children's Hospital, Adelaide; Plant Pathogen Culture Collection, Indooroopilly, Queensland); New Zealand (International Collection of Microorganisms from Plants, DSIR, Auckland). **Caribbean**. Cuba (INIFAT, Havana). **Europe**. Denmark (Culture Collection of Fungi, BioCentrum-DTU, Lyngby); France (Laboratoire de Cryptogamie, Muséum National d'Histoire Naturelle, Paris); Germany (Pilz-Referenz-Zentrum, Friedrich Schiller University, Jena); Italy (Industrial Yeasts Collection, Università di Perugia, Perugia) Netherlands (Centraalbureau voor Schimmelcultures, Baarn; Russia (All-Russian Collection of Microorganisms, Institute of Biochemistry and Physiology of Microorganisms, Pushchino, Moscow oblast'); Slovakia (Culture Collection of Yeasts, Institute of Chemistry, Bratislava); Sweden (Fungal Cultures, University of Goteborg, Goteborg; Culture Collection of Fungi, University of Uppsala, Uppsala); UK (CABI UK Centre, Egham [housing the collection of the former International Mycological institute and the holdings of the UK National Collection of Wood-Rotting Fungi and British Antarctic Survey]; the UK National Collection of Yeast Cultures, Norwich). **North America**. Canada (Canadian Collection of Fungal Cultures, Agriculture and Agri-Food Canada, Ottawa; University of Alberta Microfungus Collection, Edmonton, Alberta); USA (American Type Culture Collection, Washington, DC; ARS Collection of Entomopathogenic Fungi, Ithaca, NY; Pfaff Yeast Culture Collection, University of California, Davis, CA). **South America**. Brazil (Centro Especializado em Micologia Medica, Universidade Federal do Ceara, Ceara; Coleção de Culturas de Fungos, Instituto Oswaldo Cruz, Rio de Janeiro). See World Data Center for Microorganisms (<http://wdcm.nig.ac.jp>). See also Reference collections.

International collaboration is facilitated by the World Federation for Culture Collections which functions under the auspices of the IUBS and organises meetings of the International Congress of Culture Collections.

Culture maintenance is traditionally on slopes of appropriate media stored at laboratory or low temperature but now cryopreservation (see below) when applicable is the method of choice. Lyophilization (freeze-drying) of the fungus spore is an ideal method to facilitate distribution; this method is favoured by service collections (Smith *et al.* in Smith *et al.* Eds, 2001. *The UK National Culture Collection Biological Resource: Properties, maintenance and management*. pp 389. UK National Culture Collection, Egham). The properties of the fungus in culture may be unsta-

ble and subject to strain drift through loss of plasmids, spontaneous mutations or genetic recombination due to the presence of heterokaryons, the parasexual cycle or normal sexual events. Therefore conditions of storage should be selected that minimize the risk of such changes. Freezing and storage of fungi at ultra-low temperature such as in or above liquid nitrogen or in -140° to -150°C freezers appears to provide the ideal method. There are, however, several other methods that are used successfully. They range from continuous growth through methods that reduce rates of metabolism to the ideal situation where metabolism is halted, or to a level that for all practical purposes it can be treated as suspended. Microbial resource collections, large or small, set out to maintain organisms in a pure, viable and stable condition to make them available for future use. The method selected may depend upon the requirements of the use of the organism. These vary according to the numbers and range of fungi to be preserved and the facilities available. The cost of materials and labour involved and the desired level of stability and longevity required is also taken into consideration. Preservation methods that allow growth or metabolism can only be used for short-term storage, such methods are subculture, storage under a layer of mineral oil and storage in sterile water. Drying and freeze-drying techniques can be used for long-term storage of fungi but not all will survive. Storage in soil or in or above silica gel produce dry conditions that can allow the desiccated fungus to survive for 8 and up to 20 years. Freeze-drying, the removal of water, dehydration of fungi under reduced pressure by the sublimation of ice is a method widely used but generally only allows the fungus spore or other robust structures, such as sclerotia, to survive. The methods for the above preservation technique have been published widely.

Lit.: General, Hawksworth & Kirsop (Eds) (*Living resources for biotechnology: filamentous fungi*, 1988), Kirsop & Kurtzman (Eds) (*Living resources for biotechnology: yeasts*, 1988), Kirsop & Doyle (Eds) (*Maintenance of microorganisms and cultured cells: A manual of laboratory methods*, 1991), Smith & Onions (*The preservation and maintenance of living fungi*, edn 2, 1994), Ryan *et al.* (*World Journal of Microbiology & Biotechnology* 16: 183, 2000). Ryan & Smith (*MR* 108: 1351, 2004).

Cryopreservation by frozen storage, Gulya *et al.* (*MR* 97: 240, 1993), Holden & Smith (*MR* 96: 473, 1992), Ito (*Inst. Fermen. Osaka Res. Commun.* 15: 119, 1991), Morris *et al.* (*Cryobiology* 25: 471, 1988; *J. Gen. Microbiol.* 134: 2897, 1988), Pearson *et al.* (*Cryoletters* 11: 205, 1990), Roquebert & Bury (*Wrlld J. Myc. Res.* 9: 651, 1992), Smith (*in* Chang *et al.* (Eds), *Genetics and breeding of edible mushrooms*, 1993; *in* Jennings (Ed.), *Tolerance of fungi*, 1993), Hubalek (*Cryopreservation of microorganisms at ultra-low temperatures*, 1996).

Cryopreservation over liquid nitrogen, Smith (*in* Jennings (Ed.), *Tolerance of fungi*: 145, 1993).

Lyophilization (freeze drying), Ryan & Smith (*in* Day & Stacey (Eds), *Methods Molec. Biol.* 368: 127, 1995; protocols), Tan *et al.* (*Mycol.* 83: 654, 1991; *Mycol.* 86: 281, 1994), Smith (*World Journal of Microbiology & Biotechnology* 14: 49, 1998).

Mineral oil, Little & Gordon (*Mycol.* 59: 733, 1967; refs.), Fennell (*Bot. Rev.* 26: 1, 1960; review).

Anhydrous silica gel, Perkins (*Can. J. Microbiol.* 8: 591, 1962), Gentles & Scott (*Sabouraudia* 17: 415, 1979).

Soil, Bakerspigel (*Mycol.* 45: 596, 1953).

Water, Castellani (*Mycopath.* 20: 1, 1963).

Comparisons of methods, Onions (*in* Booth, *Methods in microbiology* 4: 113, 1971), Smith & Onions (*TBMS* 81: 535, 1983; mineral oil), Smith & Onions (1994), Smith (*TBMS* 79: 415, 1982; 3,000 fungi preserved up to 13 years), *IMI Culture Collection Catalogue* 10th edn, 1992), Berry & Hennebert (*Mycol.* 83: 605, 1992; freeze drying).

See also Media, Mites, and Safety.

Genetics. The text of this entry is unrevised and remains the same as for the ninth edition. In general, fungi appear to conform to the well-established patterns of genetical behaviour typical of other groups of organisms and species of *Saccharomyces*, *Neurospora*, and *Aspergillus* have been widely used in studies on formal genetics. They mostly exhibit haplo- and diplophases in their life-history, and thus undergo meiosis at some stage.

The use of monosporous cultures, and esp. of methods for the isolation of all the spores from one ascus or basidium, has made possible such detailed studies as the transmission of various mycelial characters and segregation of sex. Investigation of the stage of meiosis at which the allelomorphs segregate has been rendered possible in some ascomycetes (e.g. *Neurospora*) because the eventual products, the ascospores, exhibit a linear succession in the ascus, and the frequencies of genetical crossing-over for various characters have been deduced from such meiocyte analyses.

Incompatibility mechanisms involving one (*Mucor*) or multiple genes (*Coprinus*) are known (see heterothallism). Mutants induced by X-rays, ultraviolet light, etc., have been shown to be deficient in their capacity to effect particular stages of protein synthesis (*Neurospora*) and fermentation (yeasts).

Lit.: Kniep (*Bibliogr. genet.*, 1929), Fincham, Day & Radford (*Fungal genetics*, edn 4, 1979), Esser & Kuenen (*Genetic der Pilze*, 1965), Sermonti (*Genetics of antibiotic-producing organisms*, 1969), Day (*Genetics of host-parasite interactions*, 1974), Burnett (*Mycogenetics*, 1975), Ullrich & Raper (*Taxon* 26: 169, 1977; evol. genetic mechanisms, 80 refs), Koltin *et al.* (*Bact. Rev.* 36: 156, 1972; evol. incomp. factors in higher fungi), Day & Jellis (Eds) (*Genetics and plant pathogens*, 1987), Sidhu (Ed.) (*Genetics of plant pathogenic fungi [Adv. Pl. Path.* 6], 1988), Clutterbuck (*in* Gow & Gadd (Eds), *The growing fungus*: 239, 1995). See also Genetic engineering, Parasexual cycle, Sex, Variation.

Genicularia Rifai & R.C. Cooke (1966) [non *Genicularia* Rouss. 1806, *Algae*] $\equiv$ Geniculifera.

geniculate, bent like a knee.

Geniculifera Rifai (1975) = *Arthrotrichia* fide Oorschot (*Stud. Mycol.* 26: 61, 1985), Rubner (*Stud. Mycol.* 39, 1996), Koppenhöfer *et al.* (*Mycol.* 89: 220, 1997; ecology), Liou & Tzean (*Mycol.* 89: 876, 1997).

Geniculisynnema Okane & Nakagiri (2007), anamorphic *Nemania*. 1 (from termite nest), Japan. See Okane, I.; Nakagiri, A. (*Mycoscience* 48: 240, 2007).

Geniculodendron G.A. Salt (1974), anamorphic *Caloscypha*, Hso.0eH.10. 1, Canada; Europe. See Paden *et al.* (*CJB* 56: 2375, 1978), Harmaja (*Karstenia* 42:

27, 2002; teleomorph), Schröder *et al.* (*Forest Pathology* 32: 225, 2002; Germany).

Geniculospora Sv. Nilsson ex Marvanová & Sv. Nilsson (1971), anamorphic *Leotiomyces*, Hso.1bH.1. 2 (aquatic), widespread. Probably polyphyletic. A connection with *Hymenoscyphus* has been claimed. See Nolan (*Mycol.* 64: 1173, 1972), Ingold (*Guide to aquatic hyphomycetes*, 1975; synonymy with *Articulospora*), Belliveau & Bärlocher (*MR* 109: 1407, 2005; phylogeny).

Geniculosporium Chesters & Greenh. (1964), anamorphic *Nemania*, *Entoleuca*, *Rosellinia*, *Podosordaria*, Hso.0eH.11. 4, widespread. See Rogers *et al.* (*Mycotaxon* 67: 61, 1998; *Podosordaria* anam.), Ju & Rogers (*Mycotaxon* 73: 343, 1999).

Geniopila Marvanová & Descals (1985), anamorphic *Pezizomycotina*, Hso.≡ eH.15. 1 (aquatic), former Czechoslovakia; British Isles.

genistat, see *genestasis*.

Genistella L. Léger & M. Gauthier (1932) [non *Genistella* Ortega 1773, *Papilionaceae*] = *Legeriomyces*.

Genistellaceae L. Léger & M. Gauthier (1932) = *Legeriomycetaceae*.

Genistelloides S.W. Peterson, Lichtw. & B.W. Horn (1981), *Legeriomycetaceae*. 4 (in *Plecoptera*), USA. See Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986), Williams & Lichtwardt (*Mycol.* 79: 473, 1987), White & Lichtwardt (*Mycol.* 96: 891, 2004; Norway), White (*MR* 110: 1011, 2006; phylogeny).

Genistellospora Lichtw. (1972), *Legeriomycetaceae*. 5 (in *Diptera*), widespread. See Lichtwardt (*Mycol.* 64: 167, 1972), Moss & Lichtwardt (*CJB* 54: 2346, 1976; ultrastr.), Moss & Lichtwardt (*CJB* 55: 3099, 1977; ultrastr.), Alencar *et al.* (*Memórias do Instituto Oswaldo Cruz* 98: 799, 2003; Brazil), López Lastra *et al.* (*Mycol.* 97: 320, 2005; Argentina), White (*MR* 110: 1011, 2006; phylogeny).

genocentric, see *reproductocentric*.

genome, the total inheritable genetic material of an organism; a haploid set of chromosomes in eukaryotes. In *Saccharomyces cerevisiae* this is 12 Mgbases coding for some 6,000 genes; in *Neurospora crassa* the genome is much longer, 40 Mgbases; and *Aspergillus nidulans* has some 13,000 genes. See also Chromosome number.

Genomics. Uncertainty still exists concerning the exact meaning of the term, allowing its application to disparate activities. Several categories are now recognised which depend on the initial characteristics of interest: based on system attributes the topic can be divided into structural genomics and functional genomics (q.v.), but further divisions can be recognized when the relationships to other scientific disciplines or even the organisms being studied are considered; see Zhou *et al.* (*Microbial functional genomics*, 2004). A consensus exists, however, that the term encompasses 'the mapping, sequencing, and analysis of genomes' (Zhou *et al.*, *ibid.*). Techniques, results and discoveries made initially in studies of the molecular biology of bacteria and from ambitious projects such as the Human Genome Project (see The International Human Genome Mapping Consortium *Nature* 409: 860, 2001) are now being applied increasingly to other living organisms, including the fungi (Prade & Bohnert, *Genomics of plants and fungi*, 2003). The advent of polymerase chain reaction (PCR, q.v.) technology together with automated high throughput

capillary DNA sequencing facilities has led to a vast increase in total genome sequencing of fungi. In 1995, when the eighth edn of this *Dictionary* was published, only one entire genome sequence (*Saccharomyces cerevisiae*) had been generated; but by 2006, >40 'complete' fungal genomes were known (see Fitzpatrick *et al.*, *BMC Evol. Biol.* 6: 99, 2006) with sequencing of many more underway.

Structural genomics, the 'genome-wide structural study of genes, proteins, and other biomolecules' (Zhou *et al.*, *ibid.*). This has allowed comparative studies (including size of genome; size and number of chromosomes; and number of potential genes) to be made across different completed fungal genomes leading to more detailed phylogenetic analysis (see Wanchanthuek *et al.*, in Sunnerhagen & Piskur (Eds) *Comparative genomics using fungi as models*, 2005).

Functional genomics, the elucidation of a 'systems level understanding of the functional aspects of biological systems...using genome-wide approaches' (Zhou *et al.*, *ibid.*). This involves the combination of whole-genome sequencing and bioinformatic analysis to examine the resultant total RNA, protein and metabolite profiles ('transcriptome', 'proteome' and 'metabolome', respectively). See Castrillo & Oliver, in Brown (Ed.) *The Mycota vol. XIII: Fungal genomics*, 2005. This methodology is being used increasingly to try to understand inter-taxon relationships, pathogenicity of fungi and ultimately to develop new targeted pharmaceutical or agrochemical products.

Lit.: Arora & Khachatourians (Eds) (*Fungal genomics. Applied mycology and biotechnology* 4, 2004), Fitzpatrick *et al.* (*BMC Evol. Biol.* 6: 99, 2006), Munro *et al.* (in Brown (Ed.) *The Mycota vol. XIII: Fungal genomics*, 2005), Thomson & Zhou, (in Zhou *et al.*, *Microbial functional genomics*, 2004), Sunnerhagen & Piškur (Comparative genomics using fungi as models. *Topics in current genetics* 15: 289 pp., 2006).

genotype, the sum of the genetic potential of an organism; in some fungi only part of this is expressed at any given time. See holomorph, teleomorph, anamorph.

genus (pl. *genera*; adj. *generic*), (1) (in taxonomy), one of the principal ranks in the nomenclatural hierarchy (see Classification), the name of which forms the first part of a binomial species name (see species); (2) (more generally), a class of objects or concepts.

As in the case of the species (q.v.), there is no universally applicable criteria by which genera are distinguished, but in general the emphasis is now on there being several discontinuities in fundamental characters, especially concerning the nature of the reproductive structures. In the last century, however, features such as spore colour and septation were accorded a predominant role by some workers (see Anamorphic fungi).

Lit.: Clemençon (Ed.) (*Mycol. Helv.* 6, 1993; esp. in macromycetes), Hale (*Beih. Nova Hedw.* 79: 11, 1984; in lichens), Hawksworth (1974), Poelt (in Hawksworth (Ed.), *Frontiers in mycology*: 85, 1991; in lichens).

Geocoryne Korf (1978), *Leotiaceae*. 2, Canary Islands; India. See Lizoň *et al.* (*Mycotaxon* 67: 73, 1998; posn).

Geodina Denison (1965), *Sarcoscyphaceae*. 1, Costa Rica. See Cabello (*Boln Soc. argent. Bot.* 25: 395, 1988; numerical taxonomy).

geofungi, soil fungi (Cooke, 1963).

Geoglossaceae Corda (1838), Pezizomycotina (inc. sed.). 6 gen. (+ 4 syn.), 48 spp. Possibly allied to the *Lichinomycetes*.

Lit.: Imai (*Jl Fac. Agric. Hokkaido Univ.* 45: 155, 1941; Japanese spp.), Nannfeldt (*Ark. Bot.* 30A no. 4: 1, 1942), Mains (*Mycol.* 46: 586, 1954), Maas Geesteranus (*Persoonia* 4: 19, 1965; keys Indian spp.), Olsen (*Agarica* 7: 120, 1986), Spooner (*Bibliotheca Mycol.* 116: 711 pp., 1987), Verkley (*Persoonia* 15: 405, 1994; asci), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny).

Geoglossum Pers. (1794), Geoglossaceae. 24, widespread (temperate). See Nannfeldt (*Ark. Bot.* 30A no. 4: 1, 1942), Mains (*Mycol.* 46: 586, 1954; N. Am.), Maas Geesteranus (*Persoonia* 3: 89, 1964), Raitviir in Parmasto (*Zhivaya priroda Dal'nego Vostoka*: 52, 1971; E. former USSR), Benkert (*Mykol. MittBl.* 20: 47, 1976; Germany), Olsen (*Agarica* 7: 120, 1986; key 22 spp. Norway), Spooner (*Bibliotheca Mycol.* 116, 1987; 9 spp. Australasia, nomencl.), Verkley (*Persoonia* 15: 405, 1994; asci), Zhuang (*Fl. Fung. Sini-corum* 8, 1998; 10 spp. China), Wang (*Bull. natn. Mus. Nat. Sci. Taiwan* 13: 147, 2001; Taiwan), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006; phylogeny).

Geographical distribution. Knowledge of the geographical distribution of most fungi is inadequate. It is, however, possible to make a few generalizations. Almost every ecological niche has a specialized mycota (see Ecology), and the key factor determining fungal distribution is the substratum, whether it be a particular plant or animal, or some other material able to support their growth. Some fungi are extremely widespread compared with plants. This is especially true for species with no strong substratum preference (e.g. some generalist saprobes, lichen-forming ascomycetes, myxomycetes, polypores, opportunistic moulds, and soil fungi). Many common air-borne and soil moulds are ubiquitous. The thesis that most fungi are everywhere and that the environment selects (Gams, 1993) is probably true only for such species. Other fungi, particularly those with a narrow range of substrata are usually less widespread. Species which only occur in association with particular plants, for example, have distributions within the ranges of their associated organisms.

Some distributions can be related to continental drift, for example *Thamnomycetes* spp. in west Africa and South America, *Cyttaria* spp. in Australasia and South America, and the wide distribution of some lichens (Sheard, *Bryologist* 80: 100, 1977; Kärnefelt, *Bibl. Lich.* 38: 291, 1990; Tehler, *Opera Bot.* 70, 1988). Geographical distributions of the *Pucciniales* (Bisby, 1933) and *Erysiphales* (Hirata, 1966) have been stated to conform to the 'age and area' theory of Willis, which postulates that commonest genera are oldest, and the older the genus the wider its distribution. The geographical distribution of fungi with defined substratum preferences can depend not only on the presence of the substratum but also on its accessibility. On some Caribbean islands, for example, the absence of native terrestrial mammals has meant there are few species of dung-inhabiting fungi compared with continental America, even centuries after the introduction of horses (Richardson, pers. comm.;

Minter *et al.*, *Fungi of the Caribbean*, 2001). Substratum accessibility may also be a factor in determining fungal biodiversity hotspots. Animal and plant diversity of tropical rain forests may favour generalist fungi over specialized species which have the problem of locating their substratum; the opposite may be the case in ecosystems with lower animal and plant diversity, such as temperate conifer forests. Natural distributions of many fungi have also been affected by acid rain, air pollution (q.v.), forest clearance, and accidental or deliberate disposal by humans (see Conservation).

Some lichen-forming species have exceptionally broad distributions, and wide disjunctions are known; many follow particular forest zones or rock types, and some are even bipolar (Du Rietz, *Acta Phytogeogr. Succ.* 13: 215, 1940; Lynge, *Naturen* 12: 367, 1941). Apart from continental drift, the wide distribution of some lichens has also been related to glaciations (Brodo & Hawksworth, *Opera Bot.* 42, 1977); isolated populations of various species existed by the Cretaceous (Kärnefelt, 1990). In the *Caliciales*, small-spored genera are more likely to be distributed by long-range dispersal than those with large-spores (Tibell, *Bot. J. Linn. Soc.* 116: 159, 1994).

Because of the importance of the geographical distribution of plant pathogenic fungi for disease control regulations and international movement of plant germ plasm, the distribution of the more important plant pathogenic fungi is comparatively well known. The *IMI Distribution Maps of Plant Diseases* (1943 on) cover over 1300 spp. and are constantly updated, with new editions issued as required.

There has been a renewed interest in mapping distributions in the last two decades, facilitated by developments in computer techniques. Most initiatives are at national level, and concentrate on species that are most easily recorded; dynamically created distribution maps are now also, however, available on-line at global, regional, national and subnational levels, although the information presented on those maps is usually very incomplete (see Internet). Kreisel compiled a bibliography of published distribution maps for non-lichenized fungi (*Feddes Rep.* 82: 589, 1971, hymeno- and gasteromycetes, 1930-69; 83: 741, 1973, hemi- and phragmobasidiomycetes; 84: 619, 1973, basid. suppl.; 85: 161, 1974, anamorphic fungi and endomycetes, 1941-72; 86: 329, 1975, phycom.; 87: 109, 1976, suppl.), and Hawksworth & Ahti (*Lichenologist* 22: 1, 1990) include publications with maps.

Lit.: Diehl (*J. Wash. Acad. Sci.* 27: 244, 1937), Bisby (*Am. J. Bot.* 20: 246, 1933; *Bot. Rev.* 9: 466, 1943), Gams (*in* Winterhoff (Ed.), *Fungi in vegetation science*: 183, 1992), Hirata (*Host range and geographical distributions of the powdery mildews*, 1966), Lumbsch *et al.* (Eds) (*Phylogeography and biogeography of fungi. MR* 112, 2008), Pirozynski (*in* Ainsworth & Sussman (Eds), *The Fungi*, 3: 487, 1968), Pirozynski & Weresub (*in* Kendrick (Ed.), *The whole fungus* 1: 93, 1979), Pirozynski & Walker (*Aust. J. Bot. Suppl.* 10, 1983; Pacific).

Major regional studies are cited in this *Dictionary* under systematic entries and also Discomycetes, Inventories, Lichens, Literature, Macromycetes, Plant pathogenic fungi, and Pyrenomycetes. See also Biodiversity, Numbers of fungi, and particular substrata. **Geomorium** Speg. (1922) = *Underwoodia* fide Ga-

- mundí (*Darwiniana* 11: 418, 1957).
- Geomyces** Traaen (1914), anamorphic *Pseudogymnoascus*, *Gymnostellatospora*, Hso.0eP.1. 4, widespread (esp. north temperate). See Sigler & Carmichael (*Mycotaxon* 4: 376, 1976), van Oorschot (*Stud. Mycol.* 20, 1980), Hocking & Pitt (*Mycol.* 80: 82, 1988), Kuraishi *et al.* (*Antonie van Leeuwenhoek* 77: 179, 2000; ubiquinones), Vidal *et al.* (*Revta Iberoamer. Micol.* 17 [Special]: 22, 2000; phylogeny), Gianni *et al.* (*Mycoses* 46: 430, 2003; skin infection), Jiang & Yao (*Mycotaxon* 94: 55, 2005; phylogeny, development), Rice & Currah (*Mycol.* 98: 307, 2006; phylogeny).
- Geopetalaceae** Jülich (1982) = Pleurotaceae. The diagnosis of the family by Jülich refers to *Geopetalum* as typified by Singer (= *Faerberia*).
- Geopetalum** Pat. (1887) = *Hohenbuehelia* fide Kuyper (*in litt.*).
- Geopetalum** Singer (1951) = *Geopetalum* Pat.
- Geophila** Quél. (1886) [non *Geophila* D. Don 1825, *Rubiaceae*] = *Psilocybe* (Fr.) P. Kumm. fide Kuyper (*in litt.*).
- geophilous**, earth loving, e.g. of fungi having underground fruit bodies. Cf. *terricolous*.
- Geopora** Harkn. (1885), *Pyronemataceae*. 13, widespread (northern hemisphere). See Burdsall (*Mycol.* 60: 504, 1968), Senn-Irlet (*Beitr. Kenntn. Pilze Mitteleur.* 5: 191, 1989; key 8 spp.), Zhang & Yu (*Acta Mycol. Sin.* 11: 8, 1992; 3 spp. China), Yao & Spooner (*MR* 100: 72, 1996; key Brit. spp.), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Geoporella** Soehner (1951) = *Hydnotriza* fide Trappe (*TBMS* 65: 496, 1975).
- Geopyxis** (Pers.) Sacc. (1889), ? *Pyronemataceae*. 7 (Biotrophic, associated with conifer roots), widespread. See Thind *et al.* (*Acta Bot. Indica* 9: 115, 1981; key Himalayan spp.), Kimbrough & Gibson (*CJB* 68: 342, 1990; ultrastr.), Garnoeidner *et al.* (*Z. Mykol.* 52: 201, 1991), Crous *et al.* (*S. Afr. J. Bot.* 62: 89, 1996), Landvik *et al.* (*Nordic J. Bot.* 17: 403, 1997; DNA), Vrålstad *et al.* (*Mol. Ecol.* 7: 609, 1998; mycorrhizal status), Zhuang & Liu (*Nova Hedwigia* 83: 177, 2006).
- Georgefischeria** Thirum. & Naras. (1963), *Georgefischeriaceae*. 4 (witches' broom of *Rivea*, *Argyreia* & *Lettsomia* (*Convolvulaceae*)), India. See Bauer *et al.* (*MR* 105: 416, 2001), Gandhe (*Frontiers in Microbial Biotechnology and Plant Pathology*, (Prof. S.M. Reddy Commemoration Volume): 69, 2002).
- Georgefischeriaceae** R. Bauer, Begerow & Oberw. (1997), *Georgefischeriales*. 2 gen., 27 spp.
Lit.: Bauer *et al.* (*CJB* 75: 1273, 1997), Begerow *et al.* (*CJB* 75: 2045, 1998), Bauer *et al.* (*MR* 105: 423, 2001), Begerow *et al.* (*Mycol. Progr.* 1: 187, 2002), Begerow *et al.* (*MR* 108: 1257, 2004).
- Georgefischeriales** R. Bauer, Begerow & Oberw. (1997). *Exobasidiomycetes*. 4 fam., 7 gen., 40 spp. Fams:
- (1) **Eballistraceae**
 - (2) **Gjaerumiaceae**
 - (3) **Georgefischeriaceae**
 - (4) **Tilletiariaceae**
- For *Lit.* see under fam.
- Geoscypha** (Cooke) Lambotte (1888) = *Peziza* Fr. fide Eckblad (*Nytt Mag. Bot.* 15: 1, 1968).
- Geosiphon** F. Wettst. (1915), *Geosiphonaceae*. 1 (arbuscular mycorrhiza unknown), Europe. includes cyanobacteria (*Nostoc*) in vesicles; the only known example of endocyanosis (q.v.) in fungi. See Mollenhauer in Reisser (Ed.) (*Algae and symbiosis*: 339, 1992), Schüssler *et al.* (*Bot. Acta* 107: 36, 1994; arbuscular mycorrhizal affinity), Schüssler *et al.* (*Protoplasma* 185: 131, 1995; endocytobiosis), Gehrig *et al.* (*J. Mol. Evol.* 43: 71, 1996; phylogeny), Schüssler *et al.* (*Protoplasma* 190: 53, 1996; ultrastr.), Mollenhauer *et al.* (*Protoplasma* 193: 3, 1998; nutrition), Schüssler & Kluge in McLaughlin *et al.* (Eds) (*The Mycota A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research* 9: 151, 2001), Schüssler (*Plant and Soil* 244: 75, 2002; phylogeny, taxonomy, and evolution), Redecker & Raab (*Mycol.* 98: 885, 2006; phylogeny).
- Geosiphonaceae** Engl. & E. Gilg (1924), *Archaeosporales*. 1 gen. (+ 1 syn.), 1 spp.
Lit.: Azcon-Aguilar & Barea (*Mycorrhiza* 6: 457, 1996), Gehrig *et al.* (*J. Mol. Evol.* 43: 71, 1996), van der Heijden *et al.* (*Nature Lond.* 396: 69, 1998), Schüssler & Kluge in McLaughlin *et al.* (Eds) (*The Mycota A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research* 7A: 151, 2001), Schüßler *et al.* (*MR* 105: 1413, 2001), Redecker (*Glomeromycota Arbuscular mycorrhizal fungi and their relative(s)*. Version 01 July 2005.
<http://tolweb.org/Glomeromycota/28715/2005.07.01> in The Tree of Life Web Project, <http://tolweb.org>: [unpaginated], 2005), Schüßler & Wolf in Declerck, Strullu & Fortin (Eds) (*Root-organ culture of mycorrhizal fungi*, 2005).
- Geosiphonales** Caval.-Sm. (1998) = *Archaeosporales*.
- Geosiphonomyces** Cif. & Tomas. (1957) = *Geosiphon*.
- Geosmithia** Pitt (1979), anamorphic *Hypocreales*, Hso.0eH.32/33. 10, widespread. Species with *Talaromyces* anamorphs are unrelated. See Ogawa *et al.* (*Mycol.* 89: 756, 1997; rDNA analysis), Ogawa & Sugiyama (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 149, 2000; teleomorph), Pitt *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 9, 2000; accepted names), Heredia *et al.* (*Mycol.* 93: 528, 2001; Mexico), Prieto *et al.* (*CJB* 80: 410, 2002; cell wall polysaccharides), Kolařík *et al.* (*MR* 108: 1053, 2004; morphology, phylogeny), Kubátová *et al.* (*Czech Mycol.* 56: 1, 2004; ecology), Kolařík *et al.* (*MR* 109: 1323, 2005), Yaguchi *et al.* (*Cryptog. Mycol.* 26: 133, 2005; thermotolerant sp.), Kolařík *et al.* (*MR* 111: 1298, 2007; with bark beetles).
- Geotrichaceae** Cif. ex Subram. (1962) = *Dipodasceae*.
- Geotrichella** Arnaud (1954) nom. dub., anamorphic *Pezizomycotina*, Hso.0eP.40. 2 (on paper), France; N. America. See Sigler & Carmichael (*Mycotaxon* 4: 349, 1976).
- Geotrichites** Stubblef., C.E. Mill., T.N. Taylor & G.T. Cole (1985), *Fossil Fungi*. 1 (on arachnoid in amber), Dominican Republic.
- Geotrichoides** Langeron & Talice (1932) = *Trichosporon* fide von Arx *et al.* (*Stud. Mycol.* 14: 30, 1977).
- Geotrichopsis** Tzean & Estey (1991), anamorphic *Agaricomycetes*. 1 (with dolipore septa), Canada. See Tzean & Estey (*MR* 95: 1351, 1991).
- geotrichosis**, disease in humans or animals caused by

Geotrichum.

Geotrichum Link (1809), anamorphic *Dipodascus*, *Galactomyces*, Hsy.0eH.39. 33, Europe; America. *G. candidum* (often as *Oospora lactis*) in milk. See Morenz (*Mykol. Schriftenreihe* 1, 1963), Guého (*Antonie van Leeuwenhoek* 45: 199, 1979; base comp. and taxonomy), Weijman (*Antonie van Leeuwenhoek* 45: 119, 1979; carbohydrates and taxonomy), Olesen & Kier (*Nordic J. Bot.* 4: 365, 1984; SEM and TEM structure), de Hoog *et al.* (*Stud. Mycol.* 29: 1, 1986; key), Guého *et al.* (*J. Clin. Microbiol.* 25: 1191, 1987; DNA relatedness in *G. capitatum*), de Hoog & Amberger (*Antonie van Leeuwenhoek* 58: 101, 1990; protein patterns in *Geotrichum* and teleomorphs), Jensen *et al.* (*Mycoses* 33: 519, 1991; crossed immunoelectrophoresis to differentiate *G. candidum*), Watanabe *et al.* (*Mycoscience* 35: 417, 1994; endocoonidia), Pitt & Hocking (*Fungi and Food Spoilage* Edn 2: 593 pp., 1997; food-associated spp.), Hoog *et al.* in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 574, 1998; review), Smith & Poot (*Antonie van Leeuwenhoek* 74: 229, 1998; genetic characterization), Tsai & Hsieh (*Plant Pathology Bulletin* Taichung 8: 9, 1999; selective medium), Smith *et al.* (*Antonie van Leeuwenhoek* 77: 71, 2000; taxonomy), Marcellino *et al.* (*Appl. Environm. Microbiol.* 67: 4752, 2001; from cheese), Gente *et al.* (*Int. J. Food Microbiol.* 76: 127, 2002; chromosomes), Hoog & Smith (*Stud. Mycol.* 50: 489, 2004; phylogeny, review), Suh & Blackwell (*MR* 110: 220, 2006; on beetles), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny), Wuczkowski *et al.* (*Int. J. Syst. Evol. Microbiol.* 56: 301, 2006).

geotropism, see tropisms.

Geotus Pilát & Svrček (1953) = *Arrhenia* fide Redhead (*CJB* 62: 865, 1984).

Gerdemannia C. Walker, Błaszk., A. Schüssler & Schwarzott (2004) = *Pacispora* fide Kirk (*in litt.*).

Gerdemanniaceae C. Walker, Błaszk., A. Schüssler & Schwarzott (2004) = *Pacisporaceae*.

Gerhardtia Bon (1994) = *Lyophyllum* fide Kuyper (*in litt.*).

Gerlachia W. Gams & E. Müll. (1980) = *Microdochium* fide Samuels & Hallett (*TBMS* 81: 473, 1983).

germ pore, a differentiated, frequently apical area, or hollow, in a spore wall (esp. in rusts) through which a **germ tube** (a germination hyphae) may come out; see Melendez-Howell (*Ann. Sci. nat. Bot. sér.* 12 8: 487, 1967; germ pore of basidiospores).

germ slit, a thin area of spore wall usually orientated along the long axis of the spore. In *Bryothela mira* the germ slit is transverse (Dobbeler, *Nova Hedw.* 66: 337, fig. 3, 5, 1998).

germ tube, a germination hyphae which is formed by a germinating spore.

germicide, a substance causing destruction of microorganisms.

germination by repetition, producing secondary spores in place of germ tubes, as in *Heterobasidiomycetes* and *Sporobolomyces*.

Germ slitospore Lodha (1978) = *Coniochaeta* fide Udagawa & Furuya (*TMSJ* 20: 5, 1979), von Arx (*Gen. Fungi Sporul. Cult.* Edn 3, 1981), García *et al.* (*Mycol.* 95: 525, 2003), García *et al.* (*MR* 110: 1271, 2006; phylogeny).

Gerronema Singer (1951), Marasmiaceae. 13, widespread (esp. subtropical). See Singer (*Nova Hedwigia* 7: 53, 1964; keys), Singer (*Fl. Neotrop.* 3: 24, 1970;

key 20 neotrop. spp.), Redhead (*CJB* 65: 1551, 1986; emend. circumscrib.), Lutzoni (*Syst. Biol.* 46: 373, 1997; phylogeny), Redhead *et al.* (*Mycotaxon* 83: 19, 2002; phylogeny), Bañares *et al.* (*Mycol.* 98: 455, 2006; Canary Islands).

Gerulajacta Preuss (1855) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).

Gerwasia Racib. (1909), Phragmidiaceae. 9 (on *Rubus*, *Rosa* (*Rosaceae*)), East Indies; America (tropical); China; Indonesia; Japan; Nepal; Philippines. See Tai (*Farlowia* 3: 95, 1947), Buriticá (*Rev. I.C.N.E.* 5: 173, 1994), Berndt (*Frontiers in Basidiomycete Mycology*: 185, 2004; Costa Rica).

Geusia Rühl & Korn (1979), Microsporidia. 1.

ghost fungus, *Pleurotus nidiformis*, an Australian luminous agaric. See Willis (*Muelleria* 1: 213, 1967).

Giacominia Cif. & Tomas. (1953) = *Arthopyrenia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

giant puff-ball, *Langermannia gigantea*; see record fungi.

giant stone-fungus, *Polyporus tumulosus*; the pseudosclerotium may exceed 1 m³.

Gibbago E.G. Simmons (1986), anamorphic *Pleosporaceae*, Hso.#eP.26. 1, N. & S. America. See Simmons (*Mycotaxon* 27: 108, 1986).

gibber, gibbous (q.v.).

Gibbera Fr. (1825), Venturiaceae. Anamorphs *Dictyodochium*, *Stigmina*-like. c. 28, widespread. See Müller (*Sydowia* 8: 60, 1954), Eriksson (*Svensk bot. Tidskr.* 68: 192, 1974; key 9 spp.), Sivanesan (*TBMS* 82: 507, 1984; anamorphs), Samuels *et al.* (*Brittonia* 40: 392, 1988), Barr (*Sydowia* 41: 25, 1989; key 4 N. Am. spp.).

Gibberella Sacc. (1877), Nectriaceae. Anamorph *Fusarium*. 23 (saprobes and pathogens), widespread. *G. fujikuroi* (on cotton, maize, rice (Bakanae disease) and other crops in warm areas); *G. zeae* (frequently as *G. saubinetii*) (foot rot and ear blight (scab) of cereals). See also gibberellin. See Nirenberg & O'Donnell (*Mycol.* 90: 434, 1998), O'Donnell *et al.* (*Mycol.* 90: 465, 1998; phylogeny), Samuels *et al.* in Summerell (Ed.) (*The genus Fusarium*, 1998), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), O'Donnell *et al.* (*Mycoscience* 41: 61, 2000), Aoki *et al.* (*Mycoscience* 42: 461, 2001), Geiser *et al.* (*Mycol.* 93: 670, 2001), Leslie (*Fusarium* Paul E. Nelson Memorial Symposium: 113, 2001; population genetics), Steenkamp *et al.* (*Molecular Plant Pathology* 2: 215, 2001; molecular ecology), Britz *et al.* (*Sydowia* 54: 9, 2002; *G. circinata*), Desjardins (*Ann. Rev. Phytopath.* 41: 177, 2003; review), Mirete *et al.* (*Int. J. Food Microbiol.* 89: 213, 2003; fumonisins), Zeller *et al.* (*Mycol.* 95: 943, 2003; *G. konza*), Láday *et al.* (*Eur. J. Pl. Path.* 110: 563, 2004; mtDNA), Leslie *et al.* (*Eur. J. Pl. Path.* 110: 611, 2004; mating populations), Leslie *et al.* (*Appl. Environm. Microbiol.* 70: 2254, 2004; Kansas), Phan *et al.* (*Stud. Mycol.* 50: 261, 2004; Australia), Zeller *et al.* (*Mol. Ecol.* 13: 563, 2004; USA), Adugna *et al.* (*Z. PflKrankh. PflPath. PflSchutz* 112: 134, 2005; on *Coffea*), Geiser *et al.* (*Mycol.* 97: 191, 2005; on *Coffea*), Lepoint *et al.* (*Appl. Environm. Microbiol.* 71: 8466, 2005; on *Coffea*), Leslie *et al.* (*Mycol.* 97: 718, 2005; *G. sacchari*).

gibberellin, a complex of hormone-like substances from *Gibberella fujikuroi* (anamorph *Fusarium moniliforme*) which causes overgrowth of higher

- plants, first recognized as the cause of Bakanae disease of rice. Gibberellin A₁, A₂, A₃ and other fractions have been distinguished including **gibberellic acid** which has a similar physiological action to gibberellin A₁. Gibberellin is manufactured commercially for use in horticulture. See Stodola (*Source book on gibberellin* 1828-1957, 1958; 632 abstracts), Knapp (Ed.) (*Eigenschaften und Wirkungen der Gibberelline*, 1962), MacMillan & Takahashi (*Nature* 217: 170, 1968; allocation of trivial names), Jefferys (*Adv. appl. Microbiol.* 13: 283, 1970).
- Gibberellulina** Sousa da Câmara (1950) nom. dub., Sordariomycetidae. 1, Europe. See Rossman (*Stud. Mycol.* 42, 1999).
- Gibberidea** (Fr.) Kuntze (1898) ≡ Cucurbitaria.
- Gibberidea** Fuckel (1870), Dothideomycetes. Anamorph *Pleurostomella*. 1, Europe. See Holm (*Svensk bot. Tidskr.* 62: 217, 1968).
- Gibberinula** Kuntze (1898) ≡ Gibberidea Fuckel.
- gibbous** (of a pileus), having a swelling or wide umbo, or having a convex top and a flat underside; gibber, gibbose.
- Gibellia** Pass. (1886) ≡ Gibellina.
- Gibellia** Sacc. (1885), ? Melanconidaceae. 1 (from bark), Australia. See von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Gibellina** Pass. (1886), ? Magnaporthaceae. 3, Asia; Europe. *G. cerealis* on wheat. See Glynne *et al.* (*TBMS* 84: 653, 1985).
- Gibellula** Cava (1894), anamorphic *Torrubiella*, Hsy.0eH.15/16. 17, widespread. See Petch (*Annls mycol.* 30: 386, 1932), Samson & Evans (*Mycol.* 84: 300, 1992; on *Arachnida*), Tzean *et al.* (*Mycol.* 89: 309, 1997; spp. from Taiwan), Selçuk *et al.* (*Mycol. Balcanica* 1: 61, 2004; Turkey).
- Gibellulopsis** Bat. & H. Maia (1959), anamorphic *Plectosphaerellaceae*. 1, widespread. See Zare *et al.* (*Nova Hedwigia* 85: 463, 2007).
- Gibsonia** Massee (1909) ? = *Melanospora* Corda fide Cannon & Hawksworth (*J. Linn. Soc. Bot.* 84, 1982).
- Gigantospora** B.S. Lu & K.D. Hyde (2003), Xylariaceae. 1, USA. See Lu & Hyde (*Nova Hedwigia* 76: 202, 2003).
- Gigasperma** E. Horak (1971), Gigaspermaceae. 2, Australasia; N. America. The genus is polyphyletic with some members belonging to *Boletales* and others to *Agaricales*. See Beaton & Malajczuk (*TBMS* 87: 478, 1986), Castellano & Trappe (*Aust. Syst. Bot.* 5: 613, 1992), Matheny *et al.* (*Mycol.* 98: 982, 2006; see on-line supplementary material).
- Gigaspermaceae** Jülich (1982), Agaricales. 1 gen., 2 spp.
Lit.: Castellano & Trappe (*Aust. Syst. Bot.* 5: 641, 1992), Kropp & Hutchison (*Mycol.* 88: 662, 1996).
- Gigaspora** Gerd. & Trappe (1974), Gigasporaceae. 7, widespread. See Sward (*New Phytol.* 87: 761, 1980), Sward (*New Phytol.* 87: 661, 1981; spore ultrastr.), Walker & Sanders (*Mycotaxon* 27: 169, 1986; emend.), Spain *et al.* (*Mycotaxon* 34: 667, 1989), Tommerup & Sivasithamparam (*MR* 94: 897, 1991), Maia *et al.* (*Mycol.* 85: 883, 1993), Maia *et al.* (*Mycol.* 86: 343, 1994; spore wall ultrastr., germination), Bentivenga & Morton (*Mycol.* 87: 719, 1995; monogr. & key), Montecchi *et al.* (*Riv. Micol.* 39: 269, 1996), Yao *et al.* (*Genera of Endogonales*: 229 pp., 1996), Gadhar *et al.* (*Can. J. Microbiol.* 43: 795, 1997; polymorphism), Bago *et al.* (*New Phytol.* 139: 581, 1998; molecular analysis), Lanfranco *et al.* (*Mol. Ecol.* 8: 372, 1999; genetic variation), Redecker & Raab (*Mycol.* 98: 885, 2006; phylogeny).
- Gigasporaceae** J.B. Morton & Benny (1990), Diversisporales. 2 gen., 39 spp.
Lit.: Azcon-Aguilar & Barea (*Mycorrhiza* 6: 457, 1996), Bentivenga & Morton (*Proc. natn Acad. Sci. U.S.A.* 93: 5659, 1996; fatty acids), van der Heijden *et al.* (*Nature Lond.* 396: 69, 1998), Lanfranco *et al.* (*Mol. Ecol.* 8: 37, 1999; sequence variability), Jeffries & Dodd (*Appl. Microb. System.*: 73, 2000), Schüßler *et al.* (*MR* 105: 1413, 2001), Walker & Schüssler (*MR* 108: 982, 2004), Redecker (*Glomeromycota* Arbuscular mycorrhizal fungi and their relative(s). Version 01 July 2005. <http://tolweb.org/Glomeromycota/28715/2005.07.01> in The Tree of Life Web Project, <http://tolweb.org>: [unpaginated], 2005), Souza *et al.* (*MR* 109: 697, 2005).
- Gigasporites** Carlie J. Phipps & T.N. Taylor (1996), Fossil Fungi. 1, Antarctica. See Phipps & Taylor (*Mycol.* 88: 709, 1996).
- Gilbertella** Hesselt. (1960), Choanephoraceae. 1, widespread (tropical). *G. persicaria* pathogenic to peach (*Amygdalus persicae*). See Hesseltine (*Bull. Torrey bot. Club* 87: 21, 1960), O'Donnell *et al.* (*CJB* 55: 662, 1977; zygosporontogeny), Powell *et al.* (*CJB* 59: 908, 1981; ultrastr. chlamydospore), Powell *et al.* (*Protoplasma* 111: 87, 1982; ultrastr. membrane), Whitney & Arnott (*Mycol.* 78: 42, 1986), Whitney & Arnott (*Mycol.* 80: 707, 1988; calcium oxalate crystals), Benny (*Mycol.* 83: 150, 1991), Michaelides *et al.* (*Mycol.* 89: 609, 1997; zygosporogenesis), Donnell *et al.* (*Mycol.* 93: 286, 2001; phylogeny), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny), Papp *et al.* (*Acta Biolog. Hung.* 54: 393, 2003; phylogeny).
- Gilbertellaceae** Benny (1991) = Choanephoraceae.
Lit.: Kirk (*in litt.*).
- Gilbertia** Donk (1934) nom. inval. = *Amanita* Pers. fide Kuyper (*in litt.*).
- Gilbertiella** R. Heim (1965) [non *Gilbertiella* Boutique 1951, *Annonaceae*] ≡ Gyrodon.
- Gilbertina** R. Heim (1966) = Gyrodon fide Pegler (*Kew Bull. Addit. Ser.* 9, 1983).
- Gilbertsonia** Parmasto (2001), Fomitopsidaceae. 1, USA. See Parmasto (*Harvard Pap. Bot.* 6: 179, 2001).
- Gilchristia** Redaelli & Cif. (1934) ≡ Zymonema.
- Gilkeya** M.E. Sm., Trappe & Rizzo (2007), Pyrenomataceae. 1 (hypogeous), N. America. See Smith *et al.* (*Mycol.* 98: 705, 2006), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- gill** (of an agaric), commonly used in English for lamella (q.v.) which is to be preferred as a more international term; - **fungi**, members of the *Agaricales*.
- Gilletia** Torrend (1914) ≡ Telligia.
- Gilietiella** Sacc. & P. Syd. (1899), Dothideomycetes. Anamorph *Ascochyta*-like. 2 or 2 (on *Chusquea*), America. See Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962), Eriksson (*SA* 7: 72, 1988).
- Gillotia** Sacc. & Trotter (1913), Mycosphaerellaceae. Anamorph *Asteromella*-like. c. 3, widespread (tropical). See von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Gilmania** Bat. & Cif. (1962) = *Chaetothyrium* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Gilmaniella** G.L. Barron (1964), anamorphic *Pezizomycotina*, Hso.0eP.1/10. 7, widespread. See Moustafa & Ezz-Eldin (*MR* 92: 502, 1989; key),

Umali *et al.* (*MR* 102: 435, 1998; Hong Kong).

gilvous, pale yellow.

gin, see spirits.

Ginanniella Cif. (1938) = *Urocystis* fide Nagler (*Z. Mykol.* 53: 331, 1987), Vánky (*Illustrated genera of smut fungi*, 1987).

ginger beer plant (Californian or American 'bees'), a mixture of a yeast (*Saccharomyces pyriformis*) and a bacterium (*Bacterium vermiforme*) used for fermenting a sugar solution to make a drink (Marshall Ward, *Phil. Trans. R. Soc., Lond. B* 183: 125, 1892). See Ramsbottom (*TBMS* 7: 86, 1921); cf. tibi, tea fungus, teekwass.

Ginzbergerella Zahlbr. (1931) = *Gyrocollema* fide Henssen (*SA* 5: 131, 1986).

Giraffachitina Locq. (1985), Fossil Fungi. 1, Estonia.

Girardia Gray (1821) = *Bangia* fide Henssen (*Symb. bot. upsal.* 18 no. 1, 1963).

Giulia Tassi (1904), anamorphic *Pezizomycotina*, Cpd.0eH.1. 1, Europe. See Pirozynski & Shoemaker (*CJB* 49: 529, 1971).

Gjaerumia R. Bauer, M. Lutz & Oberw. (2005), Gjaerumiaceae. 3 (on *Liliaceae* s.l.), Europe (northern). See Bauer *et al.* (*MR* 109: 1250, 2005).

Gjaerumiaceae R. Bauer, M. Lutz & Oberw. (2005), Georgefischeriales. 1 gen., 3 spp.
Lit.: Bauer *et al.* (*MR* 109: 1250, 2005).

Glabrocyphe W.B. Cooke (1961), Marasmiaceae. 13, widespread. See Cooke (*Beih. Sydowia* 4: 45, 1961), Redhead *et al.* (*Mycotaxon* 83: 19, 2002; phylogeny).

Glabrotheca Chardón (1939), *Pezizomycotina*. 1, Venezuela.

glabrous, smooth; not hairy.

glaireous, slimy.

Glaphyriopsis B. Sutton & Pascoe (1987), anamorphic *Pezizomycotina*, Ccu.≡ eH-P.15. 2, Australia. See Sutton & Pascoe (*TBMS* 88: 169, 1987).

Glarea Bills & F. Paláez (1999), anamorphic *Helotiales*, Hso.?.?. 1, Spain. See Bills *et al.* (*MR* 103: 189, 1999).

Glaucinarina Fée ex A. Massal. (1860) = *Diorygma* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Kalb *et al.* (*Symb. bot. upsal.* 34 no. 1: 133, 2004).

Glaucumaria M. Choisy (1929) ? = *Lecanora* fide Hafellner (*Beih. Nova Hedwigia* 79: 241, 1984; status).

Glaucospora Rea (1922) = *Melanophyllum* fide Singer (*Agaric. mod. Tax.*, 1951).

glaucous, having a bluish-grey waxy bloom.

Glaxoa P.F. Cannon (1997), Tubeufiaceae. 1, Great Britain. See Cannon (*SA* 15: 121, 1997), Kodsueb *et al.* (*Fungal Diversity* 21: 105, 2006).

Glaziella Berk. (1880), Glaziellaceae. 1, widespread (tropical). See Landvik & Eriksson (*SA* 13: 13, 1984; posn), Gibson *et al.* (*Mycol.* 78: 941, 1987), Landvik *et al.* (*Nordic Jl Bot.* 17: 403, 1997; phylogeny), Harrington *et al.* (*Mycol.* 91: 41, 1999; phylogeny), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).

Glaziellaceae J.L. Gibson (1986), *Pezizales*. 1 gen. (+ 1 syn.), 1 spp.

Lit.: Landvik & Eriksson (*SA* 13: 13, 1984; posn), Gibson *et al.* (*Mycol.* 78: 941, 1986), Landvik & Eriksson (*SA* 13: 13, 1994), Landvik *et al.* (*Nordic Jl Bot.* 17: 403, 1997), Harrington *et al.* (*Mycol.* 91: 41,

1999), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Hansen *et al.* (*Mycol.* 97: 1023, 2005), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).

Glaziellales J.L. Gibson (1986) = *Pezizales*.

gleba, the sporing tissue in an angiocarpous sporocarp, esp. of gasteromycetes and hypogeous *Pezizales*;

glebal mass, the projectile of *Sphaerobolus*.

glebula, a rounded process from a lichen thallus.

Glenospora Berk. & Desm. (1849) nom. rej. = *Septobasidium*. Used in medical mycology for unrelated fungi. fide Berndt (*in litt.*) Used in medical mycology for unrelated fungi; see, Petch (*TBMS* 12: 105, 1927).

Glenosporaceae Nann. (1934) = *Septobasidiaceae*.

Glenosporella Nann. (1931) = *Geomyces* fide Carmichael (*CJB* 40, 1962), van Oorschot (*Stud. Mycol.* 20, 1980).

Glenosporopsis O.M. Fonseca (1943), anamorphic *Pezizomycotina*, Hso.0eP.1/4. 1 (on humans), Brazil. See Taborda *et al.* (*J. Clin. Microbiol.* 37: 2031, 1999).

gleocystidium, see cystidium.

Gleophyllum, see *Gloeophyllum*.

gleoplerous hyphae (oil hyphae), hyphae with very long cells (or unicellular), with numerous oil drops in the plasma. See Jülich (*in* Gams (Ed.), *Kleine Kryptogamenflora* II(7), 1984).

gliatope, a site of heavy gel production (Moore, *Am. J. Bot.* 52: 391, 1965). See gel tissue.

Glioannellochium Matsush. (1989), anamorphic *Pezizomycotina*, Hsp.0eH.19. 1, Australia. See Matsushima (*Matsush. Mycol. Mem.* 6: 19, 1989).

Glioblastocladium Matsush. (1989), anamorphic *Pezizomycotina*, Hso.0eH.10. 1, Australia. See Matsushima (*Matsush. Mycol. Mem.* 6: 20, 1989).

Gliobotrys Höhn. (1902) = *Stachybotrys* fide Bisby (*TBMS* 26: 133, 1943).

Gliocephalis Matr. (1899), anamorphic *Pyxidioraceae*, Hsy.0eH.15. 2, Asia; N. America. See Hawksworth (*Bull. Br. Mus. nat. hist. Bot.* 6: 181, 1979), Jacobs *et al.* (*Mycol.* 97: 111, 2005; phylogeny, morphology).

Gliocephalotrichum J.J. Ellis & Hesselt. (1962), anamorphic *Leuconectria*, Hso.0eH.15. 5, widespread. See Wiley & Simmons (*Mycol.* 63: 575, 1971; key), Rossman *et al.* (*Mycol.* 85: 685, 1993; teleomorph), Schoch *et al.* (*Stud. Mycol.* 45: 45, 2000; phylogeny), Watanabe & Nakamura (*Mycoscience* 46: 46, 2005; Japan), Decock *et al.* (*Mycol.* 98: 488, 2006; French Guiana).

Gliocladiopsis S.B. Saksena (1954), *Nectriaceae*. 1, pantropical. See Barron (*The genera of hyphomycetes from soil*, 1968), Schoch *et al.* (*Stud. Mycol.* 45: 45, 2000; phylogeny), Crous (*Taxonomy and Pathology of Cyliandrocladium (Calonectria) and Allied Genera*: 278 pp., 2002; revision).

Gliocladium Corda (1840), anamorphic *Sphaerostilbella*, Hsy.0eH.15. 13, widespread. See also *Clonostachys*, *Trichoderma*. See Seifert (*Stud. Mycol.* 27: 1, 1985; teleomorph), Schroers (*Stud. Mycol.* 46: 1, 2001), Samuels *et al.* (*CBS Diversity Ser.* 4, 2006; USA).

Gliocladochium Höhn. (1916) = *Periola*.

Gliocoryne Maire (1909) = *Pistillaria* Fr. fide Corner (*Ann. Bot. Mem.* [A monograph of *Clavaria* and allied genera] 1, 1950).

Gliodendron Salonen & Ruokola (1969) = *Sterigmatobotrys* fide Sutton (*Mycol. Pap.* 132, 1973).

Gliomastix Guég. (1905), anamorphic *Hypocreales*,

- Hso.0eP.15. 19, widespread. See Dickinson (*Mycol. Pap.* 115, 1968; key), Gams (*Cephalosporium-artige Schimmelpilze*, 1971), Hammill (*Mycol.* 73: 229, 1981; typification), Gams & Boekhout (*Proc. Indian Acad. Sci. Pl. Sci.* 94: 273, 1985).
- Glionectria** Crous & S.L. Schoch (2000), Nectriaceae. Anamorph *Gliocladiopsis*. 1, widespread (pantropical). See Schoch *et al.* (*Stud. Mycol.* 45: 45, 2000), Crous (*Taxonomy and Pathology of Cyllindrocladium (Calonectria) and Allied Genera*: 278 pp., 2002; revision).
- Gliophorus** Herink (1958) = *Hygrocybe* fide Singer (*Agaric. mod. Tax.* edn 2, 1962).
- Gliophragma** Subram. & Lodha (1964), anamorphic *Pezizomycotina*, Hsy.1bH.10. 1, India. See Subramanian & Lodha (*CJB* 42: 1059, 1964).
- Gliostroma** Corda (1837) nom. dub., anamorphic *Pezizomycotina*. See Holubová-Jechová (*Sydowia* 46: 242, 1994).
- gliotoxin**, an antibiotic from *Gliocladium virens* (Webster & Lomas, *TBMS* 47: 535, 1964), *Aspergillus fumigatus*, *Penicillium cinerascens* (Brian & Hemming, *Ann. appl. Biol.* 32: 214, 1945; *Biochem. J.* 41: 570, 1947); antibacterial and antifungal (has been used as a seed dressing). Cf. viridin.
- Gliotrichum** Eschw. (1822) nom. dub., ? Fungi.
- Glischroderma** Fuckel (1870), anamorphic *Pezizaceae*, St.0eP.6. 1, Europe. See Hennebert (*Persoonia* 7: 183, 1973), Norman & Egger (*Mycol.* 91: 820, 1999; phylogeny), Hansen *et al.* (*Mycol.* 93: 958, 2001; phylogeny).
- Glischrodermataceae** Rea (1922) = *Pezizaceae*.
- Globaria** Quél. (1873) = *Bovista* fide Demoulin (*Persoonia* 7: 152, 1973).
- Globifomes** Murrill (1904), Polyporaceae. 1, N. America. See Gilbertson & Ryvarden (*N. Amer. Polyp.* 1: 307, 1987).
- Globipilea**, see *Globopilea*.
- Globoa** Bat. & H. Maia (1962), Dothideomycetes. 1, Uganda. See Batista & Maia (*Beih. Sydowia* 3: 54, 1962).
- Globoasclerotes** Stach & Pickh. (1957), Fossil Fungi. 1 (Carboniferous), Germany.
- globoid** (globose, globular, globulose), spherical or almost so (Fig. 23.1).
- Globonectria** Etayo (2002), Bionectriaceae. 1, Colombia. See Etayo (*Bibliotheca Lichenol.* 84: 47, 2002).
- Globopilea** Beauseign. (1926) = *Helvella* fide Dissing (*Dansk bot. Ark.* 25 no. 1, 1966).
- Globosasclerotes** Stach & Pickh. (1957), Fossil Fungi. 1 (Carboniferous, Tertiary), Europe. See Stach & Pickhardt (*Palaeontologische Zeitschrift* 31: 140, 1957).
- Globosomyces** Jülich (1980), Polyporales. 1, Borneo. See Jülich (*J. Linn. Soc. Bot.* 81: 45, 1980).
- Globosopyreno** Lloyd (1923) nom. dub., ? Fungi.
- Globosphaeria** D. Hawksw. (1990), Sordariomycetes. 1 (on lichens, esp. *Normandina*), Tasmania. See Hawksworth (*Lichenologist* 22: 301, 1990), Matzer (*Cryptog. Mycol.* 14: 11, 1993).
- Globuliciopsis** Hjortstam & Ryvarden (2004), Polyporales. 2, S. America. See Hjortstam & Ryvarden (*Syn. Fung.* 18: 22, 2004).
- Globulicium** Hjortstam (1973), Agaricomycetes. 1, Europe. *Hymenochaetales* or *Agaricales* (*Rickenella* clade). See Hjortstam (*Svensk bot. Tidskr.* 67: 108, 1973).
- Globuligera** (Sacc.) Höhn. (1918) = *Xylogramma* fide Kutorga & Hawksworth (*SA* 15: 1, 1997).
- Globulina** Speg. (1888), Dothideomycetes. 1, Brazil. See Rossman (*Mycol. Pap.* 157, 1987).
- Globulina** Velen. (1934) [non *Globulina* Link 1820, *Chlorophyta*] = *Unguiculella* fide Svrček (*Česká Mykol.* 41: 193, 1987).
- Globuliroseum** Sullia & K.R. Khan (1984), anamorphic *Pezizomycotina*, Hsp.0eH.1. 1, India. See Sullia & Khan (*Kavaka* 11: 67, 1983).
- glochidiate**, covered with barbed bristles.
- Gloeandromyces** Thaxt. (1931), Laboulbeniaceae. 2, C. & S. America. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- Gloeasterostroma** Rick (1938) nom. conf., Russulales. See Rick (*Iheringia Série Botânica* 4: 116, 1959).
- Gloeocalyx** Masee (1901) = *Plectania* fide Korf (*Mycol.* 49: 102, 1957).
- Gloeocantharellus** Singer (1945), Gomphaceae. 3, N. & S. America. See Petersen (*The genera Gomphus and Gloeocantharellus in North America*, 1972), Vasco-P. & Franco-Molano (*Mycotaxon* 91: 87, 2005; Colombian Amazonia).
- Gloeocercospora** D.C. Bain & Edgerton ex Deighton (1971) = *Microdochium* fide Rawla (*TBMS* 60: 283, 1973; comparison with *Ramulispora*), Braun (*Monogr. Cercosporaella, Ramularia Allied Genera (Phytopath. Hyphom.)* 1, 1995), Heo *et al.* (*Pl. Path. J.* 15: 242, 1999; Korea).
- Gloeocorticium** Hjortstam & Ryvarden (1986), Cyphellaceae. 1, Argentina. See Hjortstam & Ryvarden (*Mycotaxon* 25: 551, 1986).
- Gloeocoryneum** Weindlm. (1964) = *Leptomelanconium* fide Morgan-Jones (*CJB* 49: 1011, 1971).
- Gloeocybe** Earle (1909) = *Lactarius* fide Singer (*Agaric. mod. Tax.*, 1951).
- Gloeocystidiellaceae** Jülich (1982) = *Stereaceae*.
- Gloeocystidiellum** Donk (1931), *Stereaceae*. 7, widespread. *Sensu lato* 68 spp. See Donk (*Fungus Wageningen* 26: 8, 1956), Eriksson & Ryvarden (*Cortic. N. Europ.* 3: 405, 1975; key 10 Eur. spp.), Stalpers (*Stud. Mycol.* 40: 59, 1996; key), Larsson & Larsson (*Mycol.* 95: 1037, 2003; phylogeny).
- Gloeocystidiopsis** Jülich (1982) = *Gloiothela* fide Hjortstam & Larsson (*Windahlia* 21, 1994).
- Gloeocystidium** P. Karst. (1889) = *Dacryobolus* fide Donk (*Persoonia* 3: 199, 1964).
- gloeocystidium**, see *cystidium*.
- Gloeodes** Colby (1920), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, widespread. *G. pomigena* (sooty blotch of apple and citrus). See Williamson & Sutton (*Pl. Dis.* 84: 714, 2000), Grabowski (*Phytopathologia Polonica* 34: 5, 2004; Poland), Williamson *et al.* (*Mycol.* 96: 885, 2004).
- Gloeodiscus** Dennis (1961), ? Dothideomycetes. 1, New Zealand. See Dennis (*Kew Bull.* 15: 319, 1961).
- Gloeodontia** Boidin (1966), *Stereaceae*. 5, widespread. See Burdsall & Lombard (*Mem. N. Y. bot. Gdn* 28: 16, 1976), Stalpers (*Stud. Mycol.* 40: 59, 1996; key), Larsson & Larsson (*Mycol.* 95: 1037, 2003; phylogeny).
- Gloeoglossum** E.J. Durand (1908) = *Geoglossum* fide Nannfeldt (*Ark. Bot.* 30A no. 4: 1, 1942).
- Gloeohaustoriales**. Ordinal name proposed by Heim (*BSMF* 67: 354, 1951) for *Antennopsis*, *Muiaria*, *Muiogone* and *Chantransiopsis*.
- Gleoheppia** Gyeln. (1935), *Gleoheppiaceae* (L.). 4, widespread (desert areas). See Henssen (*Lichenolo-*

- gist 27: 261, 1995), Schultz & Büdel (*Lichenologist* 34: 39, 2002), Schultz (*Bryologist* 110: 286, 2007; USA).
- Gloeheppiaceae** Henssen (1995), Lichinales (L). 3 gen., 8 spp.
Lit.: Henssen (*Lichenologist* 27: 261, 1995).
- Gloehypochnium** (Parmasto) Hjortstam (1987), Russulales. 1, widespread. See Hjortstam (*Mycotaxon* 28: 19, 1987), Larsson (*Mycol.* 95: 1037, 2004; phylogeny).
- Gloeolecta** Lettau (1937) = *Bryophagus* fide Hawksworth *et al.* (*Lichenologist* 12: 1, 1980).
- Gloeomucro** R.H. Petersen (1980), Hydnaceae. 9, widespread. See Petersen (*Mycol.* 72: 301, 1980).
- Gloeomucronaceae** Jülich (1982) = Hydnaceae.
- Gloeomyces** Sheng H. Wu (1996), Stereaceae. 3, Taiwan; Japan. See Wu (*Mycotaxon* 58: 47, 1996), Larsson & Larsson (*Mycol.* 95: 1037, 2003; phylogeny).
- Gloeopeniophora** Höhn. & Litsch. (1907) = *Peniophora* fide Eriksson *et al.* (*Cortic. N. Europ.* 5, 1978; as subgen.).
- Gloeopeniophorella** Rick (1934) nom. dub., Russulales.
- Gloeopeziza** Zukal (1891), Helotiaceae. 2 or 4 (on *Hepaticae*), widespread. See Döbbeler (*Sydowia* 38: 41, 1986), Döbbeler (*Sendtnera* 3: 103, 1996).
- Gloeophyllaceae** Jülich (1982), Gloeophyllales. 7 gen. (+ 12 syn.), 31 spp.
Lit.: Hof (*Some Wood-Destroying Basidiomycetes* 1: 55, 1981), Corner (*Beih. Nova Hedwigia* 86: 265 pp., 1987), Jung (*Bibliotheca Mycol.* 119: 260 pp., 1987), Chamuris (*Mycol. Mem.* 14: 247 pp., 1988), Hjortstam & Ryvarden (*Mycotaxon* 37: 55, 1990), Nakasone (*Mycol. Mem.* 15: 412 pp., 1990), Nakasone (*Mycol.* 82: 622, 1990), Ryvarden & Gilbertson (*Syn. Fung.* 6: 387 pp., 1993), Ginns (*Mycol.* 90: 19, 1998), Thorn *et al.* (*Mycol.* 92: 241, 2000), Hibbett & Donoghue (*Syst. Biol.* 50: 215, 2001), Adair *et al.* (*FEMS Microbiol. Lett.* 211: 117, 2002), Binder & Hibbett (*Mol. Phylogen. Evol.* 22: 76, 2002), Schmidt *et al.* (*Z. Mykol.* 68: 141, 2002), Yuan *et al.* (*Mycosystema* 23: 173, 2004), Binder *et al.* (*Systematics and Biodiversity* 3: 113, 2005), Moreth & Schmidt (*Holzforschung* 59: 90, 2005).
- Gloeophyllales** Thorn (2007). Agaricomycetes. 1 fam., 8 gen., 33 spp. Fam.:
Gloeophyllaceae
 For *Lit.* see under fam.
- Gloeophyllum** P. Karst. (1882), Gloeophyllaceae. 13, widespread. See David & Fiasson (*Bull. mens. Soc. linn. Lyon* 46: 304, 1977; chemotaxonomy), Corner (*Beih. Nova Hedwigia* 86: 61, 1987; key Malaysia spp.), Schmidt *et al.* (*Z. Mykol.* 68: 141, 2002; species in buildings), Yuan *et al.* (*Mycosystema* 23: 173, 2004; China).
- Gloeoporus** Mont. (1842), Meruliaceae. 26, widespread. See David (*BSMF* 88: 209, 1972), Coelho *et al.* (*Mycol.* 98: 821, 2006; Brazil).
- Gloeopyrenia** Zschacke (1937) = *Protothelenella* fide Mayrhofer (*Herzogia* 7: 313, 1987), Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Gloeoradulum** Rick (1959) nom. dub., Agaricomycetes.
- Gloeosebacina** Neuhoff (1924) = *Stypella* fide Donk (*Persoonia* 4: 178, 1966).
- Gloeosoma** Bres. (1920) = *Aleurodiscus* fide Lemke (*CJB* 42: 213, 1964).
- Gloeosporidiella** Petr. (1921), anamorphic *Drepanopeziza*, Cac.0eH.15. 12, widespread. See Rimpau (*Phytopath. Z.* 43: 257, 1962), Constantinescu *et al.* (*Mycotaxon* 94: 175, 2005; Sweden).
- Gloeosporidiellaceae** Melnik (1986) = Dermateaceae.
- Gloeosporidina** Petr. (1921), anamorphic *Apiognomonia*, Cac.0eH.15. 7, widespread. See Sutton & Pollack (*Mycol.* 65: 1125, 1973), Kubono (*TMSJ* 34: 261, 1993), Kubono *et al.* (*Mycoscience* 35: 279, 1994; *Stromatinia* teleomorph), Butin & Kehr (*Eur. J. For. Path.* 28: 297, 1998; *Apiognomonia* teleomorph), Yuan *et al.* (*Pl. Dis.* 84: 510, 2000; on *Eucalyptus*, Australia).
- Gloeosporidium** Höhn. (1916) = *Discula* fide von Arx (*Bibliotheca Mycol.* 24, 1970).
- Gloeosporiella** Cava (1892), anamorphic *Pezizomycotina*, Hsp.1bH.1. 1, Europe. See Sutton (*Nova Hedwigia* 25: 163, 1974).
- Gloeosporina** Höhn. (1916) = *Asteroma* fide Sutton (*Mycol. Pap.* 141, 1977).
- Gloeosporiopsis** Speg. (1910) = *Colletotrichum* fide Petrak & Sydow (*Annls mycol.* 33: 178, 1935).
- Gloeosporium** Desm. & Mont. (1849) = *Marssonina*. Used for many very diverse fungi, v. Arx (1970) lists 735 names and refers 288 to the *Colletotrichum* anamorph of *Glomerella cingulata* and others to 48 other gen. For the plant pathogens *G. album*, see *Phlyctema*; *G. concentricum*, *Cylindrosporium*; *G. musarum*, *Colletotrichum*; *G. perennans*, *Cryptosporiopsis*. fide von Arx (*Bibliotheca Mycol.* 24: 203 pp., 1970).
- Gloeostereum** S. Ito & S. Imai (1933), Cyphellaceae. 1, Japan. See Petersen & Parmasto (*MR* 97: 1213, 1993).
- Gloeosynnema** Seifert & G. Okada (1988), anamorphic *Agaricomycetes*, Hsy.0eH.21. 1 (with clamp connections), Indonesia; Japan. See Seifert & Okada (*Mycotaxon* 32: 471, 1988).
- Gloeotinia** M. Wilson, Noble & E.G. Gray (1954), Helotiales. Anamorph *Endoconidium*. 1, widespread. *G. granigena*; blind seed disease of grass seed. See Wilson *et al.* (*TBMS* 37: 29, 1954), Griffiths (*TBMS* 41: 461, 1958; sexuality), Hardison (*Mycol.* 54: 201, 1962; hosts), Schumacher (*Mycotaxon* 8: 125, 1975; nomencl.), Holst-Jensen *et al.* (*Mycol.* 89: 885, 1997; nuclear rDNA phylogeny), Alderman (*Mycol.* 90: 422, 1998; species separation).
- Gloeotrochila** Petr. (1947) = *Cryptocline* fide von Arx (*Verh. K. ned. Akad. Wet. Amst. C* 51: 24, 1957).
- Gloeotromera** Ervin (1956) = *Ductifera* fide Wells (*Mycol.* 50: 407, 1958).
- Gloeotulasnella** Höhn. & Litsch. (1908) = *Tulasnella* fide Olive (*Mycol.* 49: 668, 1957).
- Gloiocephala** Masee (1892), Physalacriaceae. 30, widespread. See Antonín (*Fungus Flora of tropical Africa* 1, 2007).
- Gloiodon** P. Karst. (1879), ? Bondarzewiaceae. 3, Europe. See Maas Geesteranus (*Proc. K. ned. Akad. Wet. C* 66: 430, 1963), Stalpers (*Stud. Mycol.* 40: 78, 1996; key), Desjardin & Ryvarden (*Sydowia* 55: 153, 2003; monogr.).
- Gloiosphaera** Höhn. (1902), anamorphic *Pezizomycotina*, Hso.0eH.15. 2, Europe; N. America. See Wang (*Mycol.* 63: 890, 1971), Pollack & McKnight (*Mycol.* 64: 415, 1972).
- Gloiosporae**, having slimy spores. Cf. *Xerosporae*. See Wakefield & Bisby (*TBMS* 25: 50, 1941).
- Gloiiothelaceae** Boidin, Mugnier & Canales (1998) = Stereaceae.

Gloiothele Bres. (1920), Peniophoraceae. 6, widespread. See Ginns & Freeman (*Bibliotheca Mycol.* 157, 1994), Legon & Pegler (*Mycologist* 16: 177, 2002; *Gloiothele lactescens*), Larsson & Larsson (*Mycol.* 95: 1037, 2003; phylogeny).

Glomeraceae Piroz. & Dalpé (1989), Glomerales. 2 gen. (+ 5 syn.), 86 spp.

Lit.: Pirozynski & Dalpé (*Symbiosis* 7: 1, 1989), Morton & Benny (*Mycotaxon* 37: 471, 1990; key), Azcon-Aguilar & Barea (*Mycorrhiza* 6: 457, 1996), van der Heijden *et al.* (*Nature Lond.* 396: 69, 1998), Schüßler *et al.* (*MR* 105: 1413, 2001), Walker & Schüssler (*MR* 108: 982, 2004), Redecker (*Glomeromycota* Arbuscular mycorrhizal fungi and their relative(s). Version 01 July 2005. <http://tolweb.org/Glomeromycota/28715/2005.07.01> in The Tree of Life Web Project, <http://tolweb.org>: [unpaginated], 2005).

Glomerales J.B. Morton & Benny (1990). Glomeromycetes. 1 fam., 2 gen., 86 spp. Endomycorrhizal on plants. Fam:

Glomeraceae

Morton & Benny (*Mycotaxon* 37: 471, 1990; rev., keys) recognized two suborders: *Glomineae* for the vesicular-arbuscular mycorrhiza (VAM) forming (1) and (2), and *Gigasporineae* for the arbuscular mycorrhiza forming (3) but inconsistent with molecular phylogeny, see Schwarzott *et al.* (*Mol. Phylog. Evol.* 21: 190, 2001).

Lit.: Thaxter (*Proc. Am. Acad. Arts & Sci.* 57: 291, 1922; sporocarpic spp.), Gerdemann & Trappe (*Mycol. Mem.* 5, 1974; rev.), Walker (*Mycotaxon* 18: 443, 1983; spore wall morphology [murograph]), Powell & Bagyaraj (*VA Mycorrhiza*, 1984; review), Burdett *et al.* (*CJB* 62: 2128, 1984; arbuscule staining), Berch (*Front. Appl. Microbiol.* 2: 161, 1986; review), Silvia & Hubbell (*Symbiosis* 1: 259, 1986; aeroponic culture), Bonfonte-Falso (*Symbiosis* 3: 249, 1987; review), Stubblefield & Taylor (*New Phytol.* 108: 3, 1988; palaeomycology), Jabaji-Hare (*Mycol.* 80: 622, 1988; lipid & fatty acid profiles), Morton (*Mycotaxon* 32: 267, 1988, checklist 126 spp. and classific., 37: 493, 1990; evolution, *Mycol.* 82: 192, 1990; phylogeny, *Mycorrhiza* 2: 97, 1993; review), Pirozynski & Dalpé (*Symbiosis* 7: 1, 1989; rev. & palaeomycology), Schenck & Pérez (*Manual for the identification of VA mycorrhizal fungi*, 3rd edn, 1990), Allen (*The evolution of mycorrhizae*, 1991; *Mycorrhizal functioning*, 1992), Bruns *et al.* (*Mol. Phylog. Evol.* 1: 231, 1992; phylogeny), Millner & Kitt (*Mycorrhiza* 2: 9, 1992; soil-less culture), Streussy (*Mycorrhiza* 1: 113, 1992; phylogeny), Read *et al.* (*Mycorrhizas in ecosystems*, 1992), Morton *et al.* (*Mycotaxon* 48: 491, 1993; INVAM culture collection), Maia *et al.* (*Mycol.* 85: 323, 1993; fixation & embedding), Simon *et al.* (*Nature* 363: 67, 1993; phylogeny), Walker & Trappe (*MR* 97: 339; names & epithets), Sancholle & Dalpé (*Mycotaxon* 49: 187, 1993; fatty acids), Hass *et al.* (*Am. J. Bot.* 81: 29, 1994; palaeomycology), Giovannetti & Gianinazzi-Pearson (*MR* 98: 705, 1994; review), Gianinazzi-Pearson *et al.* (*Mycol.* 86: 478, 1994; wall chemistry & phylogeny), Morton & Bentivegna (*Plant & Soil* 159: 47, 1994; taxonomy), Bentivegna & Morton (*in* Piegler & Linderman (Eds), *Mycorrhizae and plant health*: 283, 1983; systematics), Robson *et al.* (*Management of mycorrhizas in agriculture, horticulture, and forestry*, 1994), Gianinazzi & Schüepp (Eds)

(*Impact of arbuscular mycorrhizas on sustainable agriculture and natural ecosystems*, 1994; taxonomy, biodiversity, Eur. culture collection), Mehrotra & Bajjal (*in* Devivedi & Pandey (Eds), *Biotechnology In India*, p. 227, 1994), Morton *et al.* (*in* Varma & Hock (Eds), *Mycorrhiza: structure, function, molecular biology and biochemistry*: 669, 1995, *CJB* 73(suppl. 1): S25, 1995; diversity), Yao *et al.* (*Kew Bull.* 50: 349, 1995), Clapp (Ed.) (*Species diagnostics protocols (Meth. Mol. Biol.* 50), 1996), Dodd & Rosendahl (*Mycorrhizae* 6: 275, 1996; identification system), Phipps & Taylor (*Mycol.* 88: 707, 1996; fossils), Remy *et al.* (*Proc. Nat. Acad. Sci. USA* 91: 11841, 1994; paleomycology), Sbrana *et al.* (*MR* 99: 1249, 1995; biochemistry), Sanders *et al.* (*New Phytol.* 133: 123, 1996; genetic diversity), Simon (*New Phytol.* 133: 95, 1996; phylogeny), Linder (*in* Carroll & Tudzynski (Eds), *The mycota* 6B, p. 117, 1997; review), Mehrotra (*Mycorrhiza News* 9: 1, 1997), Hosny *et al.* (*Fung. Gen. Biol.* 22: 103, 1997; DNA base composition), Redecker *et al.* (*Appl. Microbiol.* 63: 1756, 1997; identification, *Fung. Genet. Biol.* 28: 238, 1999; phylogeny, *Mol. Phylog. Evol.* 14: 276, 2000; phylogeny, *Science* 289: 1884, 2000; phylogeny), Sanders (*Progr. Microbiol. Ecol.*, p. 77, 1997; biodiversity), Smith & Read (*Mycorrhizal Symbiosis*, 2nd ed.), Varma (Ed.) (*Mycorrhiza manual*, 1998), Wu & Lin (*Technical Manual Mycorrhizal Fungi*, 1998), Blackwell (*Science* 289: 1884, 2000; phylogeny).

Glomerella Spauld. & H. Schrenk (1903), Glomerellaceae. Anamorph *Colletotrichum*. c. 11 (necrotrophic on plants), widespread (esp. tropical). *G. cingulata* on many hosts (*CMI Descript.* 315, 1971); *G. acutata* on many hosts, *G. tucumanensis* on sugarcane. See Sutton *in* Bailey & Jeger (Eds) (*Colletotrichum: Biology, Pathology and Control*: 1, 1992; review), Uecker (*Mycol.* 86: 82, 1994; ontogeny), Johnston & Jones (*Mycol.* 89: 420, 1997; DNA), Cannon *et al.* *in* Prusky *et al.* (Eds) (*Colletotrichum: Host Specificity, Pathology and Host-Pathogen Interaction*: 1, 2000; sp. concepts), Guerber & Correll (*Mycol.* 93: 216, 2001; *G. acutata*), Rodríguez-Guerra *et al.* (*Mycol.* 97: 793, 2005; *G. lindemuthianum*), Cook *et al.* (*MR* 110: 672, 2006; *G. truncata*), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).

Glomerellaceae Locq. ex Seifert & W. Gams (2007), Hypocreomycetidae (inc. sed.). 2 gen. (+ 23 syn.), 71 spp.

Lit.: Sutton (*Colletotrichum: Biology, Pathology and Control*: 1, 1992), Sivanesan & Hsieh (*MR* 97: 1523, 1993), Uecker (*Mycol.* 86: 82, 1994), Johnston & Jones (*Mycol.* 89: 420, 1997), Silva-Hanlin & Hanlin (*MR* 103: 153, 1999), García Muñoz *et al.* (*Mycol.* 92: 488, 2000), Prusky *et al.* (*Host specificity, Pathology, and Host-Pathogen Interactions of Colletotrichum*: 400 pp., 2000), Guerber & Correll (*Mycol.* 93: 216, 2001), Abang *et al.* (*Pl. Path.* 51: 63, 2002), Guerber *et al.* (*Mycol.* 95: 872, 2003), Lu *et al.* (*MR* 108: 53, 2004), Lubbe *et al.* (*Mycol.* 96: 1268, 2004), Du *et al.* (*Mycol.* 97: 641, 2005), Farr *et al.* (*MR* 110: 1395, 2006), Zhang *et al.* (*Mycol.* 98: 1076, 2006).

Glomerilla Norman (1869), ? Verrucariaceae (?L). 1, Norway.

Glomerillaceae Norman (1869) = Verrucariaceae.

Glomerobolus Kohlm. & Volkm.-Kohlm. (1996), anamorphic *Stictidaceae*, Hso.?.?. 1, USA. See

- Kohlmeyer & Volkmann-Kohlmeyer (*Mycol.* **88**: 329, 1996), Schoch *et al.* (*MR* **110**: 257, 2006; phylogeny, dispersal).
- Glomeromycetes** Caval.-Sm. (1998), Glomeromycota. 4 ord., 9 fam., 12 gen., 169 spp. Ords:
- (1) **Archaeosporales**
 - (2) **Diversisporales**
 - (3) **Glomerales**
 - (4) **Paraglomerales**.
- For *Lit.* see ord. and fam.
- Glomeromycota** C. Walker & A. Schüssler (2001), Glomeromycota. 4 ord., 9 fam., 12 gen., 169 spp. Ords:
- (1) **Archaeosporales**
 - (2) **Diversisporales**
 - (3) **Glomerales**
 - (4) **Paraglomerales**.
- For *Lit.* see ord. and fam.
- glomerospore**, an asexual reproductive structure [in *Glomeromycota*] formed at the end of a subtending hyphae, or a bulbous sporogenous cell, or from a sporiferous saccule, in this case with lateral or intercalary position, with or without a germinative component, presenting or not a germinal shield or orb, typically formed by fungi that form an arbuscular mutualistic symbiosis with most terrestrial plants (see Gotoa & Maia, *Mycotaxon* **96**: 129, 2006).
- Glomerula** Bainier (1903) = *Actinomucor* fide Heseltine (*Mycol.* **47**: 344, 1955).
- Glomerularia** H. Karst. (1849) = *Gonatobotrys* fide Henderson (*Notes R. bot. Gdn Edinb.* **23**: 497, 1961).
- Glomerularia** Peck (1879) = *Glomopsis*.
- Glomerulomyces** A.I. Romero & S.E. López (1989), anamorphic *Agaricomycetes*, Hso.0eH.6. 1 (with clamp connexions), Argentina. See Romero & López (*Mycotaxon* **34**: 432, 1989).
- glomerulus (glomerule)**, a clump or cluster; frequently used for clusters of photobiont cells in lichens.
- Glomites** T.N. Taylor, W. Remy, Hass & Kerp (1995), Fossil Fungi. 1 (Devonian), Scotland. See Taylor *et al.* (*Mycol.* **87**: 561, 1995).
- Glomopsis** D.M. Hend. (1961), anamorphic *Herpo-basidium*. 2, USA. See Donk (*Persoonia* **4**: 213, 1966), Mel'nik & Sheiko (*Nov. sist. Niz. Rast.* **35**: 90, 2001; Russia).
- Glomorphites** García Massini (2007), Fossil Fungi. 1. See García Massini, J.L. (*Int. J. Pl. Sci.* **168**: 673, 2007).
- Glomospora** D.M. Hend. (1961), anamorphic *Platy-gloeaceae*. 1, British Isles. See Henderson (*Notes R. bot. Gdn Edinb.* **23**: 497, 1961).
- Glomosporiaceae** Cif. (1963), Urocystidales. 3 gen. (+ 5 syn.), 59 spp.
- Lit.*: Hughes (*Mycol.* **68**: 693, 1976), Vánky & Berbee (*Mycotaxon* **33**: 281, 1988), Vánky (*Trans. Mycol. Soc. Japan* **32**: 145, 1991), Bauer *et al.* (*CJB* **75**: 1273, 1997), Begerow *et al.* (*CJB* **75**: 2045, 1998), Piepenbring *et al.* (*Protoplasma* **204**: 202, 1998), Vánky (*Mycotaxon* **70**: 35, 1999), Begerow *et al.* (*MR* **104**: 53, 2000), Andrade *et al.* (*Phytopathology* **94**: 875, 2004).
- Glomosporium** Kochman (1939) = *Thecaphora*.
- Glomus** Tul. & C. Tul. (1845), Glomeraceae. c. 85, widespread. Genus is non-monophyletic. See Gerde-mann & Trappe (*Mycol. Mem.* **5**, 1974), Berch & Fortin (*CJB* **61**: 2608, 1983), Berch & Fortin (*CJB* **62**: 170, 1984), Jabaji-Hare *et al.* (*Mycol.* **76**: 1024, 1984; lipid composition), Morton (*Mycol.* **77**: 192, 1985; morphological variation), Bonfante-Fasolo *et al.* (*Biol. Cell* **57**: 265, 1986; chitin in cell wall), Bonfante-Fasolo & Schubert (*CJB* **65**: 539, 1987; spore wall ultrastr.), Koske & Gemma (*Mycol.* **81**: 935, 1989), Koske & Halvorsol (*Mycol.* **81**: 927, 1989), Almeida & Schenk (*Mycol.* **82**: 703, 1990), Schenck & Pérez (*Manual for the Identification of VA Mycorrhizal Fungi*, 1990), Chabot *et al.* (*Mycol.* **84**: 315, 1992; life cycle in root culture), Meier & Charvat (*Int. J. Pl. Sci.* **153**: 541, 1992; ultrastr. spore germ.), Yao *et al.* (*Mycologist* **6**: 132, 1992; ultrastr.), Wu & Silvia (*Mycol.* **85**: 317, 1993; spore ontogeny), Błaszkowski (*Mycorrhiza* **4**: 201, 1994), Cabello *et al.* (*Mycotaxon* **51**: 123, 1994), Gaspar *et al.* (*Mycotaxon* **51**: 129, 1994; lipid & fatty acid composition), Maia & Kimbrough (*Int. J. Pl. Sci.* **155**: 689, 1994; ultrastr.), Miller & Jeffries (*MR* **98**: 307, 1994; spore wall ultrastr.), Błaszkowski (*Mycol.* **87**: 732, 1995), Lanfranco *et al.* (*Mol. Ecol.* **4**: 61, 1995; identification), Walker *et al.* (*MR* **99**: 1500, 1995), Yao *et al.* (*Kew Bull.* **50**: 349, 1995), Dodd *et al.* (*New Phytol.* **133**: 113, 1996; genetic variation), Lloyd-Macgilp *et al.* (*New Phytol.* **133**: 103, 1996; genetic diversity), Morton (*Mycorrhiza* **6**: 161, 1996), Pfeiffer *et al.* (*Mycotaxon* **59**: 383, 1996), Spain *et al.* (*Mycotaxon* **60**: 137, 1996), Bentivenga *et al.* (*Am. J. Bot.* **84**: 1211, 1997; genetic variation), Błaszkowski (*Mycol.* **89**: 339, 1997), Błaszkowski & Tadych (*Mycol.* **89**: 804, 1997), Morton *et al.* (*MR* **101**: 625, 1997; synanamorph), Strullu *et al.* (*C.R. Acad. Sci. Paris Sér. III* **320**: 41, 1997; life cycle), Stürmer & Morton (*Mycol.* **89**: 72, 1997; development), Zhang *et al.* (*Mycosystema* **16**: 241, 1997), Maia & Kimbrough (*Int. J. Pl. Sci.* **159**: 581, 1998; ultrastr.), Sawaki *et al.* (*Mycoscience* **39**: 477, 1998; phylogeny & synanamorph), Vandenkoornhuyse & Leyval (*Mycol.* **90**: 791, 1998; genetic diversity), Walker & Vestberg (*Ann. Bot.* **82**: 601, 1998; synonymy), Schwarzott *et al.* (*Mol. Phylog. Evol.* **21**: 190, 2001; polyphyletic), Błaszkowski *et al.* (*Mycotaxon* **90**: 447, 2004; n.sp.), Błaszkowski *et al.* (*MR* **110**: 555, 2006; n.sp.), Redecker & Raab (*Mycol.* **98**: 885, 2006; phylogeny).
- Gloniella** Sacc. (1883), Hysteriaceae. 9, widespread (temperate). See Zogg (*Beitr. Kryptfl. Schweiz* **11** no. 3, 1962), Sivanesan *et al.* (*TBMS* **90**: 665, 1988; Indian spp.), Steinke & Hyde (*Mycoscience* **38**: 7, 1997; S. Africa), Lorenzo & Messuti (*MR* **102**: 1101, 1998; S. America), Checa *et al.* (*Mycol.* **99**: 285, 2007; Costa Rica).
- Gloniopsis** De Not. (1847), Hysteriaceae. 2 or 3, widespread (temperate). See Zogg (*Beitr. Kryptfl. Schweiz* **11** no. 3, 1962), Lorenzo & Messuti (*MR* **102**: 1101, 1998; S. America), Lee & Crous (*S. Afr. J. Bot.* **69**: 480, 2003; S. Africa), Checa (*Fl. Mycol. Iberica* **6**, 2004; Spain).
- Glonium** Muhl. (1813), Hysteriaceae. Anamorph *Cleistonium*. c. 13, widespread (temperate). See Speer (*BSMF* **102**: 101, 1986), Lorenzo & Messuti (*MR* **102**: 1101, 1998; S. America), Vasil'eva (*Mikol. Fitopatol.* **34**: 3, 2000; Russian Far East), Lee & Crous (*S. Afr. J. Bot.* **69**: 480, 2003; S. Africa), Messuti & Lorenzo (*Nova Hedwigia* **84**: 521, 2007; S. America).
- Glossifungites** Lomnicki (1886), Fossil Fungi. 1 (Cretaceous), Poland.
- Glossodium** Nyl. (1855) = *Icmadophila* fide Rambold *et al.* (*Biblthca Lichenol.* **53**: 217, 1993).
- glossoid cell**, elongate (tongue-shaped) cell containing an elaborate extrusome (*Haptoglossa*).

- Glottia** M. Gauthier ex Manier & Lichtw. (1969), Legeriomycetaceae. 6 (in *Ephemeroptera* and *Plecoptera*), widespread. See Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986), Lichtwardt & Williams (*CJB* 68: 1057, 1990), Williams & Lichtwardt (*CJB* 68: 1045, 1990), White & Lichtwardt (*Mycol.* 96: 891, 2004; Norway).
- glucans**, one of the main constituents of fungal walls. **R-glucans** are alkali insoluble; **S-glucans** are soluble.
- Glugea** Thélohan (1891), Microsporidia. 24.
- Glugoides** J.I.R. Larsson, D. Ebert, J. Vavra & Voronin (1996), Microsporidia. 1. See Larsson *et al.* (*Eur. J. Protist.* 32: 251, 1996).
- Glukomyces** Beij. [not traced] nom. dub., ? Fungi.
- gluten** (1) a substance on the surface of some agarics, etc., which is sticky when wet; (2) spore mass in *Phallus*.
- Glutinaster** Earle (1909) = *Tricholoma* fide Singer (*Agaric. mod. Tax.*, 1951).
- Glutinisporidium** Thor (1930) nom. dub., ? Fungi. 1, Svalbard.
- Glutinium** Fr. (1849), anamorphic *Pezizomycotina*, Hso.?.?. 3, Europe; N. America.
- Glutinoaggar** Sivan. & Watling (1980), anamorphic *Agaricomycetes*. 1 (with clamp connexions), Seychelles. See Sivanesan & Watling (*TBMS* 74: 424, 1980).
- glutinous**, sticky; made up of, or covered with, gluten.
- glyceollin**, a phytoalexin (q.v.) from soybean (*Glycine max*).
- Glycydiderma** Paulet (1808) = *Geastrum*.
- Glycyphila** Mont. (1851), anamorphic *Pezizomycotina*, Hso.?.?. 2, Europe.
- Glyphidaceae** Stizenb. (1862) = *Graphidaceae*.
- Glyphidium** A. Massal. (1860) ? = *Arthonia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Glyphis** Ach. (1814), *Graphidaceae* (L). 5, widespread (esp. tropical). See Pant (*Geophytology* 20: 48, 1991; 2 spp. India), Archer (*Telopea* 10: 589, 2004; Australia), Archer (*Telopea* 11: 59, 2005; Australia), Staiger *et al.* (*MR* 110: 765, 2006; phylogeny).
- Glyphium** Nitschke ex F. Lehm. (1886), *Mytilinidiaceae*. Anamorph *Peyronelia*. 4 or 6, widespread. See Sutton (*TBMS* 54: 255, 1970), Goree (*CJB* 52: 1265, 1974), Vasil'eva (*Mikol. Fitopatol.* 35: 15, 2001; Russian Far East), Lumbsch *et al.* (*Symb. bot. upsal.* 34 no. 1: 9, 2004; phylogeny), Lorenzo & Messuti (*Boln Soc. argent. Bot.* 40: 13, 2005; Argentina), Wedin *et al.* (*MR* 109: 159, 2005; phylogeny), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny).
- Glypholecia** Nyl. (1853), *Acarosporaceae* (L). 5, Europe; N. America. See Hafellner (*Cryptog. bot.* 5: 99, 1995), Lutzoni *et al.* (*Am. J. Bot.* 91: 1446, 2004; phylogeny), Reeb *et al.* (*Mol. Phylogen. Evol.* 32: 1036, 2004; phylogeny), Wedin *et al.* (*MR* 109: 159, 2005; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- glypholecine**, having particularly labyrinth-like lirella as in *Glypholecia*.
- Glypholeciomyces** Cif. & Tomas. (1953) = *Glypholecia*.
- Glyphomyces** Cif. & Tomas. (1953) = *Glyphis*.
- Glyphopeltis** Brusse (1985), ? *Psoraceae* (L). 1, Europe; S. Africa. See Timdal (*Mycotaxon* 31: 101, 1988), Timdal (*Cryptog. Bryol.-Lichénol.* 15: 171, 1994; asci), Egea *et al.* (*Flechten Follmann Contribu-*
- tions to Lichenology in Honour of Gerhard Follmann: 183, 1995).
- Glyptoderma** R. Heim & Perr.-Bertr. (1971), *Agaricaceae*. 1, America (tropical). See Heim & Perreau-Bertrand (*Revue Mycol. Paris* 36: 90, 1971).
- Glyptospora** Fayod (1889) = *Lacrymaria* fide Kuyper (*in litt.*).
- Gnaphalomyces** Opiz = *Lanosa* fide Streinz (*Nom. fung.*: 302, 1862).
- Gnomonia** Ces. & De Not. (1863), *Gnomoniaceae*. Anamorphs *Asteroma*, *Cylindrosporella*, *Discula*, *Leptothyrium*, *Zythia*. 60, widespread. *G. platani* (plane (*Platanus*) scorch). See Bolay (*Ber. schweiz. bot. Ges.* 81: 398, 1972), Barr (*Mycol. Mem.* 7, 1978; key 35 spp.), Monod (*Beih. Sydowia* 9: 1, 1983), Bolay (*Mycotaxon* 41: 287, 1991; N. Am. spp.), Lappalainen & Yli-Mattila (*MR* 103: 328, 1999; RAPDs), Castlebury *et al.* (*Mycol.* 94: 1017, 2002), Sogonov *et al.* (*Sydowia* 57: 102, 2005; type species), Moročko *et al.* (*Eur. J. Pl. Path.* 114: 235, 2006; on *Fragaria*), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny), Green & Castlebury (*MR* 111: 62, 2007; phylogeny, anamorph), Moročko & Fatehi (*MR* 111: 603, 2007; on strawberry).
- Gnomoniaceae** G. Winter (1886) nom. cons., *Diaporthales*. 18 gen. (+ 26 syn.), 204 spp.
Lit.: Barr (*Mycol. Mem.* 7: 1, 1978), Monod (*Beih. Sydowia* 9: 1, 1983), Noordeloos *et al.* (*Persoonia* 14: 47, 1989), Redlin & Rossman (*Mycol.* 83: 200, 1991), Lappalainen & Yli-Mattila (*MR* 103: 328, 1999), Zhang & Blackwell (*Mycol.* 93: 355, 2001), Castlebury *et al.* (*Mycol.* 94: 1017, 2002), Sogonov *et al.* (*Sydowia* 57: 102, 2005), Rossman *et al.* (*Myco-science* 48: 135, 2007; phylogeny), Mejía *et al.* (*MR* 112: 23, 2008; phylogeny).
- Gnomoniella** Sacc. (1881), *Gnomoniaceae*. Anamorphs *Asteroma*, *Discula*. 13, widespread. See Barr (*Mycol. Mem.* 7, 1978), Monod (*Beih. Sydowia* 9: 1, 1983), Redlin & Stack (*Mycotaxon* 32: 175, 1988; on *Fraxinus*), Barr (*Mycotaxon* 41: 287, 1991; N. Am. spp.), Farr *et al.* (*Sydowia* 53: 185, 2001; phylogeny).
- Gnomonina** Höhn. (1917) = *Laestadia*.
- Gnomoniopsis** Berl. (1892) = *Gnomonia* fide Bolay (*Ber. schweiz. bot. Ges.* 81, 1972).
- Gnomoniopsis** Stoneman (1898) = *Glomerella*.
- gnotobiotic** (of cultures), ones in which all the living components are known. Cf. axenic.
- Godal** Adans. (1763) nom. dub., anamorphic *Pezizomycotina*.
- Godfrinia** Maire (1902) = *Hygrocybe* fide Singer (*Agaric. mod. Tax.*, 1951).
- Godronia** Moug. & Lév. (1846), *Helotiaceae*. Anamorphs *Sporonema*, *Topospora*. 27, widespread (north temperate). See Groves (*CJB* 43: 1195, 1965; key), Holm & Holm (*Nordic Jl Bot.* 11: 675, 1991), Verkley (*Nova Hedwigia* 75: 433, 2002; anamorph).
- Godroniella** P. Karst. (1884) = *Myxormia* fide Clements & Shear (*Gen. Fung.*, 1931), Tulloch (*Mycol. Pap.* 130, 1972).
- Godroniopsis** Diehl & E.K. Cash (1929), *Helotiaceae*. Anamorphs *Micropera*, *Sphaeronaema*, *Dichaenopsella*. 2, N. America. See Petrak (*Sydowia* 6: 336, 1952).
- Goidanichia** G. Arnaud (1954) = *Goidanichiella* G. Arnaud ex G.L. Barron.
- Goidanichia** Tomas. & Cif. (1952) = *Staurothele* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

- Goidanichiella** G. Arnaud ex G.L. Barron (1968) = *Haplographium* fide Gams *et al.* (*Mycotaxon* 38: 149, 1990).
- Goidanichiella** G.L. Barron ex W. Gams (1990), anamorphic *Pezizomycotina*, Hso.0eH.15. 2, widespread. See Gams *et al.* (*Mycotaxon* 38: 149, 1990), Hyde *et al.* (*Fungal Diversity* 11: 119, 2002; Brunei).
- Goidanichiomyces** Cif. & Tomas. (1953) = *Goidanichia* Tomas. & Cif.
- Golbergia** J. Weiser (1977), Microsporidia. 1.
- Golgi body**, Dictyosome with large numbers of cisternae which may be visible using light microscopy after staining.
- Golovin** (Petr Nikolaevich; 1897-1968; Russia, later Uzbekistan). Instructor, Salsk District Station of Plant Protection (1925); student, Institute of Plant Pathology, Leningrad (1925-c.1933); Plant Pathologist, Central-Asian Institute of Plant Protection, Tashkent (1930-1933); Senior Lecturer, Plant Anatomy & Morphology and Head of the Mycology Laboratory (1934-1943) then Professor of Non-flowering Plants, Central-Asian State University (1943-1951); Senior Scientist, V.L. Komarov Botanical Institute, Leningrad (1951-1962). Pioneer mycologist in central Asia, exploring the mycota and collecting in the central and western Tien-Shan mountains, the deserts of Kzyl-Kum and Kara-Kum, and the Pamirs (1934-1950); also significant work on the *Erysiphaceae*. Specimens are in the fungal reference collection, V.L. Komarov Botanical Institute, St Petersburg (LE). *Publs.* [*Fungus Flora in Central Asia. Parasitic Fungi in Central Asia*] (1949) [in Russian]; [Monographic survey on the genus *Leveillula* Arnaud (Parasitic fungi ? fam. *Erysiphaceae*)] and [Material for a monograph of the parasitic fungi (family *Erysiphaceae*) in the USSR]. *Notulae Systematicae e Sectione Cryptogamica Instituti Botanicae Nomine V.L. Komarovii Academiae Scientiarum, USSR* (1956) [in Russian]. *Biogs, obits etc.* Gorlenko & Dunin ([*Mikologiya i Fitopatologiya*] 3: 94, 1969) [portrait [in Russian]].
- Golovinina** Mekht. (1967) = *Drechslerella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Golovinomyces** (U. Braun) V.P. Gelyuta (1988), *Erysiphaceae*. Anamorph *Oidium* subgen. *Reticoloidium*. 32, widespread. *G. cichoracearum* (mildew of composites). See Braun (*Beih. Nova Hedwigia* 89, 1987; key; as *Erysiphe* sect. *Golovinomyces*), Bardin *et al.* (*Pl. Path.* 48: 531, 1999; genetic variation, as *Erysiphe*), Braun (*Schlechtendalia* 3: 48, 1999; generic taxonomy), Cherepanov (*Mikol. Fitopatol.* 35: 71, 2001; Russia, key), Vakalounakis & Klironomou (*Mycotaxon* 80: 489, 2001; on cucurbits), Matsuda & Takamatsu (*Mol. Phylogen. Evol.* 27: 314, 2003; host-parasite relations), Takamatsu & Matsuda (*Mycoscience* 45: 340, 2004; evolution), Cunnington *et al.* (*Australas. Pl. Path.* 34: 51, 2005; on *Solanaceae*, Australia), Takamatsu *et al.* (*MR* 110: 1093, 2006; evolution), Voytyuk *et al.* (*Mycol. Balcanica* 3: 131, 2006; Israel), Takamatsu *et al.* (*MR* 112: 299, 2008; phylogeny).
- Gomezina** Chardón & Toro (1934) = *Aphanostigme* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Gomphaceae** Donk (1961), Gomphales. 13 gen. (+ 17 syn.), 287 spp.
Lit.: Corner (*Ann. Bot. Mem.* [A monograph of *Clavaria* and allied genera] 1: 1, 1950), Donk (*Persoonia* 3: 199, 1964), Corner (*Beih. Nova Hedwigia* 33: 1, 1970), Marr & Stuntz (*Bibliotheca Mycol.* 38: 232 pp., 1973), Petersen (*Bibliotheca Mycol.* 43: 161 pp., 1975), Petersen (*Bibliotheca Mycol.* 79: 261 pp., 1981), Parmasto & Ryvarden (*Windahlia* 18: 35, 1988), Núñez & Ryvarden (*Sydowia* 46: 321, 1994), Pine *et al.* (*Mycol.* 91: 944, 1999), Villegas *et al.* (*Mycotaxon* 70: 127, 1999), Humpert *et al.* (*Mycol.* 93: 465, 2001), Hibbett & Binder (*Proc. R. Soc. Lond. B. Biol. Sci.* 269: 1963, 2002), Binder *et al.* (*Systematics and Biodiversity* 3: 113, 2005), Nouhra *et al.* (*Mycorrhiza* 15: 55, 2005).
- Gomphales** Jülich (1981). Phallomycetidae. 3 fam., 18 gen., 336 spp. Fams:
(1) **Clavariadelphaceae**
(2) **Gomphaceae**
(3) **Lentariaceae**
Lit.: Villegas *et al.* (*Fungal Diversity* 18: 157, 2005; spore characters).
- Gomphidiaceae** Maire ex Jülich (1982), Boletales. 4 gen. (+ 3 syn.), 30 spp. Associated with ectomycorrhizas of members of *Suillaceae* and *Rhizopogonaceae*, always in association with *Pinaceae* (north temperate). Autonomy of families in the suilloid clade (*Gomphidiceae*, *Rhizopogonaceae*, *Suillaceae*) is fairly weak, and the three families are maintained in the present edition for convenience only.
Lit.: Miller (*Mycol.* 63: 1129, 1971), Agerer (*Nova Hedwigia* Beih. 53: 127, 1991), Greselin (*Boll. Gruppo Micol. 'G. Bresadola'* 34: 56, 1991), Besl & Bresinsky (*Pl. Syst. Evol.* 206: 223, 1997), Miller & Aime (*Trichomyces and Other Fungal Groups, Robert W. Lichwardt Commemoration Volume*: 315, 2001), Miller *et al.* (*Mycol.* 94: 1044, 2002), Miller (*Mycol.* 95: 176, 2003), Watling (*Edinb. J. Bot.* 61: 41, 2004).
- Gomphidius** Fr. (1836), Gomphidiaceae. 10, widespread (esp. north temperate). See Watling (*British Fungus Flora* 1: 77, 1970; key), Miller (*Mycol.* 63: 1129, 1971; key), Singer (*Taxon* 22: 445, 1973; typification), Agerer (*Beih. Nova Hedwigia* 53: 127, 1991; ecology), Miller & Aime (*Mycol.* 94: 1044, 2002; new spp.), Miller (*Mycol.* 95: 176, 2003).
- Gomphillaceae** Walt. Watson ex Hafellner (1984), Ostropales (L). 23 gen. (+ 21 syn.), 318 spp.
Lit.: Vězda & Poelt (*Folia geobot. phytotax.* 22: 179, 1987), Kalb & Vězda (*Bibliotheca Lichenol.* 29: 80 pp., 1988; 43 spp. neotrop.), Lücking (*Bibliotheca Lichenol.* 65: 109, 1997; Costa Rica), Denetiere & Péroni (*Cryptog. Bryol.-Lichénol.* 19: 105, 1998; phylogeny), Lücking *et al.* (*Mycol.* 96: 283, 2004; phylogeny), Lücking *et al.* (*Bryologist* 110: 622, 2007; N America).
- Gomphillus** Nyl. (1855), Gomphillaceae (L). 4, widespread. See Kalb & Vězda (*Bibliotheca Lichenol.* 29, 1988), Lücking (*Bibliotheca Lichenol.* 65: 109, 1997; Costa Rica), Buck in Glenn *et al.* (Eds) (*Lichenogr. Thomsoniana*: 71, 1998), Denetiere & Péroni (*Cryptog. Bryol.-Lichénol.* 19: 105, 1998; phylogeny), Lücking *et al.* (*Mycol.* 96: 283, 2004; phylogeny), Ferraro & Lücking (*Bryologist* 108: 491, 2005; Americas), Lücking *et al.* (*Lichenologist* 37: 123, 2005; phylogeny), Lücking *et al.* (*Bryologist* 110: 622, 2007; N America).
- Gomphinaria** Preuss (1851) = *Acrotheca* fide Saccardo (*Syll. fung.* 4: 277, 1886).
- Gomphogaster** O.K. Mill. (1973), Gomphidiaceae. 1, USA. See Miller (*Mycol.* 65: 227, 1973).
- Gomphora** Fr. (1825) = *Gomphus* Pers. fide Petersen

- (The genera *Gomphus* and *Gloeocantharellus* in North America, 1972).
- Gomphos** Kuntze (1891) $\equiv$ Cortinarius.
- Gomphospora** A. Massal. (1852) ? = *Schismatomma* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Gomphus** (Fr.) Weinm. (1826) $\equiv$ Gomphidius.
- Gomphus** Pers. (1797), Gomphaceae. 10, widespread (temperate). See Petersen (*The genera Gomphus and Gloeocantharellus in North America*, 1972).
- Gonapodya** A. Fisch. (1892), Gonapodyaceae. 2, widespread (temperate). See Karling (*Chytriomyc. Iconogr.*, 1977), Noyes Mollione & Longcore (*Mycol.* 91: 727, 1999; ultrastr.), Gandhe & Kurne (*Zoos' Print Journal* 20: 2059, 2006; reproduction).
- Gonapodyaceae** H.E. Petersen ex P.M. Kirk, P.F. Cannon & J.C. David (2001), Monoblepharidales. 2 gen., 7 spp.
Lit.: Mollicone & Longcore (*Mycol.* 91: 727, 1999), Noyes Mollicone & Longcore (*Mycol.* 91: 727, 1999), Steciow *et al.* (*Boln Soc. argent. Bot.* 36: 203, 2001), Bullerwell *et al.* (*Nucl. Acids Res.* 31: 1614, 2003).
- Gonatobotrydiaceae** Nann. (1934) = Ceratostomataceae.
- Gonatobotrys** Corda (1839), anamorphic *Melanospora*, Hso.0-1eH.8. 2 (fungicolous), widespread. See Whaley & Barnett (*Mycol.* 55: 199, 1963; *G. simplex* on *Alternaria* and *Cladosporium*), Walker & Minter (*TBMS* 77: 299, 1981; key), Vakili (*MR* 93: 67, 1989; teleomorph).
- Gonatobotrytites** Pia (1927), Fossil Fungi. 1 (Eocene), Europe.
- Gonatobotryum** Sacc. (1880), anamorphic *Pezizomycotina*, Hso.0eH/1eP.5. 4 (fungicolous), widespread. See Kendrick *et al.* (*CJB* 45: 591, 1968; conidiogenesis), Walker & Minter (*TBMS* 77: 299, 1981; key).
- Gonatophragmiella** Rak. Kumar, A.N. Rai & Kamal (1994), anamorphic *Pezizomycotina*, Hso. $\equiv$ eP.?. 1, India. See Kumar *et al.* (*Indian Phytopath.* 47: 129, 1994).
- Gonatophragmium** Deighton (1969), anamorphic *Acrospermum*, Hso. $\equiv$ eP.10. 2, widespread (tropical). See Takahashi & Teramine (*Ann. phytopath. Soc. Japan* 52: 404, 1986; teleomorph), Rai (*MR* 100: 1263, 1996; India), Siboe *et al.* (*Mycotaxon* 73: 283, 1999; Kenya).
- Gonatopyricularia** Z.D. Jiang & P.K. Chi (1989) $\equiv$ Pyriculariopsis.
- Gonatorhodis** Clem. & Shear (1931) $\equiv$ Gonatorrhodiella.
- Gonatorrhodiella** Thaxt. (1891) = *Gonatobotryum* fide Walker & Minter (*TBMS* 77: 299, 1981).
- Gonatorrhodum** Corda (1839), anamorphic *Pezizomycotina*, Hso.0eP.?. 1 or 2, Europe.
- Gonatosporium** Corda (1839) = *Arthrimum* fide Hughes (*CJB* 36: 727, 1958).
- Gonatotrichum** Corda (1842) $\equiv$ Gonytrichum.
- Gondwanamyces** G.J. Marais & M.J. Wingf. (1998), Ceratocystidaceae. Anamorph *Knoxdaviesia*. 2 (on *Protea*), S. Africa. See Marais *et al.* (*Mycol.* 90: 136, 1998), Viljoen *et al.* (*MR* 103: 497, 1999; phylogeny), Wingfield *et al.* (*MR* 103: 1616, 1999; phylogeny), Gibb & Hausner (*MR* 107: 1442, 2003; introns), Roets *et al.* (*Stud. Mycol.* 55: 199, 2006; phylogeny), Roets *et al.* (*CJB* 84: 989, 2006; PCR detection).
- Gongromeriza** Preuss (1851) = *Chloridium* fide Hughes (*Friesia* 9: 61, 1969).
- Gongronella** Ribaldi (1952), Cunninghamellaceae. 2, widespread. See Hessletine & Ellis (*Mycol.* 53: 406, 1961), Hessletine & Ellis (*Mycol.* 56: 568, 1964; key), Upadhyay (*Nova Hedwigia* 17: 65, 1969; key), Kirk (*IMI Descr. Fungi Bact.* 131, 1997), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny).
- Gongylia** Körb. (1855) = *Arthrorhaphis* fide Hawksworth *et al.* (*Lichenologist* 12: 13, 1980), Jørgensen & Santesson (*Taxon* 42: 881, 1993), Fryday (*Bryologist* 107: 231, 2004).
- gongylidius** (pl. **gongylidia**), a bulbous structure developed by fungi cultivated by termites.
- Gongylocladium** Wallr. (1833) $\equiv$ *Oedemium*.
- gonidial layer**, photobiont layer in a lichen thallus (obsol.).
- gonidimium**, a hymenial alga (obsol.).
- Gonidiomyces** Vain. (1921) nom. dub., *Pezizomycotina*. 1, Philippines.
- gonidium**, photobiont (obsol.).
- gonimium**, a cyanobacterial cell in a lichen thallus (obsol.).
- goniocyst** (**goniocystula**), a group of algal cells derived from a single cell surrounded by a hyphal envelope forming a roundish structure which is not a sorolium (e.g. the vegetative thallus '*Botrydina vulgaris*'; q.v.), (Fig. 22H). See Sérusiaux (*Lichenologist* 17: 1, 1985).
- goniocystangium**, cup-like structure bearing goniospores (q.v.) on foliicolous species of *Catillaria* (Vězda, 1980) and *Opegrapha* (Santesson, *Svensk Naturv.* 1968: 176, 1968; Sérusiaux, 1985).
- Gonionema** Nyl. (1855) = *Thermutis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Goniopila** Marvanová & Descals (1985), anamorphic *Pezizomycotina*, Hso.0eH.21. 1 (aquatic), USA; Europe. See Marvanová & Descals (*J. Linn. Soc. Bot.* 91: 14, 1985), Belliveau & Bärlocher (*MR* 109: 1407, 2005; placement in *Helotiales*), Campbell *et al.* (*MR* 110: 1025, 2006; placement in *Pleosporales*).
- Goniosporium** Link (1824) = *Arthrimum* fide Höhnelt (*Mitt. bot. Inst. tech. Hochsch. Wien* ser. 2 2: 9, 1925).
- goniosporous**, having angled spores.
- Gonohymenia** J. Steiner (1902) = *Lichinella* fide Moreno & Egea (*Cryptog. Bryol.-Lichénol.* 13: 237, 1992), Schultz & Büdel (*Lichenologist* 34: 39, 2002).
- Gonohymeniomyces** Cif. & Tomas. (1953) ? = *Pso-rotichia*.
- Gonolecania** Zahlbr. (1924) = *Byssolecania* fide Santesson (*Svensk bot. Tidskr.* 43: 547, 1949), Santesson (*SA* 10: 137, 1991).
- gonoplasm** (of *Peronosporales*), the protoplasm, at the centre of an antheridium, which later undergoes fusion with the oosphere.
- gonosphere**, a zoospore of the *Chytridiales* (obsol.).
- Gonothecis** Clem. (1909) = *Gyalectidium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Gonothecium** (Vain.) Clem. & Shear (1931) = *Gyalectidium* fide Santesson (*Symb. bot. upsala.* 12 no. 1: 1, 1952).
- gonotocont**, the organ in which meiosis takes place.
- Gonsala** (orthographic variant), see *Gonzala*.
- Gonyella** Syd. & P. Syd. (1919), anamorphic *Pezizomycotina*, Hso.1eP.?. 1, Europe.
- Gonytrichella** Emoto & Tubaki (1971) = *Dicyma* fide von Arx (*Proc. k. ned. Akad. Wet. Ser. C, Biol. Med. Sci.* 85: 21, 1982).

- Gonytrichum** Nees & T. Nees (1818), anamorphic *Chaetosphaeria*, *Melanopsammella*, Hsy.0eP.15. 7, widespread. See Gams & Holubová-Jechová (*Stud. Mycol.* 13, 1976; key), Persiani & Maggi (*Mycotaxon* 39: 465, 1990; ontogeny), Réblová (*Stud. Mycol.* 45: 149, 2000; review), Réblová & Winka (*Mycol.* 92: 939, 2000; phylogeny), Fernández *et al.* (*Mycol.* 98: 121, 2006; phylogeny, morphology).
- Gonzala** Adans. ex Léman (1821) = *Peziza* Fr. fide Streinz (*Nom. fung.*, 1862).
- González Frago** (Romualdo; 1862-1928; Spain). Student of medicine, Seville (c. 1879-1882); Keeper of Pacific Collections, Museo de Ciencias Naturales, Madrid (1884-1885); practising doctor, Seville (1885-1911) [providing expert support during the 1888 cholera epidemic in Toledo]; mycologist with state support (1911 onwards); President (1920) then Honorary Member (1921-1928), Real Sociedad Española de Historia Natural, Madrid. Pioneer of mycology in Spain, establishing a national fungal reference collection, and (with Ciferri, q.v.) making significant contributions to the mycota of the Dominican Republic. *Publs.* Contribución a la flora micológica del Guadarrama. Uredinales. *Trabajos del Museo Nacional de Ciencias Naturales. Madrid* vols 3-5 (1914); (with Ciferri) Hongos parásitos y saprofitos de la República Dominicana. *Estación Agronómica de Moca* (1928). *Biogs, obits etc.* Ciferri (*Estación Agronómica de Moca Serie B, Botánica* 12: 1, 1928) [portrait].
- Gooday** (Graham William; 1942-2002; England). PhD Bristol (1968); Research Fellow, Leeds University (1967-1969) and with J.H. Burnett (q.v.), Oxford University (1969-1972); Lecturer to full Professor of Microbiology, Aberdeen (1972-2002). First recipient of Society for General Microbiology's Fleming Medal, 1976; FRSE, 1989; President, British Mycological Society, 1993. Over 200 papers, including studies of fungal sex hormones, hyphal growth, basidiomycete fruit body formation, chitin biosynthesis and degradation in a wide range of organisms (including fungi, parasites, fish, plants and man), algal cytology, and algal-invertebrate symbiosis; notable research achievements were autoradiographic confirmation of the apex as the site of wall synthesis in fungi, characterisation of the action of trisporic acid sex pheromone of *Mucor*, and biochemical characterisation of fungal chitin synthases and chitinases; an influential teacher and mentor to many other mycologists. *Publs.* Functions of trisporic acid. *Phil. Trans. Roy. Soc. B* 284: 509, 1978; An autoradiographic study of hyphal growth of some fungi. *J. Gen. Microbiol.* 67: 125 1971; The First Fleming Lecture. Biosynthesis of the fungal wall: Mechanisms and implications. *J. Gen. Microbiol.* 99: 1, 1977.
- Goosia** B. Song (2003), Englerulaceae. 1, China. See Song (*Mycotaxon* 87: 413, 2003).
- Goosiella** Morgan-Jones, Kamal & R.K. Verma (1986), anamorphic *Pezizomycotina*, Hso.0= hH.2.10. 1, India. See Morgan-Jones *et al.* (*Mycol.* 78: 496, 1986).
- Goosiomycetes** N.K. Rao & Manohar. (1989), anamorphic *Pezizomycotina*, Hso.0bP.12. 1, India. See Rao & Manoharachary (*MR* 92: 250, 1989).
- Goossensia** Heinem. (1958), Cantharellaceae. 1, Congo. See Heinemann (*Bull. Jard. Bot. État* 28: 424, 1958).
- Goplana** Racib. (1900), Chaconiaceae. 12 (on dicots, (II, III)), widespread (tropical). See Ono & Hennen (*TMSJ* 24: 369, 1983), Berndt (*Mycol.* 91: 1045, 1999).
- Gorgadesia** Tav. (1964), Roccellaceae (L). 1, Cape Verde. See Tavares (*Revta Biol. Lisb.* 4: 131, 1964), Follmann & Mies (*Courier Forschungsinstitut Senckenberg* 105: 57, 1988), Tehler (*CJB* 68: 2458, 1990; cladistics), Myllys *et al.* (*Bryologist* 101: 70, 1998; phylogeny).
- Gorgomyces** M. Gönczöl & Révay (1985), anamorphic *Pezizomycotina*, Hso.0fH.1/10. 1 (nematophagous, aquatic), Hungary; Spain. See Gönczöl & Révay (*Nova Hedwigia* 41: 453, 1985), Roldán (*Mycotaxon* 34: 381, 1989).
- Gorgoniceps** (P. Karst.) P. Karst. (1871), Helotiaceae. 6, widespread. See Seaver (*Mycol.* 38: 548, 1946), Korf (*Mycol.* 58: 724, 1966), Huhtinen & Iturriaga (*Mycotaxon* 29: 189, 1987; culture).
- Gorlenko** (Mikail Vladimirovich; 1908-1994; Russia). Graduated, Voronezh State University (1930); Phytopathologist then Director, Voronezh Plant Protection Station (1929-1941); Head of Laboratory then Director, Moscow Plant Protection Station (1941-1955); Head, Mycology and Algology Department, Lomonosov Moscow State University (1955-1994). He provided an academic infrastructure for mycology, through which his teams could work on physiology and evolution of parasitism and specialization, variability and genetics of plant pathogenic fungi, their cytology, soil fungi as antagonists of plant pathogens, antibiotics of fungal origin for plant protection, mushrooms cultivation and other topics; organizer and first Editor-in-Chief, *Mikologiya i Fitopatologiya* (1967-1994). *Publs.* [Plant diseases and environment] (1950) [in Russian, Chinese edn 1954]; *Response of Plant Immunity to Infectious Diseases* (1973) [in Russian]; (ed.) *Plant Life: Myxomycetes and Fungi* edn 2 vol. 2 (1991) [in Russian]. *Biogs, obits etc.* Anon. ([*Mikologiya i Fitopatologiya*] 22: 273, 1988) [portrait, in Russian]; Anon. ([*Mikologiya i Fitopatologiya*] 29: 66, 1995) [portrait, in Russian]; Litvinov, Novotel'nova & Khokhryakov ([*Mikologiya i Fitopatologiya*] 3: 287, 1969) [portrait, in Russian].
- Gorodkoviella** Vassilkov (1969) = *Pachyella* fide Dissing (*SA* 6: 129, 1987).
- gossamers**, fine, floating mycelial nets produced by fungi on media lacking added carbon (Wainwright, *Mycologist* 1: 182, 1987).
- Goupilia** Méral (1834) ? = *Scleroderma* fide Stalpers (*in litt.*).
- Govindua** Bat. & H. Maia (1960), Microthyriaceae. 1, India. See Batista & Maia (*Revta Biol. Lisb.* 2: 95, 1960).
- Graamspora** Locq. & Sal.-Cheb. (1980), Fossil Fungi. 1, Cameroon.
- Gracilistilbella** Seifert (2000), anamorphic *Stilbocrea*. 4, widespread. See Seifert & Samuels (*Stud. Mycol.* 45: 18, 2000).
- Graddon** Dennis (1955), Helotiales. 1, Europe. See Dennis (*Kew Bull.* 1955: 359, 1955), Nauta & Spooner (*Mycologist* 14: 65, 2000; UK).
- Graddonidiscus** Raitv. & R. Galán (1992), Hyaloscyphaceae. 3, Europe; N. America. See Galán *et al.* (*MR* 98: 1137, 1994), Raitviir (*Scripta Mycologica Tartu* 20, 2004).
- Grahamiella** Spooner (1981), Helotiaceae. 3, Europe. See Spooner (*TBMS* 76: 265, 1981).

- Grallomyces** F. Stevens (1918), anamorphic *Pezizomycotina*, Hsy.0bP.19. 1, widespread (tropical). See Deighton & Pirozynski (*Mycol. Pap.* 105, 1966), Heredia Abarca & Mercado Sierra (*Mycotaxon* 68: 137, 1998; Mexico).
- Gram**, + or - (of bacteria), staining or not staining by Gram's method (see Methods).
- Gramincola** Velen. (1947) nom. dub., Agaricales.
- Graminella** L. Léger & M. Gauthier ex Manier (1962), Legeriomycetaceae. 3 (in *Ephemeroptera*), widespread. See Lichtwardt & Moss (*TBMS* 76: 311, 1981), Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986; key), Valle (*Mycol.* 99: 442, 2007; Spain), Valle *et al.* (*Mycol.* 100: 149, 2008; Mexico).
- Graminelloides** Lichtw. (1998), Legeriomycetaceae. 1 (in *Diptera*), Costa Rica. See Lichtwardt (*Rev. Biol. Trop.* 45: 1349, 1997), Nelder *et al.* (*Fungal Diversity* 22: 121, 2006; ecology and taxonomy).
- graminicolous**, living on *Gramineae*.
- Grammothele** Berk. & M.A. Curtis (1868), Polyporaceae. 8, widespread (tropical). See Ryvarden (*TBMS* 73: 1, 1979), Ipulet & Ryvarden (*Syn. Fung.* 20: 87, 2005; Uganda).
- Grammotheleaceae** Berk. & M.A. Curtis (1868), Polyporaceae. 8, widespread (tropical). See Ryvarden (*TBMS* 73: 1, 1979), Ipulet & Ryvarden (*Syn. Fung.* 20: 87, 2005; Uganda).
- Grammothelopsis** Jülich (1982), Polyporaceae. 4, Africa; S. America. See David & Rajchenberg (*Mycotaxon* 22: 299, 1985), Ryvarden & de Meijer (*Syn. Fung.* 15: 34, 2002; Brazil).
- Granatisporites** Elsik & Janson. (1974), Fossil Fungi. 5 (Paleocene), Canada. = *Brachysporisporites* (Fossil fungi) fide Kremp (*BMR Bull.* 192: 76, 1978).
- Grandigallia** M.E. Barr, Hanlin, Cedeño, Parra & R. Hern. (1987), Dothideomycetes. 1, Venezuela. See Barr *et al.* (*Mycotaxon* 29: 196, 1987).
- Grandinia** Fr. (1838) nom. rej., Agaricomycetidae. See Donk (*Taxon* 5: 77, 1956) but see, Jülich (*Int. J. Mycol. Lichenol.* 1: 27, 1982).
- Grandiniella** P. Karst. (1895) = *Phanerochaete* fide Eriksson *et al.* (*Taxon* 27: 51, 1978).
- Grandiniochaete** Rick (1940) nom. dub., Agaricomycetidae. See Donk (*Taxon* 5: 79, 1956).
- Grandinioides** Banker (1906) = *Mycobonia* fide Donk (*Taxon* 6: 17, 1957).
- Granmamyses** J. Mena & Mercado (1988) = *Weufia* fide Mercado (*AnaNet* 10: 8, 1990).
- Granodiporites** C.P. Varma & Rawat (1963), Fossil Fungi. 2, India.
- granular (granulate, granulose)** (of a surface), covered with very small particles. Fig. 20.4.
- Granularia** Roth (1791) = *Nidularia* Fr. fide Palmer (*Taxon* 10: 54, 1961).
- Granularia** Sacc. & Ellis ex Sacc. (1882), anamorphic *Pezizomycotina*, Hsp.0eH.?. 1, N. America.
- Granularia** Sowerby (1815) = *Urocystis* fide Vánky (*in litt.*).
- Granulina** Velen. (1947) nom. dub., Agaricomycetes. 'gasteromycetes'.
- Granulobasidium** Jülich (1979), Cyphellaceae. 1, N. America. See Jülich (*Persoonia* 10: 328, 1979), De Meulder (*AMK Mededelingen*: 30, 2005).
- Granulocystis** Hjortstam (1986) [non *Granulocystis* Hindák 1977, *Algae*] = *Leifia*.
- Granulodiplodia** Zambett. ex M. Morelet (1973) = *Sphaeropsis* Sacc. fide Sutton (*Mycol. Pap.* 141, 1977).
- granuloma**, a nodule of firm tissue formed as a reaction to chronic irritation.
- Granulomanus** de Hoog & Samson (1978), anamorphic *Torrubiella*, Hso.0fH.15. 1 (on *Arachnida*), British Isles. See Samson *et al.* (*Atlas of Entomopathogenic Fungi*: 187 pp., 1988).
- Granulopyrenis** Aptroot (1991), Requiellaceae ($\pm$ L). 6, widespread (tropical). See Aptroot (*Bibliotheca Lichenol.* 44: 91, 1991), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny).
- Graphidaceae** Dumort. (1822), Ostropales (L). 25 gen. (+ 59 syn.), 897 spp.
Lit.: Wirth & Hale (*Contr. US natn Herb.* 36: 63, 1963; Mexico), Wirth & Hale (*Smithson. Contr. bot.* 40, 1978; Dominican Republic), Nakanishi (*J. Sci. Hiroshima Univ. B(2)* 25: 16, 1987), Harris (*Some Florida lichens*, 1990; gen. concepts), López de Silanes (*Clementeana* 3: 25, 1997; key Iberian spp.), Winka *et al.* (*Lichenologist* 30: 455, 1998), Archer (*Telopea* 8: 273, 1999), Nakanishi & Harada (*Nat. Hist. Res.* 5: 63, 1999), Staiger & Kalb (*Mycotaxon* 73: 69, 1999), Archer (*Telopea* 8: 461, 2000), Kauff & Lutzoni (*Mol. Phylogen. Evol.* 25: 138, 2002), Kalb *et al.* (*Symb. bot. upsala.* 34 no. 1: 133, 2004), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Staiger *et al.* (*MR* 110: 765, 2006), Archer (*Systematics & Biodiversity* 5: 9, 2007; Solomon Is).
- Graphidales** Bessey (1907) = Ostropales.
- Graphidastra** (Redinger) G. Thor (1990), Roccellaceae (L). 2, paleotropical. See Thor (*Op. bot.* 103: 80, 1991), Grube (*Bryologist* 101: 377, 1998; phylogeny), Thor (*J. Jap. Bot.* 77: 47, 2002; Japan, Taiwan), Sparrius *et al.* (*Lichenologist* 38: 27, 2006; Thailand, Vietnam).
- Graphidium** Lindau (1909) ? = *Paecilomyces* fide Kendrick & Carmichael *in* Ainsworth *et al.* (Eds) (*The Fungi* 4A: 390, 1973).
- Graphidomyces** E.A. Thomas ex Cif. & Tomas. (1953) = *Graphis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Graphidula** Norman (1853) = *Verrucaria* Schrad. fide Staiger (*Bibliotheca Lichenol.* 85, 2002).
- Graphilbum** H.P. Upadhyay & W.B. Kendr. (1975) = *Pesotum* fide Upadhyay & Kendrick (*Mycol.* 67: 800, 1975), Mouton *et al.* (*S. Afr. J. Sci.* 90: 293, 1994; review), Okada *et al.* (*CJB* 76: 1502, 1998), Harrington *et al.* (*Mycol.* 93: 111, 2001; phylogeny), Kim *et al.* (*FEMS Microbiol. Lett.* 222: 187, 2003).
- Graphina** Müll. Arg. (1880) = *Graphis* fide Dharne & Raychoudhury (*Bull. bot. Surv. India* 10: 267, 1969), Archer (*Telopea* 8: 273, 1999), Archer (*Mycotaxon* 77: 153, 2001; Australia), Archer (*Mycotaxon* 83: 361, 2002; Solomon Is), Archer (*Mycotaxon* 88: 143, 2003; Australia, Solomon Is), Archer (*Mycotaxon* 86: 31, 2003), Makhija & Adawadkar (*Mycotaxon* 91: 347, 2005; India), Staiger *et al.* (*MR* 110: 765, 2006; phylogeny; 107842), Lücking *et al.* (*Taxon* 56: 1296, 2007; nomencl.).
- Graphinella** Zahlbr. (1923) = *Spirographa* fide Santeson (*The lichens and lichenicolous fungi of Sweden and Norway*, 1993).
- Graphinellaceae** Walt. Watson (1929) = *Odontotrema* taceae.
- Graphinomyces** Cif. & Tomas. (1953) = *Thalloloma* fide Lücking & Hawksworth (*Taxon* 56: 1274, 2007).
- Graphiocladiella** H.P. Upadhyay (1981) = *Leptographium* fide Tsuneda & Hiratsuka (*CJB* 62: 2618,

- 1984; SEM conidiogenesis), Six *et al.* (*Mycol.* **95**: 781, 2003).
- Graphiola** Poit. (1824), Graphiolaceae. *c.* 5, widespread (tropical and glasshouses). *G. phoenicis* on *Phoenix*. See Cole (*Mycol.* **75**: 93, 1983), Begerow *et al.* (*Mycol. Progr.* **1**: 187, 2002; phylog.).
- Graphiolaceae** Clem. & Shear (1931), Exobasidiales. 2 gen. (+ 4 syn.), 6 spp.
Lit.: Oberwinkler *et al.* (*Pl. Syst. Evol.* **140**: 251, 1982), Cole (*Mycol.* **75**: 93, 1983), Blanz & Gottschalk (*Syst. Appl. Microbiol.* **8**: 121, 1986; affin. with *Exobasidium* and some graminicolous smuts from 5S ribosomal RNA data), Bauer *et al.* (*CJB* **75**: 1273, 1997), Begerow *et al.* (*CJB* **75**: 2045, 1998), Sjamsuridzal & Sugiyama (*J. gen. appl. Microbiol. Tokyo* **44**: 355, 1998), Begerow *et al.* (*Mycol. Progr.* **1**: 187, 2002).
- Graphiolales** = Exobasidiales.
- Graphiolites** Fritel (1910), Fossil Fungi. 1 (Eocene), France.
- Graphiopsis** Bainier (1907) = *Phaeoisaria* fide Mason (*Annotated Acct of Fungi rec'd I.M.I.*, 1937).
- Graphiopsis** Trail (1889), anamorphic *Davidiellaceae*. 1 (on *Paeonia*), widespread. See Braun *et al.* (*Mycotaxon* **103**: 207, 2008).
- Graphiothecium** Fuckel (1870), anamorphic *Pezizomycotina*, Hso.0eP.?. 6, widespread (north temperate). See Braun (*Sydowia* **45**: 81, 1993).
- Graphis** Adans. (1763), Graphidaceae (L.). *c.* 386, widespread (esp. tropical). See Winka *et al.* (*Lichenologist* **30**: 455, 1998; DNA), Archer (*Telopea* **8**: 273, 1999; Australia), Nakanishi & Harada (*Natural History Research* **5**: 63, 1999; Micronesia), Archer (*Aust. Syst. Bot.* **14**: 245, 2001; Australia), Nakanishi *et al.* (*Bull. natn. Sci. Mus. Tokyo*, B **27**: 47, 2001; Thailand), Nakanishi *et al.* (*Bull. natn. Sci. Mus. Tokyo*, B **28**: 107, 2002; Vanuatu), Staiger (*Biblthca Lichenol.* **85**, 2002; revision), Bock & Hauck (*Lichenologist* **37**: 105, 2005; Africa), Adawadkar & Makhija (*Mycotaxon* **96**: 51, 2006; India), Archer (*Biblthca Lichenol.* **94**, 2006; Australia), Miadlikowska *et al.* (*Mycol.* **98**: 1088, 2006; phylogeny), Staiger *et al.* (*MR* **110**: 765, 2006; phylogeny), Adawadkar & Makhija (*Mycotaxon* **99**: 303, 2007; India), Archer (*Systematics & Biodiversity* **5**: 9, 2007; Solomon Is).
- Graphium** Corda (1837), anamorphic *Microascus*, *Pseudallescheria*, Hsy.0eH.19. *c.* 30, widespread. See also *Pesotum*, *Ophiostoma*. See Sutton & Laut (*Bi-mon. Res. Nts Can. For.* **26**: 25, 1970; conidiogenesis), Ellis (*Dematiaceous Hyphomycetes*, 1971; key), Wingfield *et al.* (*MR* **95**: 1328, 1991; gen. synonymy), Seifert & Okada in Wingfield *et al.* (Eds) (*Ceratocystis and Ophiostoma Taxonomy, Ecology and Pathogenicity*: 27, 1993; anamorphs of *Ophiostoma*), Issakainen *et al.* (*J. Med. Vet. Mycol.* **35**: 389, 1997), Issakainen *et al.* (*MR* **103**: 1179, 1999), Okada *et al.* (*CJB* **76**: 1495, 1999; 18S RNA analysis), Okada *et al.* (*Stud. Mycol.* **45**: 169, 2000; typification, phylogeny), Rainer *et al.* (*J. Clin. Microbiol.* **38**: 3267, 2000; genetic variation), Jacobs *et al.* (*Mycol.* **95**: 714, 2003), Zhang *et al.* (*Mycol.* **98**: 1076, 2006; phylogeny).
- graphium** (pl. -ia), the synnema of *Graphium*.
- Graphostroma** Piroz. (1974), Graphostromataceae. Anamorph *Nodulisporium*-like. 1, N. America. See Glawe & Rogers (*CJB* **64**: 1493, 1986; anamorph), Barr *et al.* (*Mycotaxon* **48**: 529, 1993; posn), Vassiljeva & Stephenson (*Fungal Diversity* **17**: 191, 2004; synonym of *Diatrype*), Zhang *et al.* (*Mycol.* **98**: 1076, 2006; phylogeny).
- Graphostromataceae** M.E. Barr, J.D. Rogers & Y.M. Ju (1993), Xylariales. 1 gen., 1 spp.
Lit.: Pirozynski (*CJB* **52**: 2129, 1974), Barr (*Mycol.* **77**: 549, 1985), Glawe & Rogers (*CJB* **64**: 1493, 1986), Barr *et al.* (*Mycotaxon* **48**: 529, 1993).
- Graphyllum** Clem. (1901), Hysteriaceae. 10, N. America. See Shoemaker & Babcock (*CJB* **70**: 1617, 1992; posn), Barr (*SA* **12**: 27, 1993), Checa *et al.* (*Mycol.* **99**: 285, 2007; Costa Rica).
- Greeneria** Scribn. & Viala (1887), anamorphic *Diaporthales*, Cac.0eP.15. 1, widespread. See Sutton (*The Coelomycetes*, 1980), Kao *et al.* (*Pl. Prot. Bull. Taiwan* **32**: 256, 1990; pathology of *G. uvicola*), Farr *et al.* (*Sydowia* **53**: 185, 2001; phylogeny, review).
- gregarious**, in companies or groups but not joined together.
- Gregorella** Lumbsch (2005), Arctomiaceae (L.). 1, Europe. See Lumbsch *et al.* (*Lichenologist* **37**: 300, 2005).
- Gretetia** Donadini (1980) = *Smardaea* fide Korf & Zhuang (*Mycotaxon* **40**: 413, 1991), Hansen *et al.* (*Mol. Phylogen. Evol.* **36**: 1, 2005; phylogeny).
- Gremilia** Nieuwl. (1916) = *Polycephalum*.
- Gremmenia** Korf (1962) = *Phacidium* fide Reid & Pirozynski (*Mycol.* **60**: 526, 1968), Stone & Gernandt (*Mycotaxon* **91**: 115, 2005).
- Gremmeniella** M. Morelet (1969), Helotiales. Anamorph *Brunchorstia*. *c.* 3 (conifer canker), widespread (northern hemisphere). See also *Ascocalyx*. See Petrini *et al.* (*CJB* **67**: 2805, 1989), Bernier *et al.* (*Appl. Environm. Microbiol.* **60**: 1279, 1994; DNA), Hamelin & Rail (*CJB* **75**: 693, 1997; DNA), Hamelin *et al.* (*Phytopathology* **88**: 582, 1998; biogeography), Kaitera *et al.* (*MR* **102**: 199, 1998; Finland, Russia), Hamelin *et al.* (*MR* **104**: 527, 2000; PCR detection), Uotila *et al.* (*Forest Pathology* **30**: 211, 2000; hybridisation), Dusabenyagasani *et al.* (*CJB* **80**: 1151, 2002; molecular variation), Hantula & Tuomivirta (*CJB* **81**: 1213, 2003; Europe), Santamaria *et al.* (*Forest Pathology* **34**: 395, 2004; Spain), Wang *et al.* (*Mol. Phylogen. Evol.* **41**: 295, 2006; phylogeny), Wang *et al.* (*Mycol.* **98**: 1065, 2006; phylogeny).
- Greville** (Robert Kaye; 1794-1866; England, later Scotland). Trained in medicine, London and Edinburgh, then settling in Edinburgh. An ardent collector, he influenced Berkeley (q.v.) to study fungi rather than algae and mosses, and introduced him to W.J. Hooker. His fungal specimens are mostly in the fungal reference collection at Edinburgh Botanic Garden (E). His interests also included campaigning for the emancipation of slaves and, in natural history, diatoms, flowering plants and insects. *Publs. Scottish Cryptogamic Flora* (1823-1828); *Flora Edinensis* (1824). *Biogs, obits etc.* Balfour (*Transactions of the Botanical Society of Edinburgh* **8**: 463, 1866); Grumann (1974: 371); Stafleu & Cowan (*TL-2* **1**: 1009, 1976).
- grex** (1) see plasmodium; (2) (of cultivated plants) progeny of an artificial cross between known parents.
- Grifola** Gray (1821), Meripilaceae. 5, widespread (temperate). See Corner (*Beih. Nova Hedwigia* **96**: 63, 1989), Shen *et al.* (*Mycol.* **94**: 472, 2002; phylogeny).
- Grifolaceae** Jülich (1982) = Meripilaceae.
- Griggsia** F. Stevens & Dalbey (1919), ? Dothideomy-

- cetes. 1, West Indies.
- Grilletia** Renault & C.E. Bertrand (1885), Fossil Fungi, Chytridiomycota. 1 (Carboniferous), France.
- Grimmicola** Döbbeler & Hertel (1983), Helotiaceae. 1 (on *Grimmia*), Marion Island. See Döbbeler & Hertel (*Sydowia* 36: 34, 1983).
- Griphosphaerella** Petr. (1927) = *Monographella* fide Müller (*Revue Mycol.* Paris 41: 129, 1977).
- Griphosphaeria** Höhn. (1918) = *Discostroma* fide Brockmann (*Sydowia* 28, 1976).
- Griphosphaerioma** Höhn. (1918), Amphisphaeriaceae. Anamorphs *Labridella*, *Sarcostroma*. 2, N. America; Japan. See Shoemaker (*CJB* 41: 1419, 1963), Kang *et al.* (*MR* 103: 53, 1999), Ono & Kobayashi (*Mycoscience* 44: 109, 2003).
- griseofulvin** ('fulvicin', 'grifulvin', 'grisactin'), a Cl-containing antibiotic from *Penicillium griseofulvum*, *P. nigricans*; described and named by Raistrick *et al.* in 1936, and independently as 'curling factor' by Brian *et al.* in 1946. See Brian (*Ann. Bot. Lond.* N.S. 13: 59, 1949; *TBMS* 43: 1, 1960; reviews); antifungal. Has been used as a systemic fungicide against plant pathogens (Rhodes *et al.*, *Ann. appl. Biol.* 45: 215, 1957) and orally against dermatophyte infections in animals and humans (Gentles, *Nature* 182: 476, 1958; Lauder & O'Sullivan, *Vet. Rec.* 70: 949, 1958; Davies, *Antifungal chemotherapy*, 1980: 180).
- Griseoporia** Ginns (1984) = *Gloeophyllum* fide Ryvarden (*Syn. Fung.* 5, 1991).
- grisette**, basidiomata of the edible *Amanita vaginata*.
- grist**, see Brewing.
- Groenhiella** Jørg. Koch, E.B.G. Jones & S.T. Moss (1983), Nitschkiaceae. 1 (on rotten wood, marine), Denmark. See Petersen (*Bot. Mar.* 40: 71, 1997; ultrastr.).
- Grosmannia** Goid. (1936), Ophiostomataceae. Anamorphs *Leptographium*, *Pesotum*-like. 1 (associated with bark beetles), widespread. See de Hoog (*Stud. Mycol.* 7, 1974), Zipfel *et al.* (*Stud. Mycol.* 55: 75, 2006).
- Grove** (William Bywater; 1848-1938; England). Headmaster of Birmingham High School for Boys (1887-1900); Lecturer in Horticulture and Chemistry, Studley Horticultural College (1900-1905); Lecturer in Botany, Birmingham Municipal Technical School (1905-1927). A great collector whose field experience resulted in accounts of rusts and of coelomycetes which became standard texts. His specimens are now in the fungal reference collection, Royal Botanic Gardens, Kew (K). *Publs. British Rust Fungi* (1913); *British Stem- and Leaf- Fungi (Coelomycetes)* (1935-1937); English translation of Tulasne's *Selecta Fungorum Carpologia* (1931). *Biogs, obits etc.* Buller (*North-west Naturalist* 13: 30, 1938) [portrait]; Mason (*Journal of Botany* London 76: 86, 1938); Stafleu & Cowan (*TL-2* 1: 1015, 1976).
- Groveola** Syd. (1921) = *Uromyces* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- Groveolopsis** Boedijn (1951), anamorphic *Pezizomycotina*, Cpd.0fH.19. 1, Java. See Boedijn (*Sydowia* 5: 351, 1951), Nag Raj & DiCosmo (*Univ. Waterloo Biol. Ser.* 21, 1980).
- Groves** (James Walton; 1906-1970; Canada). Mycologist (1936-1951) then Chief of Mycology Section (1951-1970), Canada Agriculture, Ottawa. Noted for research on discomycetes taxonomy (esp. *Dermateaceae* and *Sclerotiniaceae*), and on seed-borne fungi (some with Skolko). *Publs.* The genus *Tympanis*. *Canadian Journal of Botany* (1952); The genus *Durandiella*. *Canadian Journal of Botany* (1954); The genus *Godronia*. *Canadian Journal of Botany* (1965). *Biogs, obits etc.* Shoemaker (*Mycol.* 63: 1, 1971) [portrait]; Thomson (*Canadian Field Naturalist* 86: 177, 1972) [portrait].
- Grovesia** Dennis (1960), Helotiaceae. 1, Venezuela. See Dennis (*Kew Bull.* 14: 444, 1960).
- Grovesiella** B. Erikss. (1969) = Erikssonopsis.
- Grovesiella** M. Morelet (1969), Helotiaceae. Anamorph *Pittostroma*. 3, USA; Europe. See Seiber & Kowalski (*Mycol.* 85: 653, 1993; anamorph).
- Grovesinia** M.N. Cline, J.L. Crane & S.D. Cline (1983), Sclerotiniaceae. Anamorph *Hinomyces*. 1, widespread (north temperate). See Harada & Noro (*TMSJ* 29: 85, 1988), Holst-Jensen *et al.* (*Mycol.* 89: 885, 1997; phylogeny), Holst-Jensen *et al.* (*Nordic JI Bot.* 18: 705, 1999; phylogeny), Holst-Jensen *et al.* (*Mycol.* 96: 135, 2004; phylogeny), Narumi-Saito *et al.* (*Mycoscience* 47: 351, 2006; anamorph).
- growth form**, see habit.
- Growth rates**. In fungi growth may be unrestricted or restricted.
- (1) **Unrestricted growth** occurs when a fungus is grown in batch culture in a medium containing an excess of all nutrients. Under these conditions, growth is exponential and proceeds at the organism's maximum specific growth rate for the conditions (type of nutrients, temperature, pH etc.). Thus, $\frac{dM}{dt} = \mu_{\max} M$ where M = fungal biomass, t = time and $\mu_{\max}$ = maximum specific growth rate. The fastest $\mu_{\max}$ recorded for a fungus in batch culture on a glucose-mineral salts medium is 0.61 h^{-1} (doubling time of 1.1 h) for *Geotrichum candidum*. During unrestricted growth, the total hyphal length and the number of tips of a mycelium increase at the same $\mu_{\max}$, and consequently the ratio (G , the hyphal growth unit) between these parameters is a constant (Trinci, *J. Gen. Microbiol.* 81: 225, 1974). Thus, unrestricted growth of a mycelium involves the duplication of a physiological unit of growth (G) consisting of a hyphal tip and a certain length of hypha. G is species- and strain-specific (Trinci, in Jennings & Rayner (Eds), *Ecology and physiology of the fungal mycelium*: 23, 1984) varying from c. $48 \mu\text{m}$ (*Penicillium chrysogenum*) to c. $682 \mu\text{m}$ (*Fusarium vauceri*).
- (2) **Restricted growth** of a fungus occurs when not all nutrients (including O_2) are present in excess [e.g. in a chemostat culture (Righelato, in Smith & Berry (Eds), *The filamentous fungi* 1: 79, 1975)] or when factors such as nutrient concentration, pH or mycelial morphology are altered sufficiently to affect $\mu_{\max}$ [e.g. in submerged batch culture in which growth is decelerating because of nutrient depletion or in which mycelial pellets (spherical colonies) are formed (Trinci, *Arch. Mikrob.* 73: 353, 1970)]. Batch growth of a fungus on a solid medium eventually results in the establishment of conditions (e.g. nutrient depletion, change in pH etc.) below the centre of the colony which are less favourable for growth than was initially the case. Consequently, mature colonies of fungi increase in radius at a linear rate (K_r). Thus, $R = R_0 + K_r(t_1 - t_0)$ where t_0 = time at onset of linear expansion of colony and R_0 = colony radius at t_0 . For colonies expanding in radius at a linear rate, growth in a peripheral ring of biomass (w , the peripheral growth zone) occurs at approximately $\mu_{\max}$ but growth proceeds at below $\mu_{\max}$ elsewhere in the col-

ony, often falling to zero or near zero at the colony centre, i.e. a colony is heterogeneous and growth of most of its biomass is restricted. Expansion in radius of a mature colony is described by the following equation (Trinci, *J. Gen. Microbiol.* 67: 325, 1971) $K_r = w\mu$. It follows from this equation that K_r cannot be used to study the effect of an environmental variable on growth if the variable alters w .

Lichens are amongst the slowest growing organisms known; measured rates vary from 0.01-90 mm marginal growth p.a. (most in range 1.0-6.0 mm). Minutely crustose species are generally the slowest, and fruticose ones (e.g. *Ramalina menziesii*) the fastest. Some species have different growth rates in different geographical regions, and competition may limit growth of adjacent thalli (Pentecost, *Lichenologist* 12: 135, 1980). Growth rates of some species are reported to be accelerated by chemicals (see Barashkova, *Problems of the North* 7: 149, 1964). A few attempts at modelling lichen growth have been made (Hill, *Lichenologist* 13: 265, 1981; Topham (in Seaward, *Lichen ecology*: 35, 1977; review).

For reviews see Gow & Gadd (Eds) (*The growing fungus*, 1995), Wessels (in Hawksworth (Ed.), *Frontiers in mycology*: 27, 1991; molec. aspect).

See also Ecology, Lichenometry, Longevity, Physiology.

Gruby (David; 1810-1898; Serbia, later France). A Hungarian Jew, born in Kis-Kér [then Hungary, now Backo Dobro Polje, Serbia]; studied medicine at Vienna (1828-1839); teacher and researcher, Hospital St Louis and the Foundling Asylum, Paris (c. 1840); medical doctor, Paris (1844 onwards) [with patients including Frédéric Chopin and Franz Liszt; experimenting in anaesthesia in 1847-1848]. During 1841-1844, i.e. before Pasteur (q.v.), he published the first descriptions of the fungi causing favus (*Trichophyton schoenleinii*), thrush (*Candida albicans*), and ringworm of the beard (*T. mentagrophytes*) and of the scalp (*Microsporum audouinii*) in humans. *Publs. Mémoire sur une végétation qui constitue la vraie teigne. Comptes Rendus Hebdomadaire des Séances de l'Académie des Sciences, Paris* (1841); *Recherches anatomiques sur une plante cryptogame qui constitue le vrai muguet des enfants. Comptes Rendus Hebdomadaire des Séances de l'Académie des Sciences, Paris* (1842); *Sur une espèce de mentagre contagieuse résultant du développement d'un nouveau cryptogame dans la racine des poils de la barbe de l'homme. Comptes Rendus Hebdomadaire des Séances de l'Académie des Sciences, Paris* (1842); *Recherches sur la nature, le siège et le développement du Porrigo decalvans ou phytoalopécie. Comptes Rendus Hebdomadaire des Séances de l'Académie des Sciences, Paris* (1843); *Recherches sur les cryptogames qui constituent la maladie contagieuse du cuir chevelu sous le nom de Teigne (Mahon). Herpes tonsurans (Cazenave). Comptes Rendus Hebdomadaire des Séances de l'Académie des Sciences, Paris* (1844). *Biogs, obits etc.* Beeson (David Gruby, M.D. (1810-1898). *Archives of Dermatology and Syphilology* Chicago 23: 141, 1931); Zakon & Benedek (*Bulletin of the History of Medicine* 16: 155, 1944, portrait [also English translation of five papers]).

Grubyella M. Ota & Langeron (1923) = *Trichophyton* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Guanomyces M.C. González, Hanlin & Ulloa (2000), Sordariales. 1, Mexico; Trinidad. See González *et al.* (*Mycol.* 92: 1138, 2000), Stchigel *et al.* (*MR* 110: 1361, 2006; phylogeny).

Guceviczia Glezer (1959) = *Wojnowicia* fide Sutton (*Česká Mykol.* 29: 97, 1975).

Gudelia Henssen (1995), Gloeoheppiaceae (L.). 1, Mexico. See Henssen (*Lichenologist* 27: 261, 1995).

Guedea Rambelli & Bartoli (1978), anamorphic *Peizizomycotina*, Hso.≡ eP.1. 2, widespread. See Rambelli & Bartoli (*TBMS* 71: 342, 1978).

Gueguenia Bainier (1907) = *Amblyosporium* fide Pirozynski (*CJB* 47: 325, 1969).

Guehomyces Fell & Scorzetti (2004), anamorphic *Cystofilobasidiaceae*. 1. See Fell & Scorzetti (*Int. J. Syst. Evol. Microbiol.* 54: 997, 2004).

Guelichia Speg. (1886), anamorphic *Puttemansia*, Hsp.0eH.?. 1, S. America. See Petrak & Sydow (*Annls mycol.* 34: 38, 1936).

Guepinella Bagl. (1870) = *Heppia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Guepinia Fr. (1825), Auriculariales. 1, widespread (north temperate). See Donk (*Persoonia* 4: 185, 1966).

Guepinia Hepp (1864) [non *Guepinia* Bastard 1821, *Cruciferae*] = *Heppia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Guepiniopsis Pat. (1883), Dacrymycetaceae. c. 7, widespread. See Kennedy (*Mycol.* 50: 874, 1959), McNabb (*N.Z. Jl Bot.* 3: 159, 1965; monotypic), Roberts (*Mycotaxon* 96: 83, 2006; Caribbean).

Guestia G.J.D. Smith & K.D. Hyde (2001), Xylariaceae. 1, Ecuador. See Smith & Hyde (*Fungal Diversity* 7: 107, 2001), Petrini (*N.Z. Jl Bot.* 41: 71, 2003; key).

Guignardia Viala & Ravaz (1892) nom. cons., Botryosphaeriaceae. Anamorphs *Phyllosticta*, *Leptodothiorella*. c. 65, widespread. *G. aesculi* (leaf blotch of horse chestnut, *Aesculus*), *G. bidwellii* (black rot of grapes, *Vitis*), *G. camelliae* (copper blight of tea, *Camellia*), *G. citricarpa* (on *Citrus*), *G. vaccinii* (scald or blast of cranberry, *Vaccinium*). See van der Aa (*Stud. Mycol.* 5, 1973; *Phyllosticta* anamorphs), Punithalingam (*Mycol. Pap.* 136, 1974; culture), Eriksson & Hawksworth (*SA* 5: 132, 1986), Hyde (*Sydowia* 47: 180, 1995; spp. on palms), Janex-Favre *et al.* (*MR* 100: 875, 1996; ontogeny), Silva-Hanlin & Hanlin (*MR* 103: 153, 1999; DNA), Hoffmann & Hafellner (*Bibliotheca Lichenol.* 77, 2000; excl. lichenicolous spp.), Meyer *et al.* (*S. Afr. J. Sci.* 97: 191, 2001; on *Citrus*, S Africa), Okane *et al.* (*CJB* 79: 101, 2001; on *Ericaceae*), Zhou & Stanosz (*Mycol.* 93: 516, 2001), Baayen *et al.* (*Phytopathology* 92: 464, 2002; *G. citricarpa*), Bonants *et al.* (*Eur. J. Pl. Path.* 109: 503, 2003; PCR detection), Okane *et al.* (*Mycoscience* 44: 353, 2003; endophytes), Pandey *et al.* (*MR* 107: 439, 2003; endophytes), Rodrigues *et al.* (*MR* 108: 45, 2004; *G. mangiferae*), Paul *et al.* (*Crop Protection* 24: 297, 2005; biogeography), Crous *et al.* (*Stud. Mycol.* 55: 235, 2006; phylogeny), Meyer *et al.* (*Pl. Dis.* 90: 97, 2006; diagnostics), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny), Baldassari *et al.* (*Eur. J. Pl. Path.* 120: 103, 2007; on *Citrus*).

Guignardiella Sacc. & P. Syd. (1902) = *Vestergrenia* Rehm.

Guilliermond (Marie Antoine Alexandre; 1876-1945; France). Worked at the University of Lyons and from

- 1921 in Paris; Professor of Botany, the Sorbonne, Paris (1927); Membre de l'Institut (1935). Noted for his studies on cytology, sexuality, and phylogeny of yeasts. Founder of *Revue de Cytologie et de Cytophysiologie Vegetales* (1935 onwards). *Publs. Les Levures* (1912) [English translation, Tanner, 1920]; *Cytoplasm of the Plant Cell* (1941) [gives special attention to fungi and has a long list of Guilliermond's publications]. *Biogs, obits etc.* Verona (*Mycopathologia et Mycologia Applicata* 4: 124, 1948); Heim (Notice sur la vie et les travaux de Alexandre Guilliermond (1876-1945) déposée en la séance du 21 Avril 1947. *Institut de France Académie des Sciences*).
- Guilliermondella** Nadson & Krassiln. (1928) = *Saccharomycopsis* Schiønning fide Kurtzman & Robnett (*CJB* 73 Suppl. 1: S824, 1995).
- Guilliermondia** Boud. (1904), ? Sordariales. 1, Europe.
- Guilliermondia** Nadson & Konok. (1911) = *Nadsonia*.
- Guizhounema** X. Mu (1977), Fossil Fungi. 1, China.
- Gummiglobus** Trappe, Castellano & Amar. (1996), Mesophelliaceae. 2, Australia. See Trappe & Bougher (*Australasian Mycologist* 21: 9, 2002; key).
- Gummivena** Trappe & Bougher (2002), Mesophelliaceae. 1, Australia. See Trappe & Bougher (*Australas. Mycol.* 21: 9, 2002).
- gummosis**, a plant disease having secretion of 'gum' as a well-marked symptom; of cucumber (*Cladosporium cucumerinum*).
- Gurleya** Doflein (1898), Microsporidia. 7.
- Gurleyides** Voronin (1986), Microsporidia. 1.
- Gussonea** Tornab. (1848) = *Pleopsidium* fide Hafellner (*Nova Hedwigia* 56: 281, 1993).
- Gut fungi**, Fungi enter animal guts with food, both non-flagellate (*Trichomycetes*) and flagellate (*Neocallimastigales*) gut fungi, which naturally grow and reproduce only there. Both groups may confer some benefits on their hosts, but are primarily commensals exploiting highly specialized environments. Many *Trichomycetes* attach to the gut lining, especially the hind gut, of diverse larval and adult arthropods. These guts may be somewhat anaerobic, but the non-flagellate gut fungi contain mitochondria and grow best aerobically (Lichtwardt, in Howard & Miller, *The Mycota. VI Human and Animal Relationships*: 315, 1996, review, bibliogr.). Flagellate *Neocallimastigales* inhabit the foregut or hindgut fermentation chambers of most herbivores. All lack mitochondria and are obligate anaerobes which colonize ingested plant material and aid its digestion (Li & Heath, *Can. J. Microbiol.* 39: 1003, 1993; Trinci *et al.*, *MR* 98: 129, 1994, reviews, bibliogr.). Unidentified chytrids also occur in sea urchin guts (Thorsen, *Mar. Biol.* 133: 353, 1999) and may thus be more widespread.
- guttate** (1) having tear-like drops; (2) (of a pileus), marked as if by drops of liquid.
- Guttularia** W. Oberm. (1913) ? = *Melanospora* Corda fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- guttulate** (of spores), having one or more oil-like drops (**guttules**) inside.
- Gutturomyces** Rivolta (1884) ? = *Aspergillus* fide Sutton (*in litt.*).
- Gyalecta** Ach. (1808), Gyalectaceae (L.). 34, widespread (esp. temperate). See Vězda (*Sborn. Vys. Zemšd. Lesn. Brno* 1: 21, 1958), Vězda (*Folia geobot. phytotax.* 4: 443, 1969), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998; DNA), Alvarez Andrés & López de Silanes (*Nova Hedwigia* 74: 257, 2002; Iberian peninsula), Kauff & Lutzoni (*Mol. Phylogen. Evol.* 25: 138, 2002; phylogeny), Peršoh *et al.* (*Mycol. Progr.* 3: 103, 2004; asci), Kauff & Büdel (*Bryologist* 108: 272, 2005; ontogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Gyalecta** Eaton (1829) [non *Gyalecta* Ach. 1808] = *Diploschistes* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Gyalectaceae** Stizenb. (1862), Ostropales (L.). 7 gen. (+ 11 syn.), 80 spp.
Lit.: Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952), Vězda (*Folia geobot. phytotax.* 1: 311, 1966), Vězda (*Folia geobot. phytotax.* 4: 443, 1969), Hansen *et al.* (*Herzogia* 7: 367, 1987; Greenland), Coppins *et al.* (*Graphis Scripta* 6: 89, 1994), Lücking (*Trop. Bryol.* 15: 45, 1998), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998; DNA), Lücking (*Lichenologist* 31: 359, 1999), Messuti *et al.* (*Bryologist* 102: 314, 1999), Kauff & Lutzoni (*Mol. Phylogen. Evol.* 25: 138, 2002), Wiklund & Wedin (*Cladistics* 19: 419, 2003), Lumbsch *et al.* (*Mol. Phylogen. Evol.* 31: 822, 2004), Reeb *et al.* (*Mol. Phylogen. Evol.* 32: 1036, 2004), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Gyalectales** Henssen ex D. Hawksw. & O.E. Erikss. (1986) = Ostropales.
- Gyalectella** J. Lahm (1883) = *Dimerella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Gyalectidium** Müll. Arg. (1881), Gomphillaceae (L.). 43, widespread (tropical). See Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952), Vězda (*Folia geobot. phytotax.* 14: 43, 1979), Vězda & Poelt (*Folia geobot. phytotax.* 22: 179, 1987), Ferraro *et al.* (*J. Linn. Soc. Bot.* 137: 311, 2001; monograph), Ferraro & Lücking (*Acta Bot. Brasilica* 17: 619, 2003; Brazil), Lücking *et al.* (*Lichenologist* 37: 123, 2005; phylogeny), Saffranek & Lücking (*Bryologist* 108: 295, 2005; USA).
- Gyalectina** Vězda (1970) = *Cryptolechia*.
- Gyalectomyces** E.A. Thomas ex Cif. & Tomas. (1953) = *Gyalecta* Ach. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Gyalidea** Lettau ex Vězda (1966) nom. cons., Asterothyriaceae (L.). 30, widespread. See Vězda (*Folia geobot. phytotax.* 1: 311, 1966), Vězda (*Folia geobot. phytotax.* 14: 43, 1979; key), Vězda & Poelt (*Phyton Horn* 30: 47, 1990; 21 spp.), Vězda & Poelt (*Nova Hedwigia* 53: 99, 1991; key), Etayo & Vezda (*Lichenologist* 26: 333, 1994; Europe), Malcolm & Vezda (*Nova Hedwigia* 61: 457, 1995; New Zealand), Foucard & Thor (*Lichenologist* 28: 101, 1996; Sweden), Harada & Vezda (*Bryologist* 99: 193, 1996; Japan), Harada & Vezda (*Nat. Hist. Res.* 5: 57, 1999; Japan), Aptroot & Lücking (*Taxon* 51: 565, 2002; nomencl.), Henssen & Lücking (*Ann. bot. fenn.* 39: 273, 2002; anatomy, ontogeny), Aptroot & Lücking (*Biblthca Lichenol.* 86: 53, 2003; phenotype phylogeny).
- Gyalideopsis** Vězda (1972) nom. cons., Gomphillaceae (L.). 70, widespread. See Vězda (*Folia geobot. phytotax.* 14: 43, 1979; key), Kalb & Vězda (*Nova Hedwigia* 58: 511, 1994; trop.), Lücking (*Biblthca Lichenol.* 65: 1, 1997), Lücking & Sérusiaux (*Lichenologist* 30: 543, 1998), Sérusiaux (*Nova Hedwigia* 67: 381, 1998; W Indies), Boom & Vezda (*Öst. Z. Pilzk.* 9: 27, 2000; Europe), Etayo & Diederich (*Bryologist* 104: 130, 2001; USA), Ferraro

- (*Fungal Diversity* 15: 153, 2004; hypophores), Lendemer & Lücking (*Bryologist* 107: 234, 2004; N America), Lücking *et al.* (*Mycol.* 96: 283, 2004; phylogeny), Lücking *et al.* (*Lichenologist* 37: 123, 2005; phylogeny), Lücking *et al.* (*Lichenologist* 38: 131, 2006; Costa Rica), Lücking *et al.* (*Bryologist* 110: 622, 2007; N America), Vězda (*Bibliotheca Lichenol.* 96: 305, 2007; key foliicolous spp.).
- Gyalolechia** A. Massal. (1852) = *Fulgensia* fide Kärnefelt (*Cryptog. Bot.* 1: 147, 1989).
- Gyelnik** (Vilmos Köfaragó; 1906-1945; Hungary). PhD, Budapest University (1929); worked at the Budapest National Museum during the German occupation; died in Austria as a result of a bomb attack. Published about 100 papers on lichen-forming fungi (1926-1942) proposing new names mainly in *Alectoria*, *Nephroma*, *Parmelia*, and *Peltigera*. His work has been much criticized. Collections now in Budapest (BP) [? some missing; see Verseghe (*Typen-Verzeichnis der Flechtensammlung* (1964), catalogue of types in BP]. *Biogs, obits etc.* Grummann (1974: 451); Hillmann (*Feddes Repertorium* 46: 132, 1939); Kušan (*Annales Mycologici* 32: 57, 1934, criticism); Sjödin (*Acta Horti Gothoburgensis* 19: 113, 1954; bibliography, catalogue of new names); Stafleu & Cowan (*TL-2* 1: 1027, 1976).
- Gymnascella** Peck (1884), Gymnoascaceae. 14, widespread. See Currah (*Mycotaxon* 24: 1, 1985), Sugiyama *et al.* (*Mycoscience* 40: 251, 1999; DNA), Iwen *et al.* (*J. Clin. Microbiol.* 38: 375, 2000; pulmonary infection), Kuraishi *et al.* (*Antonie van Leeuwenhoek* 77: 179, 2000; ubiquinones), Solé *et al.* (*Stud. Mycol.* 47: 141, 2002; phylogeny), Sugiyama *et al.* (*Stud. Mycol.* 47: 5, 2002; phylogeny, links with *Arachniotus*).
- Gymnoascaceae** Baran. (1872), Onygenales. 12 gen. (+ 10 syn.), 38 spp.
Lit.: Malloch (*Phytophylactica*, 1981)
Lit.: von Arx (*Gen. Fungi Sporul. Cult.* Edn 3, 1981) Currah (*Mycotaxon* 24: 1, 1985; monogr.), Ghosh (*Proc. Indian Acad. Sci. (Pl. Sci.)* 94: 197, 1986; physio-ecology), Ghosh (*Kavaka* 12: 1, 1986; phylogeny), Currah (*SA* 7: 1, 1988; key gen.), Dalpé (*New Phytol.* 113: 523, 1989), Bowman *et al.* (*Mol. Phylogen. Evol.* 6: 89, 1996), Sugiyama *et al.* (*Mycoscience* 40: 251, 1999; phylogeny), Iwen *et al.* (*J. Clin. Microbiol.* 38: 375, 2000), Kuraishi *et al.* (*Antonie van Leeuwenhoek* 77: 179, 2000), Sugiyama & Mikawa (*Mycoscience* 42: 413, 2001), Sugiyama *et al.* (*Stud. Mycol.* 47: 5, 2002), Untereiner *et al.* (*Stud. Mycol.* 47: 25, 2002), Stchigel & Guarro (*MR* 111: 1100, 2007).
- Gymnoascales** G. Winter (1884) = Onygenales.
- Gymnoascoideus** G.F. Orr, K. Roy & G.R. Ghosh (1977), Gymnoascaceae. Anamorph *Malbranchea*. 1, widespread. See Currah (*Mycotaxon* 24: 1, 1985), Currah in Hawksworth (Ed.) (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. 269 269: 291, 1994; posn), Sugiyama *et al.* (*Mycoscience* 40: 251, 1999; phylogeny), Solé *et al.* (*Stud. Mycol.* 47: 141, 2002; phylogeny).
- Gymnoascopsis** C. Moreau & M. Moreau (1959) ? = *Ascosorus* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Gymnoascus** Baran. (1872), Gymnoascaceae. Anamorph *Malbranchea*. 8, widespread (north temperate). See Orr (*Mycotaxon* 5: 470, 1977; key), von Arx (*Persoonia* 13: 173, 1986; key 14 spp. s.l.), Sugiyama *et al.* (*Mycoscience* 40: 251, 1999; DNA), Kuraishi *et al.* (*Antonie van Leeuwenhoek* 77: 179, 2000; ubiquinones), Sugiyama & Mikawa (*Mycoscience* 42: 413, 2001; phylogeny), Solé *et al.* (*Stud. Mycol.* 47: 141, 2002; phylogeny), Sugiyama *et al.* (*Stud. Mycol.* 47: 5, 2002; phylogeny), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny).
- gymnocarpous** (of a sporocarp), open, with the hymenium appearing and developing to maturity exposed and not enclosed. Cf. *angiocarpous*.
- Gymnocaulon** P.A. Duvign. (1956) = *Stereocaulon* Hoffm. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Gymnochilus** Clem. (1896) [non *Gymnochilus* Blume 1859, *Orchidaceae*] = *Psathyrella* fide Singer (*Agaric. mod. Tax.*, 1951).
- Gymnocintractia** M. Piepenbr., Begerow & Oberw. (1999) = *Ustanciosporium* fide Vánky (*in litt.*).
- Gymnoconia** Lagerh. (1894), Phragmidiaceae. 1 (on *Rubus* (0, I (=I^{III}), endocyclic pathway)) (*Rosaceae*)), widespread. *G. nitens* (orange rust of *Rubus*). See Laundon (*Mycotaxon* 3: 133, 1975), Helfer (*Nova Hedwigia* 81: 325, 2005; Europ. spp.).
- Gymnocybe** P. Karst. (1879) [non *Gymnocybe* Fr. 1825) nom. rej., *Musci*] = *Pholiota* fide Kuyper (*in litt.*).
- Gymnoderma** Humb. (1793) nom. rej., Thelephoraceae.
- Gymnoderma** Nyl. (1860) nom. cons., Cladoniaceae (L). 3, Asia; N. America. See Yoshimura & Sharp (*Am. J. Bot.* 55: 635, 1968), Ahti (*Regnum veg.* 128: 58, 1993), Wei & Ahti (*Lichenologist* 34: 19, 2002; separation of *Cetradonia*), Zhou *et al.* (*J. Hattori bot. Lab.* 100: 871, 2006; phylogeny).
- Gymnodermatomyces** Cif. & Tomas. (1953) = *Gymnoderma* Nyl.
- Gymnodiscus** Zukal (1887) [non *Gymnodiscus* Less. 1831, *Compositae*] = *Zukalina*.
- Gymnodochium** Masee & E.S. Salmon (1902), anamorphic *Pezizomycotina*, Hsp. 1eH.?. 1, Europe.
- Gymnoeurotium** Malloch & Cain (1973) = *Edyuillia* fide Benny & Kimbrough (*Mycotaxon* 12: 1, 1980).
- Gymnogaster** J.W. Cribb (1956), Agaricaceae. 1, Australia. See Cribb (*Pap. Dept. Bot. (formerly Biol.) Univ. Qd.* 3: 109, 1956).
- Gymnoglossum** Masee (1891), Bolbitiaceae. 1, Australia. See Smith (*Mycol.* 58: 122, 1966).
- Gymnogomphus** Fayod (1889) nom. dub., Boletales. The name is possibly a synonym of *Boletus*. See Singer (*Agaric. mod. Tax.* 4th ed: 758, 1986).
- Gymnographa** Müll. Arg. (1887) = *Phaeographis* fide Staiger (*Bibliotheca Lichenol.* 85: 526 pp., 2002; monograph), Archer (*Telopea* 10: 589, 2004), Archer (*Bibliotheca Lichenol.* 94, 2006), Lücking (*Bibliotheca Lichenol.* 96: 185, 2007).
- Gymnographoidea** Fink (1930) = *Mazosia* fide Aptroot (*in litt.*).
- Gymnographomyces** Cif. & Tomas. (1953) = *Gymnographa*.
- Gymnographopsis** C.W. Dodge (1967), Graphidaceae (L). 3, widespread (southern hemisphere temperate). See Dodge (*Nova Hedwigia* 12: 307, 1966), Egea & Torrente (*Cryptog. Bryol.-Lichénol.* 17: 305, 1996; S Africa), Staiger (*Bibliotheca Lichenol.* 85, 2002).
- Gymnohydnotrya** B.C. Zhang & Minter (1989), Discinaceae. 3, Australia. See Zhang & Minter (*MR* 92: 192, 1989), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).

- Gymnomitrula** S. Imai (1941) = Heyderia fide Maas Geesteranus (*Persoonia* 3: 81, 1964).
- Gymnomyces** Masee & Rodway (1898) = *Russula* fide Miller *et al.* (*Mycol.* 98: 960, 2006) Gastroid forms are polyphyletic and have formerly been morphologically recognised as a separate genus.
- Gymnopaxillus** E. Horak (1966), *Serpulaceae*. 4, S. America (temperate); Australia. See Horak (*Nova Hedwigia* 10: 335, 1966), Claridge *et al.* (*Aust. Syst. Bot.* 14: 273, 2001; Australia).
- Gymnopeltis** F. Stevens (1924) = *Lecideopsella* fide Eriksson & Hawksworth (*SA* 9: 15, 1991).
- Gymnopilus** P. Karst. (1879), ? *Strophariaceae*. c. 200, widespread. See Hesler (*Mycol. Mem.* 3, 1969; 78 N. Am. spp., keys), Guzmán-Dávalos & Ovrebo (*Mycol.* 93: 398, 2001; Costa Rica and Panama), Fausto-Guerra *et al.* (*Mycotaxon* 84: 429, 2002; cultural studies), Rees *et al.* (*Mycotaxon* 84: 93, 2002; phylogeny), Guzmán-Dávalos (*Mycol.* 95: 1204, 2003; infrageneric classification), Holec (*Mykol. Listy* 93: 10, 2005; key Czech Republic spp.), Holec (*Sborník Národního Musea v Praze* 61: 52 pp., 2005; Czech Republic).
- gymnoplast**, see protoplast.
- Gymnopuccinia** K. Ramakr. (1951) = *Didymopsorella* fide Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* rev. edit., 1983).
- Gymnopus** (Pers.) Roussel (1806) nom. rej., *Marasmiaceae*. c. 300, widespread. Segregate of *Collybia*, containing most of its species, as the genus *Collybia* was previously polyphyletic. See Antonín & Noordeloos (*Libri Botanici* 17, 1997; European spp.), Antonín *et al.* (*Mycotaxon* 63: 359, 1997; taxonomy), Moncalvo *et al.* (*Syst. Biol.* 49: 278, 2000; phylogeny), Ortega *et al.* (*Mycotaxon* 85: 67, 2003; thermophilic taxa), Mata *et al.* (*Fungal Diversity* 16: 113, 2004; Costa Rica; mating system), Wilson *et al.* (*Sydowia* 56: 137, 2004; Java and Bali), Wilson & Desjardin (*Mycol.* 97: 667, 2005; phylogeny), Mata *et al.* (*Sydowia* 58: 191, 2007).
- Gymnopus** (Quél.) Quél. ex Moug. & Ferry (1887) = *Rostkovites*.
- Gymnosphaera** Tassi (1902) [non *Gymnosphaera* Blume 1828, *Cyatheaceae*] = *Stagonospora* fide Saccardo & Saccardo (*Syll. fung.* 18: 361, 1906).
- Gymnosporangium** R. Hedw. ex DC. (1805), *Pucciniaceae*. Anamorph *Roestelia*. c. 57 (on *Rosaceae* (0, I); on *Cupressaceae* (III)), widespread. *G. gaeumannii*, *G. nootkatense* and *G. paraphysatum* have II; *G. bermudianum* is autoecious (I, III on *Juniperus*); *G. juniperi-virginianae* (apple (*Malus*)-cedar (*Juniperus*) rust of USA); *G. fuscum* (pear (*Pyrus*)-juniper (*Juniperus*) rust); *G. clavipes* (quince (*Cydonia*) rust). See Kern (*Revised taxonomic account of Gymnosporangium*, 1972; key, 400 refs.), Yun *et al.* (*Plant Pathology Journal* 21: 310, 2005; aecial hosts).
- Gymnosporium** Corda (1833) nom. dub., anamorphic *Pezizomycotina*. See Hughes (*CJB* 36: 727, 1958).
- Gymnostellatospora** Udagawa, Uchiy. & Kamiya (1993), *Myxotrichaceae*. 1, Japan. See Sigler *et al.* (*Mycoscience* 41: 495, 2000; key), Tsuneda & Currah (*Mycol.* 96: 627, 2004; morphogenesis), Rice & Currah (*Mycol.* 98: 307, 2006; phylogeny, comparison with *Pseudogymnoascus*).
- Gymnotelium** Syd. (1921) = *Gymnosporangium* fide Kern (*Revised taxonomic account of Gymnosporangium*, 1972).
- gymnothecium**, an ascoma in which the peridium is a loose hyphal network, typical of *Gymnoascaceae*.
- Gymnotrema** Nyl. (1858) = *Glyphis* fide Staiger (*Biblthca Lichenol.* 85, 2002).
- Gymnoxypium** Cif., Bat. & I.J. Araujo (1963), anamorphic *Pezizomycotina*, St.1eH.?. 2, USA; Brazil. See Ciferri *et al.* (*Quad. Lab. crittogam., Pavia* 31: 85, 1963).
- gynophore** (of *Pyronemataceae*), the multinucleate female structure undergoing development.
- Gyoerffyella** Kol (1928), anamorphic *Pezizomycotina*, Hso.0= hH.?. 9 (aquatic), Europe; N. America. See Marvanová *et al.* (*Persoonia* 5: 29, 1967; key), Marvanová (*TBMS* 65: 555, 1975), Dudka & Mel'nik (*Mikol. Fitopatol.* 24: 13, 1990; USSR spp.), Mullenko (*Polish Bot. Stud.* 5: 79, 1993; Poland), Descals (*MR* 109: 545, 2005; diagnostic features).
- Gypsoplaca** Timdal (1990), *Gypsoplacaceae* (L). 1, widespread. See Timdal (*Biblthca Lichenol.* 38: 419, 1990), Arup *et al.* (*Mycol.* 99: 42, 2007; sister group relations with *Parmeliaceae*).
- Gypsoplacaceae** Timdal (1990), *Lecanorales* (L). 1 gen., 1 spp.
Lit.: Timdal (*Biblthca Lichenol.* 38: 419, 1990), Goward *et al.* (*Bryologist* 99: 439, 1996), Arup *et al.* (*Mycol.* 99: 42, 2007; sister group relations with *Parmeliaceae*).
- Gyraria** Nees (1816) = *Tremella* Pers. fide Donk (*Persoonia* 4: 179, 1966).
- gyrate** (gyrose), curved to the back and to the front in turn; folded and wavy; convoluted like a brain; (of an apothecioid ascoma), concentrically folded, e.g. *Umbilicaria*.
- Gyratylum** Preuss (1855) ? = *Sphaeropsis* Sacc. fide Sutton (*Mycol. Pap.* 141, 1977).
- Gyrocephalus** Bref. (1888) = *Guepinia* Fr. fide Donk (*Persoonia* 4: 145, 1966).
- Gyrocephalus** Pers. (1824) nom. rej. = *Gyromitra* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Gyrocercus** Corda (1837) ? = *Circinotrichum* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Gyrocollema** Vain. (1929), *Lichinaceae* (L). 1, C. America. See Moreno & Egea (*Acta Bot. Barcinon.* 41: 1, 1992).
- Gyrocratera** Henn. (1899) = *Hydnotrya* fide Trappe (*TBMS* 65: 496, 1975).
- Gyrodon** Opat. (1836), *Paxillaceae*. 10, widespread. See Bruns *et al.* (*Mol. Ecol.* 7: 257, 1998; phylogeny), Kretzer & Bruns (*Mol. Phylogen. Evol.* 13: 483, 1999; phylogeny), Nagasawa (*Rep. Tottori Mycol. Inst.* 39: 1, 2001; Japan).
- Gyrodontaceae** Heinem. (1951) = *Paxillaceae*.
- Gyrodontium** Pat. (1900), *Coniophoraceae*. 3, widespread. See Maas Geesteranus (*Persoonia* 3: 187, 1964), Carlier *et al.* (*Cryptog. Mycol.* 25: 261, 2004; phylogeny).
- Gyroxylus** Raith. (1981), *Hymenochaetales*. 1, widespread. *Hymenochaetales* or *Agaricales* (*Rickenella* clade). See Raithelhuber (*Die Gattung Clitocybe* 1: 17, 1981).
- Gyrolophium** Kunze ex Krombh. (1831) = *Dictyonema* C. Agardh ex Kunth fide Parmasto (*Nova Hedwigia* 29: 99, 1978).
- Gyromitra** Fr. (1849) nom. cons., *Discinaceae*. c. 18, widespread (esp. north temperate). *G. esculenta* (the lorchel) has a heat-labile toxin, **gyromitrin** (q.v.),

- and is carcinogenic. See Azema (*Docums Mycol.* 10: 1, 1979), Gibson & Kimbrough (*CJB* 66: 1743, 1988; ascosporeogenesis), Kimbrough (*MR* 95: 421, 1991; septal structure), Crous *et al.* (*S. Afr. J. Bot.* 62: 89, 1996), Abbott & Currah (*Mycotaxon* 62: 1, 1997; N. Am.), Landvik *et al.* (*Nordic J. Bot.* 17: 403, 1997; phylogeny), O'Donnell *et al.* (*Mycol.* 89: 48, 1997; phylogeny), Percudani *et al.* (*Mol. Phylogen. Evol.* 13: 169, 1999; phylogeny), Huhtinen & Ruotsalainen (*Karstenia* 44: 25, 2004; Finland), Medel (*Mycotaxon* 94: 103, 2005; Mexico).
- gyromitrin** (N-formylhydrazone), heat-labile, carcinogenic, cellular toxin produced by *Gyromitra esculenta* (the lorchel; false morel); breaks down to monomethylhydrazine (MMH), which is also extremely toxic.
- Gyromitrodes** Vassilkov (1942) = *Pseudorhizina* fide Pouzar (*Česká Mykol.* 15: 42, 1961).
- Gyromium** Wahlenb. (1812) = *Umbilicaria*.
- Gyromyces** Göpp. (1844), Fossil Fungi ? Fungi. 1 (Carboniferous), Germany.
- Gyrophana** Pat. (1897) = *Serpula* fide Cooke (*Mycol.* 49: 197, 1957).
- Gyrophanopsis** Jülich (1979), Meruliaceae. 2, widespread. See Jülich (*Persoonia* 10: 329, 1979), Stalpers & Buchanan (*N.Z. J. Bot.* 29: 333, 1991).
- Gyrophila** Qué. (1886) = *Tricholoma* fide Singer & Smith (*A monograph on the genus Galerina Earle*, 1964).
- Gyrophora** Ach. (1803) = *Umbilicaria*.
- Gyrophora** Pat. (1887) = *Gyrophana*.
- Gyrophoraceae** Zenker (1827) = *Umbilicariaceae*.
- Gyrophoromyces** E.A. Thomas ex Cif. & Tomas. (1953) = *Umbilicaria*.
- Gyrophoropsis** Elenkin & Savicz (1910) = *Umbilicaria* fide Wei (*An Enumeration of Lichens in China*, 1991), Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Gyrophragmium** Mont. (1843), Agaricaceae. 1, widespread (subtropical). See Kreisel (*Feddes Repert.* 83: 577, 1973), Migliozi & Camboni (*Micol. Ital.* 30: 36, 2001), Vellinga (*MR* 108: 354, 2004; phylogeny; some species belong in *Agaricus*).
- Gyrophthorus** Hafellner & Sancho (1990), Pezizomycotina. 2 (lichenicolous), Europe. See Hoffmann & Hafellner (*Biblthca Lichenol.* 77: 1, 2000).
- Gyropodium** E. Hitchc. (1825) = *Calostoma* fide Fischer (*Nat. Pflanzenfam.* 5b: viii, 1938).
- Gyroporaceae** Binder & Bresinsky (2002), Boletales. 1 gen. (+ 4 syn.), 10 spp.
Lit.: Bruns & Gardes (*Mol. Ecol.* 2: 233, 1993), Castro & Freire (*Persoonia* 16: 123, 1995), Bruns *et al.* (*Mol. Ecol.* 7: 257, 1998), Hughey *et al.* (*Mycol.* 92: 94, 2000), Nagasawa (*Rep. Tottori Mycol. Inst.* 39: 1, 2001), Watling (*Aust. Syst. Bot.* 14: 407, 2001), Binder & Bresinsky (*Mycol.* 94: 85, 2002), Buchanan & May (*N.Z. J. Bot.* 41: 407, 2003), Bruns & Shefferson (*CJB* 82: 1122, 2004).
- Gyroporus** Qué. (1886), Gyroporaceae. 10, widespread. See Nagasawa (*Rep. Tottori Mycol. Inst.* 39: 1, 2001; Japan), Li *et al.* (*Fungal Diversity* 12: 123, 2003; China), Watling *et al.* (*British Fungus Flora. Agarics and Boleti* Rev. & Enl. Edn 1: 173 pp., 2005; UK).
- Gyrostomomyces** Cif. & Tomas. (1953) = *Gyrostomum*.
- Gyrostomum** Fr. (1825) = *Glyphis* fide Hale (*Bull. Br. Mus. nat. hist. Bot.* 8: 227, 1981), Staiger (*Biblthca Lichenol.* 85: 526 pp., 2002; monograph).
- Gyrostoma** Naumov (1914), anamorphic *Hypocreales*, St.0eH.?. 3, America; former USSR. See Samuels *et al.* (*CBS Diversity Ser.* 4, 2006).
- Gyrothecium** Nyl. (1855) = *Sporastatia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Gyothrix** (Corda) Corda (1842), anamorphic *Pezizomycotina*, Hso.0eH.6. 20, widespread (esp. tropical). See Cunningham (*Mycol.* 66: 127, 1974; key), Arambarri *et al.* (*MR* 101: 1529, 1997).
- Gyrothyrium** Arx (1950) = *Schizothyrium* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Gyrotrema** A. Frisch (2006), Thelotremataceae (L). 2, S. America (tropical). See Frisch (*Biblthca Lichenol.* 92: 379, 2006).
- Gyotrichum** Spreng. (1827) = *Circinotrichum*.
- H**, Botanical Museum, University of Helsinki (Finland); founded c. 1750.
- H bodies**, pairs of sporidia of *Tilletia* fused in pairs while still attached to the promycelium.
- Haasiella** Kotl. & Pouzar (1966), Tricholomataceae. 2, Europe. See Kotlaba & Pouzar (*Česká Mykol.* 20: 135, 1966), Redhead *et al.* (*Mycotaxon* 83: 19, 2002).
- habitat**, natural place of occurrence of an organism.
- Habrostictis** Clem. (1909) nom. dub., anamorphic *Pezizomycotina*. See Hein (*Willdenowia* Beih. 9, 1976).
- Habrostictis** Fuckel (1870) = *Orbilina* fide Baral (*SA* 13: 113, 1994).
- Haddowia** Steyaert (1972), Ganodermataceae. 3, widespread (pantropical). See Steyaert (*Persoonia* 7: 108, 1972), Ryvarden (*Syn. Fung.* 19: 19, 2004).
- Haddowiaceae** Jülich (1982) = *Ganodermataceae*.
- Hadotia** Maire (1906) = *Lophodermium* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- hadromycosis**, term coined by Pethybridge (*Sci. Proc. Roy. Dublin Soc.* 15: 63, 1916) for a plant disease in which the pathogen is confined to the xylem; tracheomycosis. 'Vascular wilt' is the preferred term when wilting is a symptom. Cf. wilt.
- Hadronema** Syd. & P. Syd. (1909), anamorphic *Pezizomycotina*, Hso.1eP.?. 3, widespread.
- Hadrospora** Boise (1989), Phaeosphaeriaceae. 2, widespread. See Boise (*Mem. N. Y. bot. Gdn* 49: 308, 1989), Webster (*Nova Hedwigia* 57: 141, 1993), Tanaka & Harada (*Mycoscience* 44: 245, 2003; Japan).
- Hadrosporium** Syd. (1938), anamorphic *Pezizomycotina*, Hsp. = eP.19. 1, Australia.
- Hadrotrichum** Fuckel (1865), anamorphic *Xylariales*, Hsp.0eP.10. 5, widespread (temperate).
- Haematomma** A. Massal. (1852) nom. cons., Haematommataceae (L). 53, widespread. See Rogers (*Lichenologist* 14: 115, 1982; Australia), Rogers & Bartlett (*Lichenologist* 18: 247, 1986; NZ), Kalb *et al.* (*Biblthca Lichenol.* 59: 199, 1995), Staiger & Kalb (*Biblthca Lichenol.* 59: 3, 1995), Lumbsch *et al.* (*Nova Hedwigia* 86: 105, 2008; phylogeny, chemistry).
- Haematommataceae** Hafellner (1984), Lecanorales (L). 1 gen. (+ 1 syn.), 53 spp.
Lit.: Rogers (*Lichenologist* 17: 307, 1985), Honegger (*New Phytol.* 103: 785, 1986), Rogers & Bartlett (*Lichenologist* 18: 247, 1986), Brodo & Culberson (*Bryologist* 89: 203, 1986), Rogers & Hafellner (*Lichenologist* 20: 167, 1988), Kalb *et al.* (*Biblthca Lichenol.* 59: 199, 1995), Staiger & Kalb (*Biblthca Lichenol.* 59: 3, 1995), Lumbsch *et al.* (*Nova Hedwigia* 86: 105, 2008; phylogeny, chemistry).

- Haematommatomyces** Cif. & Tomas. (1953) = *Ophioparma*.
- Haematomyces** Berk. & Broome (1875) nom. dub., Fungi. Based on resin.
- Haematomyxa** Sacc. (1884), Pezizomycotina. 2, N. America. See Pirozynski (*SA* 6: 130, 1987), Kutorga & Hawksworth (*SA* 15: 1, 1997).
- Haematonectria** Samuels & Nirenberg (1999), Nectriaceae. Anamorph *Fusarium*-like. 5 (saprobes and pathogens), widespread. Molecular data suggest that *Neocosmospora* is at least closely related. See Samuels & Brayford (*Sydowia* 46: 75, 1994), Spatafora & Blackwell (*Mycol.* 85: 912, 1994), O'Donnell (*Sydowia* 48: 57, 1996), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), O'Donnell (*Mycol.* 92: 919, 2000; phylogeny, as *Nectria*), Summerbell & Schroers (*J. Clin. Microbiol.* 40: 2866, 2002; phylogeny, medical strains), Leslie & Summerell (*Fusarium Labor. Manual*, 2006; review), Samuels *et al.* (*CBS Diversity Ser.* 4, 2006; USA), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny), Dupont *et al.* (*Mycol.* 99: 526, 2007; colonization of cave paintings).
- Haematostereum** Pouzar (1959) = *Stereum* fide Donk (*Persoonia* 3: 199, 1964).
- haerangium**, the sporulating organ of certain ascomycetes (e.g. *Fugascus*, *Ceratostomella*), classed by Falck as *Herangiomyces*, in which the 8 ascospores developed from the octophore are contained by a membrane and surrounded by a circle of hairs (the **tentacle**) around the ostiole of the perithecium (Falck, 1947).
- Hafellia** Kalb, H. Mayrhofer & Scheid. (1986), Caliciaceae (L). 5, widespread. See Sheard (*Bryologist* 95: 79, 1992; key 5 spp., N. Am.), Posswald *et al.* (*Muelleria* 8: 133, 1994; Tasmania), Nordin (*Symb. bot. upsal.* 32 no. 1: 195, 1997; ultrastr.), Nordin & Mattsson (*Lichenologist* 33: 3, 2001; phylogeny), Scheidegger *et al.* (*Lichenologist* 33: 25, 2001; evolution), Etayo & Marbach (*Lichenologist* 35: 369, 2003; key corticolous spp., Canary Is), Helms *et al.* (*Mycol.* 95: 1078, 2003; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Hafellnera** Houmeau & Cl. Roux (1984) = *Schaereria* fide Houmeau & Roux (*Bull. Soc. bot. Centre-Ouest* Nouv. sér. 15: 142, 1984), Thor (*Symb. bot. upsal.* 32 no. 1: 267, 1997), Tehler & Irestedt (*Cladistics* 23: 432, 2007).
- Hagenia** Eschw. (1824) [non *Hagenia* J.F. Gmel. 1791, *Angiospermae*] = *Anaptychia* fide Kurokawa (*Beih. Nova Hedwigia* 6, 1962).
- Haglundia** Nannf. (1932), Dermateaceae. 5, Europe. See Gamundí (*Fl. criptog. Tierra del Fuego* 10, 1987), Dougoud (*Schweiz. Z. Pilzk.* 70: 136, 1992), Nauta & Spooner (*Mycologist* 13: 146, 1999; UK).
- Hainesia** Ellis & Sacc. (1884), anamorphic *Discohainesia*, Ccu.0eH.15. 5, widespread. Synanamorph *Pilidium*. See Sutton & Gibson (*IMI Descr. Fungi Bact.*, 1977), Palm (*Mycol.* 83: 787, 1992; synanamorph of *Pilidium*), Punithalingam & Spooner (*MR* 101: 1228, 1997; sp.n. from England).
- hair** (in *Agaricales*), one of the hair-shaped epicuticular elements forming a pilose covering or down under a lens and not homologous with a cystidium, pseudoparaphysis, or seta, e.g. in *Lachnella*, *Crinipellis* (as restricted by Singer, 1962: 61).
- Halbania** Racib. (1889), Asterinaceae. 1, Java.
- Halbaniella** Theiss. (1917) = *Actinopeltis* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Halbanina** G. Arnaud (1918) = *Cirsosia* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Hale** (Mason Ellsworth jr, 1928-1990; USA). Born in Connecticut; influenced by A.W. Evans (1868-1959) while at Yale University; PhD, University of Wisconsin (1953); learnt microchemical techniques from Asahina (q.v.); lichenologist at the Smithsonian Institution (1957-1990). Made a unique contribution to understanding the *Parmeliaceae*, preparing monographs of numerous segregate genera and also later of lichen-forming Ostropales; his keys and textbooks contributed to a revival of interest in lichen-forming fungi of North America; made some 80,000 collections from the arctic, antarctic, and esp. the tropics as well as the USA; these are in the Smithsonian Institution (USA); also a collector and user of old printing machines. *Publs. Lichen Handbook* (1957); *How to Know the Lichens* (1979) [edn 2]; *Biology of Lichens* (1983) [edn 3]; (with V. Ahmadjian) [eds] *The Lichens* (1973, published 1974)]. *Biogs, obits etc.* Ahmadjian (*Endocytobiosis and Cell Research* 7: 1, 1990) [portrait]; Culberson (*Bryologist* 94: 90, 1991) [portrait]; Grumann (1974: 189); Lawrey (*Lichenologist* 22: 405, 1990) [portrait]; Sipman & Seaward (*International Lichenological Newsletter* 23(2): 42, 1990).
- Halecania** M. Mayrhofer (1987), Catillariaceae (L). 12, Europe; N. America. See Mayrhofer (*Herzogia* 7: 383, 1987), Coppins (*Lichenologist* 21: 217, 1989; UK), Boom & Elix (*Lichenologist* 37: 237, 2005; Asia).
- Haleomyces** D. Hawksw. & Essl. (1993), ? Verrucariaceae. 1 (on lichens, esp. *Oropogon*), widespread (neotropical). See Hawksworth & Esslinger (*Bryologist* 96: 349, 1993).
- Haligena** Kohlm. (1961), Halosphaeriaceae. 1 (marine), widespread. See Johnson *et al.* (*CJB* 65: 931, 1987), Sakayaroj *et al.* (*Mycol.* 97: 804, 2005; phylogeny, morphology).
- haline**, found near the sea shore (obsol.).
- Halisaria** Giard (1889) nom. dub., ? Fungi.
- Hallingea** Castellano (1996), Gallaceaceae. 3, S. America. See Castellano & Muchovej (*Mycotaxon* 57: 339, 1996).
- Hallucinogenic fungi**. Various fungi contain chemicals which, when consumed by humans and other animals can cause hallucinations. **Teonanácatl**, basidiomata of *Psilocybe* (*P. mexicana*, etc.; see Singer and Singer & Smith, *Mycol.* 50: 239, 1958), *Stropharia*, *Paneolus*, *Lycoperdon cruciatum*, *L. mixtecorum*, etc., eaten by Mexican Indians during magical ceremonies to induce cerebral effects; sclerotia ('ergots') of species of the ascomycete genus *Claviceps* were similarly consumed in ancient Greece as part of the mystic ceremonies at Eleusis; the strong association of toadstools, particularly the fly agaric, with elves, fairies, gnomes and other imaginary little people may have its origins in the hallucinatory effects of consuming that species. Various crystalline active principles have been isolated from these fungi, e.g. **psilocybin** and, most famously, the hallucinogenic drug LSD: at least some of these active principles are may be toxins. Possible uses have been extensively and controversially explored by the military. In many countries people who consume hallucinogenic fungi or hallucinogenic drugs derived from fungi are censured and there is frequently legislation to prevent an

activity which is viewed as harmful to society in general and the consumers themselves in particular. In response to this, a substantial underground culture has developed, with many internet sites offering advice on how to cultivate or otherwise obtain so called 'magic' mushrooms, and a tourist industry for devotees to visit countries where consumption is permitted. Certain species of *Copelandia*, *Panaeolus* and *Psilocybe* are commonly used and a range of vernacular names, such as 'blue meanies' or 'shrooms', has evolved for these fungi. Much psychedelic art, literature and music has been inspired through fungal-induced hallucinations, particularly since the 1960s, and there is some evidence that native Mexican art was similarly influenced.

Lit.: Castañeda (*The teachings of Don Juan*, 1968), Heim, Wasson *et al.* (*Les champignons hallucinogènes du Mexique*, 1958; *Nouvelles investigations sur les champignons hallucinogènes*, 1967 [reprinted from *Archiv. Mus. Nat. d'Hist. Nat. sér. 7* 6, 9]), Leary *et al.* (*The psychedelic experience*, 1964), Menser (*Magic mushroom handbook*, 1984), Shelton (*A Mexican odyssey*, 1975). *Discography*: Beatles (*Revolver*, 1966), Cream (*Disraeli Gears*, 1967), Gong (*Camembert Electrique*, 1971), Hendrix (*Are You Experienced?*, 1967), Jefferson Airplane (*Surrealistic Pillow*, 1967). See Ethnomycology, Soma.

halmophagous (of ectotrophic mycorrhiza), having a mantle and a Hartig net (Burgeff, 1943).

Haloaleurodiscus N. Maek., Suhara & K. Kinjo (2005), Russulales. 1, Japan. See Maekawa *et al.* (*MR* 109: 826, 2005).

Halobysus Zukal (1893) = *Monilia* Bonord. fide Clements & Shear (*Gen. Fung.*, 1931).

Halocyphina Kohlm. & E. Kohlm. (1965), Niaceae. 1 (marine), USA. See Ginns & Malloch (*Mycol.* 69: 53, 1977).

Halographis Kohlm. & Volkm.-Kohlm. (1988), Roccellaceae (?L). 1 (marine), Australia; Belize. See Kohlmeyer & Volkmann-Kohlmeyer (*CJB* 66: 1138, 1988), Kohlmeyer & Volkmann-Kohlmeyer (*Cryptog. Bot.* 2: 367, 1992).

Haloguignardia Cribb & J.W. Cribb (1956), Lulworthiales. 6 (forming galls on marine *Fucales*), Australasia. See Kohlmeyer & Kohlmeyer (*Marine Mycology*, 1979), Inderbitzin *et al.* (*MR* 108: 737, 2004; phylogeny), Campbell *et al.* (*MR* 109: 556, 2005; phylogeny).

halonate (1) (of a leaf-spot), having concentric rings; one of the 'frog-eye' type; (2) (of a spore), having a transparent coat around it.

Halonectria E.B.G. Jones (1965), Hypocreales. 1 (on intertidal wood, marine), British Isles. See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).

Halonina Fr. (1849) nom. dub., Fungi. See von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).

halophilic, tolerating salt; living in salt water; *Dendryphiella salina* is esp. well-studied and there appears to be no salt accumulation in its vacuoles (see Jennings, in Rodriguez-Valera (Ed.), *General and applied aspects of halophilic microorganisms*: 107, 1991; review, bibliogr.). See Marine fungi.

Halophiobolus Linder (1944) = *Lulworthia* fide Kohlmeyer & Kohlmeyer (*Marine Mycology*, 1979).

Halorosellinia Whalley, E.B.G. Jones, K.D. Hyde & Laessøe (2000), Xylariaceae. Anamorph *Geniculosporium*-like. 1 (mangrove roots), widespread (pan-tropical). See Whalley *et al.* (*MR* 104: 368, 2000),

Petrini (*N.Z. J. Bot.* 41: 71, 2003; key).

Halosarpheia Kohlm. & E. Kohlm. (1977), Halosphaeriaceae. 22 (on wood, marine or freshwater), widespread. See Jones (*CJB* 74 Suppl. 1: S790, 1995; ultrastr.), Hyde *et al.* (*Mycoscience* 40: 165, 1999), Kong *et al.* (*MR* 104: 35, 2000; DNA), Abdel-Wahab *et al.* (*Mycoscience* 42: 255, 2001), Anderson *et al.* (*Mycol.* 93: 897, 2001; phylogeny), Baker *et al.* (*CJB* 79: 1307, 2001; ultrastr.), Anderson & Shearer (*Mycotaxon* 82: 115, 2002; anamorph), Campbell *et al.* (*Fungal Diversity Res. Ser.* 7: 15, 2002; phylogeny), Pang (*Fungal Diversity Res. Ser.* 7: 35, 2002; morphology), Campbell *et al.* (*Mycol.* 95: 530, 2003; phylogeny), Pang & Jones (*Nova Hedwigia* 78: 269, 2004), Pang *et al.* (*Nova Hedwigia* 83: 207, 2006; phylogeny).

Halosphaeria Linder (1944), Halosphaeriaceae. Anamorphs *Periconia*-like, *Trichocladium*. 4 (marine wood), widespread. See Shearer & Crane (*Mycol.* 69: 1218, 1978; anamorph), Kohlmeyer & Kohlmeyer (*Marine Mycology*, 1979), Jones *et al.* (*Bot. Mar.* 27: 129, 1984), Hyde *et al.* (*Bot. Mar.* 37: 51, 1994; ultrastr.), Spatafora *et al.* (*Am. J. Bot.* 85: 1569, 1998; phylogenetic analysis), Kong *et al.* (*MR* 104: 35, 2000; DNA), Pang (*Fungal Diversity Res. Ser.* 7: 35, 2002; morphology), Campbell *et al.* (*Mycol.* 95: 530, 2003), Pang *et al.* (*J. Linn. Soc. Bot.* 146: 223, 2004; separation of *Okeanomyces*), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).

Halosphaeriaceae E. Müll. & Arx ex Kohlm. (1972), Microascales. 61 gen. (+ 5 syn.), 177 spp.

Lit.: Kohlmeyer & Kohlmeyer (*Marine Mycology*: 511, 1979), Jones *et al.* (*J. Linn. Soc. Bot.* 87: 193, 1983; *Corollospora* s.l.), Jones *et al.* (*Bot. Mar.* 27: 129, 1984; *Halosphaeria* s.l.), Nakagiri & Tubaki (*Bot. Mar.* 28: 485, 1985; anamorphs), Farrant in Moss (Ed.) (*Biology of marine fungi*: 231, 1986; asci), Jones & Moss (*SA* 6: 179, 1987; key 21 gen.), Nakagiri & Tubaki in Sugiyama (Ed.) (*Pleomorphic Fungi: The Diversity and its Taxonomic Implications*: 79, 1987), Hyde & Jones (*Bot. Mar.* 32: 205, 1989), Jones *et al.* (*CJB* 74: S342, 1989), Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 34: 1, 1991; key), Yusoff *et al.* (*CJB* 72: 1550, 1994), Jones (*CJB* 73: S790, 1995), Spatafora *et al.* (*Am. J. Bot.* 85: 1569, 1998; phylogenetic analysis), Abdel-Wahab *et al.* (*MR* 103: 1500, 1999), Chen *et al.* (*Mycol.* 91: 84, 1999), Chen *et al.* (*Mycol.* 91: 84, 1999; DNA), Hyde *et al.* (*Mycoscience* 40: 165, 1999), Kong *et al.* (*MR* 104: 35, 2000; DNA), Anderson *et al.* (*Mycol.* 93: 897, 2001), Campbell *et al.* (*Mycol.* 95: 530, 2003), Pang *et al.* (*Nova Hedwigia* 77: 1, 2003), Sakayaroj *et al.* (*Mycol.* 97: 804, 2005), Schoch *et al.* (*MR* 111: 154, 2007; as *Halosphaeriales*).

Halosphaeriales Kohlm. (1986) = Microascales.

Halosphaeriopsis T.W. Johnson (1958), Halosphaeriaceae. 1 (marine), widespread. See Jones *et al.* (*Bot. Mar.* 27: 129, 1984), Spatafora *et al.* (*Am. J. Bot.* 85: 1569, 1998; phylogenetic analysis), Kong *et al.* (*MR* 104: 35, 2000; DNA), Campbell *et al.* (*Mycol.* 95: 530, 2003; phylogeny).

Halospora, see *Holospora*.

Halotthia Kohlm. (1963), ? Zopfiaceae. 1 (marine), Europe. See Kohlmeyer (*Nova Hedwigia* 6: 9, 1963).

Halstedia F. Stevens (1920) = *Phyllachora* Nitschke ex Fuckel (1870) fide Petrak (*Annls mycol.* 32: 317, 1934).

Halteromyces Shipton & Schipper (1975), Cunning-

- hamellaceae. 1, Australia. See Shipton & Schipper (*Antonie van Leeuwenhoek* 41: 337, 1975), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny).
- Halysiomycetes** E.G. Simmons (1981), anamorphic *Pezizomycotina*, Hso.1= eH.4. 1, USA. See Simmons (*Mycotaxon* 13: 408, 1981).
- Halysium** Corda (1837) nom. conf., anamorphic *Pezizomycotina*. See Hughes (*CJB* 36: 727, 1958).
- hamanatto**, an edible oriental product obtained by the fermentation of soybeans with *Aspergillus oryzae*; tao-cho (Malaysia); tao-si (Philippines).
- hama-natto**, see Fermented food and drinks.
- Hamaspora** Körn. (1877), Phragmidiaceae. 14 (on *Rubus* (*Rosaceae*)), Africa; Asia; Australasia. See Monoson (*Mycopathologia* 37: 263, 1969), Gjørsum *et al.* (*Lidia* 5: 74, 2000; Uganda).
- Hamasporella** Höhn. (1912) = *Hamaspora* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- hamate** (**hamose**, **hamous**), hooked (Fig. 23.35); unciate. Cf. hamulate.
- hamathecium** (Eriksson, *Opera Bot.* 60: 15, 1981), a neutral term for all kinds of hyphae or other tissues between asci, or projecting into the locule or ostiole of ascomata; usually of carpocentral origin; interascal tissues. Eriksson recognized seven categories (see Fig. 14A-F):
- (A) **Interascal pseudoparenchyma**, carpocentral tissues unchanged or compressed between developing asci; e.g. *Wettsteinina*.
 - (B) **Paraphyses**, hyphae originating from the base of the cavity, usually unbranched and not anastomosed; e.g. *Pyrenula*, *Xylaria*.
 - (C) **Paraphysoids** (trabecular pseudoparaphyses; tinophyses), interascal or pre-ascal tissue stretching and coming to resemble pseudoparaphyses; often only remotely septate, anastomosing and very narrow (see Barr, *Mycol.* 71: 935, 1979); e.g. *Patellaria*, *Melanomma*.
 - (D) **Pseudoparaphyses** (cellular pseudoparaphyses; cataphyses), hyphae originating above the level of the asci and growing downwards between the developing asci, finally becoming attached to the base of the cavity and often also then free in the upper part; often regularly septate, branched and anastomosing and broader; e.g. *Pleospora*.
 - (E) **Periphysoids**, short hyphae originating above the level of the developing asci but not reaching the base of the cavity; e.g. *Nectria*, *Metacapnodium*.
 - (F) **Periphyses**, hyphae confined to the ostiolar canal; unbranched and not anastomosing; can occur in conjunction with (B), (D) or (E); e.g. *Gibberella*, *Pyrenula*.
 - (G) **Hamathecial tissue absent** (not figured), e.g. *Dothidea*.
- Hamatocanthoscypha** Svrček (1977), Hyaloscyphaeae. c. 13, widespread (temperate). See Huhtinen (*Karstenia* 29: 45, 1990; key), Raitviir (*Scripta Mycol.* 20, 2004).
- Hamigera** Stolk & Samson (1971), Trichocomaceae. Anamorph *Merimbla*. 1. See Pitt (*The genus Penicillium and its teleomorphic states Eupenicillium and Talaromyces*, 1979), Ogawa & Sugiyama (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 149, 2000), Pitt *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 9, 2000), Bills *et al.* (*MR* 105: 1273, 2001; anamorph), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny), Peterson (*Mycol.* 100: 205, 2008; 4-locus phylogeny).
- hamulate** (**hamulose**), having little hooks. Cf. hamate.
- Handkea** Kreisel (1989) = *Lycoperdon* Pers. fide Larsson & Jeppson (*MR* 112: 4, 2008).
- hanging drop**, see van Tieghem cell.
- Hansen** (Emil Christian; 1842-1909; Denmark). Microbiologist and Director of the Physiological Department of the Carlsberg Laboratories, Copenhagen. Specialized in yeasts and coprophilous fungi. *Publs.* De Danske Gjøningssvampe (Fungi fimicoli Danici) *Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening i Kjøbenhavn* (1876, published 1877); *Practical Studies in Fermentation: being Contributions to the Life-history of Micro-organisms* (1896) [translation by A.K. Miller]. *Biogs, obits etc.* Stafleu & Cowan (*TL-2* 2: 46, 1979).
- Hansenia** Lindner (1905) = *Hanseniaspora* fide von Arx (*Gen. Fungi Sporul. Cult.* Edn 3, 1981).
- Hansenia** P. Karst. (1879) [non *Hansenia* Turcz. 1884, *Umbelliferae*] = *Trametes* fide Donk (*Persoonia* 1: 173, 1960).
- Hansenia** Zikes (1911) = *Hanseniaspora* fide von Arx (*Gen. Fungi Sporul. Cult.* Edn 3, 1981).
- Hansenia** Zopf (1883) = *Strattonia* fide Lundqvist (*Symb. bot. upsala*. 20 no. 1, 1972).
- Hanseniaspora** Zikes (1911), Saccharomycodaceae. Anamorph *Kloeckera*. 10, widespread. See Meyer *et al.* (*Antonie van Leeuwenhoek* 44: 79, 1978), Boekhout *et al.* (*Int. J. Syst. Bacteriol.* 44: 781, 1994), Smith in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 214, 1998), Esteve-Zarzoso *et al.* (*Antonie van Leeuwenhoek* 80: 85, 2001; phylogeny), Cadez *et al.* (*FEMS Yeast Res.* 1: 279, 2002; genetic diversity), Cadez *et al.* (*Int. J. Syst. Evol. Microbiol.* 53: 1671, 2003; n. spp.), Capece *et al.* (*Journal of Applied Microbiology* 98: 136, 2005; strain diversity), Cadez *et al.* (*Int. J. Syst. Evol. Microbiol.* 56: 1157, 2006; phylogeny), Pramateftaki *et al.* (*FEMS Yeast Res.* 6: 77, 2006; mitochondrial genome), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Hansenula** Syd. & P. Syd. (1919) = *Pichia*. Still used in applied environments. fide Kreger-van Rij (Ed.) (*Yeasts, a taxonomic study* 3rd edn, 1984), Kurtzman (*Antonie van Leeuwenhoek* 50: 209, 1984), Barnett *et al.* (*Yeasts: Characteristics and Identification* 2nd edn, 1990), Kurtzman in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 273, 1998), Middelhoven (*Hansenula polymorpha* Biology and Applications: 1, 2002), Boekhout (Ed.) (*FEMS Yeast Res.* 7: 1081, 2007; special journal issue).
- Hansenulaceae** E.K. Novák & Zsolt (1961) = *Pichiaceae*.
- Hansford** (Clifford George; 1900-1966; England, later Jamaica, Uganda, Sri Lanka, Australia, Botswana). Microbiologist, Department of Agriculture, Jamaica; Government Mycologist, Department of Agriculture, Uganda (1926-1946); Plant Pathologist, Tea Research Institute, Sri Lanka (1946-1957); mycologist, Waite Institute, Adelaide; cotton research, Botswana. A pioneer of the mycota of East Africa, in particular Uganda; also noted as an expert on *Meliola* and related genera. Collections in EA (IMI, K). *Publs.* The Meliolineae. A monograph. *Sydowia Beiheft* (1961); *Iconographia Meliolarum. Sydowia Beiheft* (1963). *Biogs, obits etc.* Ainsworth (*Brief Biographies of British Mycologists* p. 85, 1996).

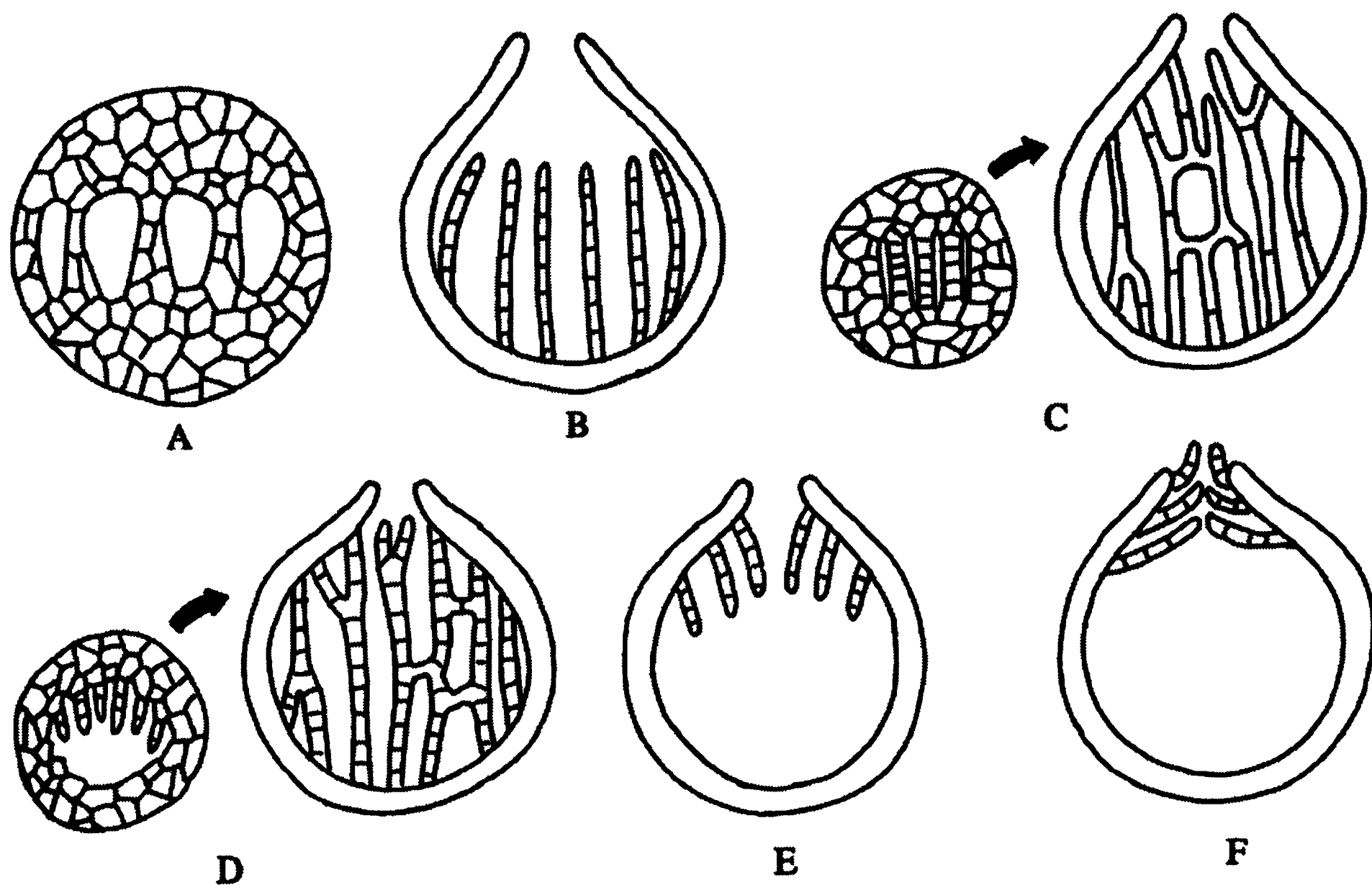


Fig. 15. Hamathecium terminology, following Eriksson (1981). See text for explanation.

Hansfordia S. Hughes (1951), anamorphic *Pezizomycotina*, Hso.0eP.11. 12, widespread. See Deighton (*TBMS* 59: 531, 1972), von Arx (*Sydowia* 35: 10, 1982; syn. with *Dicyma*), Gené *et al.* (*MR* 104: 1404, 2000; Spain).

Hansfordiella S. Hughes (1951), anamorphic *Trichothyrium*, Hso.≡ eP.1. 5, Africa; Philippines. See Subramanian (*Proc. Indian natn Sci. Acad. Part B. Biol. Sci.* 45: 282, 1957; key spp. on *Meliola* etc.).

Hansfordiellopsis Deighton (1960), anamorphic *Koordersiella*, Hso.#eP.1. 5 (on lichens), Africa; S. America. See Hawksworth (*Bull. Br. Mus. nat. hist. Bot.* 6: 181, 1979; key).

Hansfordina Bat. (1962) = *Microcallis* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).

Hansfordiopeltis Bat. & C.A.A. Costa (1956), anamorphic *Pezizomycotina*, Cpt.0eH.?. 2, Congo. See Batista & Costa (*An. Soc. Biol. Pernambuco* 14: 40, 1956), Farr (*Mycol.* 78: 269, 1986).

Hansfordiopeltopsis M.L. Farr (1986), anamorphic *Pezizomycotina*, Cpt.1bH.?. 1, Brazil. See Farr (*Mycol.* 78: 274, 1986), Reynolds & Gilbert (*Cryptog. Mycol.* 27: 249, 2006).

Hansfordiopsis Bat. (1959), *Micropeltidaceae*. 1, Australia. See Batista (*Publções Inst. Micol. Recife* 56: 407, 1959).

Hansfordiula E.F. Morris (1963) = *Phaeoisaria* fide de Hoog & Papendorf (*Persoonia* 8: 407, 1976).

Hantzschia Auersw. (1862) [non *Hantzschia* Grunov 1877, *Bacillariophyceae*] nom. rej. = *Kendrickiella* fide Kendrick (*CJB* 42: 1119, 1964), Jacobs *et al.* (*CJB* 79: 110, 2001).

Hapalocystis Auersw. ex Fuckel (1863), *Sydowiellaceae*. Anamorph *Phoma*-like. 4 (from bark), Europe; N. America. See Glawe (*Mycol.* 77: 880, 1985; anamorph), Barr (*Mycotaxon* 41: 287, 1991), Jaklitsch & Voglmayr (*Stud. Mycol.* 50: 229, 2004; key),

Rossman *et al.* (*Mycoscience* 48: 135, 2007; review).

Hapalopera Fott (1942) = *Phlyctidium* (A. Braun) Rabenh. fide Sparrow (*Aquatic Phycomycetes* Edn 2: 1187 pp., 1960) but see Batko (1975); = *Rhizophydium* fide, Karling (*Chytriomyc. Iconogr.*, 1977).

Hapalophragmiopsis Thirum. (1950) = *Hapalophragmium* fide Monoson (*Mycol.* 69: 21, 1977), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983), Lohsomboon *et al.* (*MR* 96: 461, 1992).

Hapalophragmites Ramanujam & Ramachar (1980), Fossil Fungi, *Phragmidiaceae*. 1, India. See Ramanujam & Ramachar (*Records of the Geological Survey of India* 113: 82, 1980).

Hapalophragmium Syd. & P. Syd. (1901), *Raveneliaceae*. 14 (on *Leguminosae*), Africa (tropical). See Monoson (*Mycol.* 69: 22, 1977; key), Lohsomboon *et al.* (*MR* 96: 461, 1992), Thaung (*Australasian Mycologist* 24: 29, 2005; Burma).

Hapalopilaceae Jülich (1982) = *Polyporaceae*.

Hapalopilus P. Karst. (1881), *Polyporaceae*. 5, widespread. See Ko *et al.* (*Mycol.* 93: 270, 2001).

Hapalosphaeria Syd. (1908), anamorphic *Pezizomycotina*, Cpd.0eH.15. 1 (in anthers), Europe.

Haplaria Link (1809) = *Botrytis* fide Hennebert (*Persoonia* 7: 188, 1973).

Haplariella Sacc. (1931) = *Haplariella* Syd. & P. Syd. fide Carmichael *et al.* (*Genera of Hyphomycetes*, 1980).

Haplariella Syd. & P. Syd. (1908), anamorphic *Pezizomycotina*, Cpd.0eH.?. 1, S. America.

Haplariopsis Henn. (1908) = *Haplariella* Syd. & P. Syd.

Haplariopsis Oudem. (1903), anamorphic *Pezizomycotina*, Hsy.1eH.?. 1, Europe.

haplo- (prefix), one only; single.

Haplobasidion Erikss. (1889), anamorphic *Pezizomycotina*, Hso.0eP.3. 3, Europe; Asia. See Ellis (*Mycol.*

- Pap.* 67, 1957; key).
- haplobiontic**, see Haplobionticae; cf. diplobiontic.
- Haplobionticae**. Subclass of *Ascomycota* in which the life cycles consists of one thallus (biont); cf. Diplobionticae. Introduced by Nannfeldt (1932).
- Haploblastia** Trevis. (1860) = *Strigula* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Haplocarpon** M. Choisy (1936) = *Porpidia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Fryday (*Lichenologist* 37: 1, 2005).
- Haplochalara** Linder (1933) = *Catenularia* fide Mason (*Mycol. Pap.* 5: 121, 1941).
- haploconidium** (of *Tremellales*), a uninucleate conidium.
- Haplocybe** Clem. (1909) ? = *Ombrophila* Fr. fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).
- Haplocystis** Sorokīn (1874), ? Chytridiales. 1, Italy.
- Haplodina** Zahlbr. (1930), Roccellaceae (L). 3, China.
- haplodioicous**, see heterothallism.
- Haplodothella** Werderm. (1923) = *Vestergrenia* Rehm fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Haplodothis** Höhn. (1911) = *Mycosphaerella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- haplogonidia** (**haplogonimia**), gonidia (gonimia) in ones, not in groups (obsol.).
- Haplographa** Anzi (1860) = *Lithographa* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Haplographiaceae** E. Castell. & Chalm. (1919) = *Hyaloscyphaceae*.
- Haplographites** Félix (1894), Fossil Fungi. 2 (Tertiary), Europe.
- Haplographium** Berk. & Broome (1859), anamorphic *Dematioscypha*, Hso.0eH.10. 15, widespread (esp. temperate). See Zucconi & Pagano (*Mycotaxon* 46: 11, 1993; gen. limits), Kendrick (*CJB* 81: 75, 2003; morphogenesis).
- haploheteroecious**, see heterothallism.
- haploid** (1) (of a nucleus), having the *n* number of chromosomes; (2) (of a cell), having 1 haploid nucleus; (3) (of a mycelium), made up of haploid cells;.
- Haplolepis** Syd. (1925), anamorphic *Pezizomycotina*. 2, Europe. See Sutton (*Mycol. Pap.* 141, 1977).
- Haploloma** Trevis. (1857), ? Lecanorales. 1 (on lichens), Europe.
- Haplomela** Syd. (1925) = *Melanconium* fide Clements & Shear (*Gen. Fung.*, 1931).
- haplomitotic A nuclear cycle**, occurrence of one mitotic haploid phase in the nuclear cycle (Dick, 1987); karyogamy - meiosis - mitosis - karyogamy -.
- haplomitotic B nuclear cycle**, occurrence of one mitotic diploid phase in the nuclear cycle (Dick, 1987); karogamy - mitosis - meiosis - karyogamy -.
- haplomonoeccious**, see homothallism.
- Haplomyces** Thaxt. (1893), Laboulbeniaceae. 3, N. America; Europe. See Santamaría (*Fl. Mycol. Iberica* 5, 2003; Iberian peninsula), De Kesel & Krastina-De Kesel (*Acta Mycologica Warszawa* 41: 55, 2006; Latvia).
- haplomycosis**, see adiaspiromycosis.
- haplont**, the thallus of the haplophase; the gametophyte.
- Haplopeltheca** Bat., J.L. Bezerra & Cavalc. (1963), Micropeltidaceae. 1, Brazil. See Batista *et al.* (*Publções Inst. Micol. Recife* 388: 5, 1963).
- Haplopeltis** Theiss. (1914) = *Muyocopron* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- haplophase**, the part of the life history in which the cells are haploid.
- Haplophoma** Riedl & Ershad (1977) = *Phomopsis* (Sacc.) Bubák. fide Sutton (*in litt.*).
- Haplophyse** Theiss. (1916), ? Rhytismatales. 1, Hawaii.
- Haploporaceae** Jülich (1982) = *Polyporaceae*.
- Haploporus** Bondartsev (1953) = *Haploporus* Bondartsev & Singer.
- Haploporus** Bondartsev & Singer (1944), *Polyporaceae*. 1, Europe. See Eriksson (*Symb. bot. upsal.* 16 no. 1: 160, 1958), Niemalä (*Ann. bot. fenn.* 8: 237, 1971), Zeng & Bai (*Acta Mycol. Sin.* 12: 12, 1993; China), Piątek (*Polish Botanical Journal* 48: 81, 2003; Belarus), Zmitrovich *et al.* (*International Journal of Medicinal Mushrooms* 7: 489, 2005; medicinal properties *Haploporus suaveolens*).
- Haplopyrenula** Müll. Arg. (1883) = *Vizella* fide Santesson (*Svensk bot. Tidskr.* 43: 547, 1949).
- Haplopyrenulomyces** Cif. & Tomas. (1953) = *Haplopyrenula*.
- Haplopyxis** Syd. & P. Syd. (1920) = *Uromyces* fide Baxter (*Mycol.* 55: 73, 1963).
- Haploravenelia** Syd. (1921) = *Ravenelia* fide Berndt (*in litt.*) Not used by, Arthur (*Manual Rusts US & Canada*, 1934) or, Cummins (*Rust fungi on legumes and composites in North America*, 1978).
- Haplospora** Räsänen (1943) nom. inval. = *Haplopyrenula*.
- Haplosporangium** Thaxt. (1914) = *Mortierella* fide Gams (*Persoonia* 9: 381, 1977).
- Haplosporella**, see *Aplosporella*.
- Haplosporidium** Caullery & Mesnil (1899) nom. dub., ? Fungi.
- Haplosporidium** Speg. (1912), anamorphic *Pezizomycotina*, Cpd.0eH.?. 1, Argentina. See Trotter (*Syll. Fung.* 25: 178, 1925; ? = *Chaetophoma*), Clements & Shear (*Gen. Fung.*: 357, 1931; ? = *Asteroma*).
- Haplosporium** Mont. (1843) nom. dub., Fungi. See Petrak & Sydow (*Annls mycol.* 27: 114, 1929).
- Haplostroma** Syd. & P. Syd. (1916) = *Coccodiella* fide Müller & von Arx in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 87, 1973).
- haplostromatic**, see stroma.
- Haplostromella** Höhn. (1917) nom. nud. = *Strasseria* fide Sutton (*Mycol. Pap.* 141, 1977).
- haplosynoecious**, see homothallism.
- Haplotelium** Syd. (1922) = *Uromyces* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- Haplotheciella** Höhn. (1918) = *Didymella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Haplothecium** Theiss. & Syd. (1915) = *Glomerella* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Haplothelopsis** Vain. (1921) = *Thelopsis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Haplotrichella** Arnaud (1954) = *Gliomastix* fide Carmichael *et al.* (*Genera of Hyphomycetes*, 1980).
- Haplotrichum** Eschw. (1824) nom. dub., *Pezizomycotina*.
- Haplotrichum** Link (1824), anamorphic *Botryobasidium*, Hso.0eH.3. See Hughes (*CJB* 36: 727, 1958; = *Acladium*), Holubová-Jechová (*Česká Mykol.* 30: 3, 1976), Partridge *et al.* (*Mycotaxon* 77: 201, 2001), Partridge *et al.* (*Mycotaxon* 82: 41, 2002; key).
- Haplovalsaria** Höhn. (1919) = *Didymosphaeria* fide Aptroot (*Nova Hedwigia* 60, 1995).
- Hapsidascus** Kohlm. & Volkm.-Kohlm. (1991), Pe-

- zizomycotina. 1 (marine), Belize. See Kohlmeyer & Volkmann-Kohlmeyer (*SA* 10: 113, 1991).
- Hapsidomyces** J.C. Krug & Jeng (1984), Pezizaceae. 1 (coprophilous), Venezuela. See Krug & Jeng (*Mycol.* 76: 748, 1984), Hansen *et al.* (*Mol. Phylogen. Evol.* 36: 1, 2005; phylogeny).
- Hapsidospora** Malloch & Cain (1970), Hypocreales. Anamorph *Acremonium*-like. 1 (from compost), Canada. See Suh & Blackwell (*Mycol.* 91: 836, 1999; phylogeny), Rossman *et al.* (*Mycol.* 93: 100, 2001; ? placement in *Bionectriaceae*).
- hapteron** (1) an aerial organ of attachment of some fruticose lichens (e.g. *Alectoria sarmentosa* subsp. *vexillifera*) formed by a secondary branch which becomes attached to the substratum; (2) attachment organ at base of a funicular cord in *Nidulariaceae*.
- Haptocara** Drechsler (1975), anamorphic *Pezizomycotina*, Hso.≡ eH.6. 1 (on nematodes), USA. See Drechsler (*Am. J. Bot.* 62: 1072, 1975).
- Haptocillium** W. Gams & Zare (2001), anamorphic *Ophiocordycipitaceae*. 12 (on nematodes), widespread. See Gams & Zare (*Nova Hedwigia* 72: 334, 2001), Glockling & Holbrook (*Mycologist* 19: 2, 2005), Sung *et al.* (*Stud. Mycol.* 57, 2007; phylogeny).
- haptonema**, filamentous appendage (usually coiled) consisting of the plasma membrane, a sheath of endoplasmic reticulum, and a core of several microtubules anchored near the kinetosome.
- Haptospora** G.L. Barron (1991), anamorphic *Hypocreales*, Hso.1bH.15. 3 (endoparasitic in rotifers), West Indies; New Zealand. See Barron (*CJB* 69: 503, 1991).
- Haradaea** Denchev (2006) = *Microbotryum* fide Vánky (*in litt.*) but see, Denchev *et al.* (*Mycol. Balcanica* 3: 71, 2006).
- Haraea** Sacc. & P. Syd. (1913), Meliolaceae. 1 or 2 (from leaves), Japan; West Indies.
- Haraella** Hara & I. Hino (1955) [non *Haraella* Kudô 1930, *Orchidaceae*] ≡ *Hinoa*.
- Harikrishnaella** D.V. Singh & A.K. Sarbhoy (1972) = *Chaetomella* fide Sutton & Sarbhoy (*TBMS* 66: 297, 1976).
- Hariotia** P. Karst. (1889) [non *Hariotia* Adans. 1763, *Cactaceae*] ≡ *Delphinella*.
- Hariotula** G. Arnaud (1917) = *Cyclotella* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Harknessia** Cooke (1881), anamorphic *Wuestneia*, St.0eP.19. 44, widespread. Probably referable to the *Cryptosporrellaceae*, but more research is needed. See Sutton (*Mycol. Pap.* 123, 1971; key), Nag Raj & DiCosmo (*Biblthca Mycol.* 80, 1981), Sutton & Pascoe (*MR* 92: 431, 1989; development of ostiole), Crous *et al.* (*Mycol.* 85: 108, 1993; S. Afr. spp.), Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993), Castlebury *et al.* (*Mycol.* 94: 1017, 2002), Lee *et al.* (*Stud. Mycol.* 50: 235, 2004; phylogeny, fam. placement), Rossman *et al.* (*Myco-science* 48: 142, 2007).
- Harknessiella** Sacc. (1889), Dothideomycetes. 1, N. America.
- Harmandiana** B. de Lesd. (1914) nom. dub., ? Dothideomycetes.
- Harmoniella** V.N. Boriss. (1981), anamorphic *Pezizomycotina*, Hso.0eP.10. 1, British Isles/raine. See Borissova (*Mikol. Fitopatol.* 15: 89, 1981).
- Harpagomyces** Wilcz. (1911), anamorphic *Pezizomycotina*, Hso.0bP.1. 1, Europe.
- Harpella** L. Léger & Duboscq (1929), Harpellaceae. 5 (in *Diptera*), widespread. See Lichtwardt (*Mycol.* 59: 482, 1967), Reichle & Lichtwardt (*Mycol.* 81: 103, 1972; ultrastr.), Moss & Lichtwardt (*CJB* 58: 1035, 1980; ultrastr., taxonomy), Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986; key), Alencar *et al.* (*Memórias do Instituto Oswaldo Cruz* 98: 799, 2003; Brazil), White (*MR* 110: 1011, 2006; phylogeny).
- Harpellaceae** L. Léger & Duboscq ex P.M. Kirk & P.F. Cannon (2007), Harpellales. 5 gen., 40 spp.
Lit.: Moss (*TBMS* 65: 115, 1975), Moss & Young (*Mycol.* 70: 944, 1978), Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*: 343 pp., 1986), Benny in McLaughlin *et al.* (Eds) (*The Mycota A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research* 7A: 147, 2001), Lichtwardt (*Cellular Origin and Life in Extreme Habitats* 4: 577, 2002).
- Harpellales** Lichtw. & Manier (1978). Kickxellomycotina. 2 fam., 38 gen., 200 spp. Thallus simple or branched, septate, with basal holdfast; asexual reproduction by lateral, monosporous, elongate sporangia (trichospores), which upon release exhibit one or more basally attached appendages; sexual reproduction by biconical zygosporangia; endocommensals or parasites of freshwater arthropods (normally *Insecta*). Fams:
- (1) **Harpellaceae**
(2) **Legeriomycetaceae**
Lit.: Lichtwardt (1986; fam. key, *Am. J. Bot.* 51: 836, 1964; culture), Lichtwardt & Manier (*Mycotaxon* 7: 441, 1978; taxonomy), Manier (1969; taxonomy), Moss & Lichtwardt (*CJB* 54: 2346, 1976, 55: 3099, 1977; ultrastr.), Moss & Young (*Mycol.* 70: 944, 1978; phylogeny), Moss *et al.* (*Mycol.* 67: 120, 1975; sexual reproduction), Moss (1979), Peterson & Lichtwardt (*TBMS* 88: 189, 1987; antigenic variation), White *et al.* (*Mycol.* 98: 860, 2006; molecular phylogeny), Hibbett *et al.* (*MR* 111: 109, 2007), and see under Families.
- Harpellomyces** Lichtw. & S.T. Moss (1984), Harpellaceae. 3 (in *Diptera*), widespread. See Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986), Santamaria & Girbal (*An. Jard. bot. Madr.* 55: 219, 1997; Spain), Lichtwardt *et al.* (*Mycol.* 93: 764, 2001; Canada), White (*MR* 110: 1011, 2006; phylogeny), White *et al.* (*Mycol.* 98: 872, 2006; USA).
- Harpezomyces** Malloch & Cain (1973) ≡ *Chaetosartorya*.
- Harpidiaceae** Vězda ex Hafellner (1984) = *Lichinaceae*.
- Harpidium** Körb. (1855), Lichinaceae (L). 2, Europe; N. America. See Sancho & Crespo (*Lazaroa* 5: 265, 1983), Henssen *et al.* (*Bot. Acta* 101: 49, 1987; posn), Schultz *et al.* (*Bryologist* 103: 802, 2000; N America), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key).
- Harpocephalum** G.F. Atk. (1897) = *Periconia* fide Ellis (*Dematiaceous Hyphomycetes*, 1971).
- Harpochytriaceae** Wille (1900), Monoblepharidales. 1 gen. (+ 2 syn.), 6 spp.
Lit.: Gaurilof *et al.* (*CJB* 58: 2098, 1980), Gaurilof *et al.* (*CJB* 58: 2090, 1980), Paquin *et al.* (*Curr. Genet.* 31: 380, 1997), Einax & Voigt (*Organ. Divers. Evol.* 3: 185, 2003).
- Harpochytriales** R. Emers. & Whisler (1968) = *Chytridiales*.

- Harpochytrium** Lagerh. (1890), Harpochytriaceae. 6, widespread (north temperate). See Jane (*J. Linn. Soc. Lond.* 53: 28, 1946), Gaurilof *et al.* (*CJB* 58: 2090, 1980; ultrastr.), Paquin *et al.* (*Curr. Genet.* 31: 380, 1997; within *Monoblepharidales*), James *et al.* (*Mycol.* 98: 860, 2006; phylogeny).
- Harpographium** Sacc. (1880), anamorphic *Pezizomycotina*, Hso.0eP.10. 10, widespread. See Morris (*Am. midl. Nat.* 68: 319, 1962), Deighton (*TBMS* 85: 738, 1985).
- Harpophora** W. Gams (2000), anamorphic *Gaeumannomyces*. 4, widespread. See Gams (*Stud. Mycol.* 45: 192, 2000), Freeman & Ward (*Molecular Plant Pathology* 5: 235, 2004; review), Saleh & Leslie (*Mycol.* 96: 1294, 2004; on *Zea*).
- Harposporella** Höhn. (1925) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Harposporium** Lohde (1874), anamorphic *Podocrella*, Hso.0fH.15. c. 29, widespread (temperate). See Drechsler (*Mycol.* 38: 1, 1946), Saikawa & Endo (*TMSJ* 27: 341, 1986; TEM nematode infection), Barron & Szuarto (*CJB* 69: 1284, 1991), Hodge *et al.* (*MR* 101: 1377, 1997; *Hirsutella* synanamorph), Glockling (*MR* 102: 891, 1998), Gams & Zare (*Mycology Series* 19: 17, 2003), Chaverri *et al.* (*Mycol.* 97: 433, 2005).
- Harpostroma** Höhn. (1928), anamorphic *Leptosillia*, St.0fH.?. 1, Europe.
- Hartiella** Massee (1910) = *Calostilbella* fide Mason (*Mycol. Pap.* 2: 29, 1925).
- Hartig** (Heinrich Julius Adolph Robert; 1839-1901; Germany). Teacher at Forestry Academy Eberswalde, 1866-1878, then Professor of Botany, Munich. Noted for his work on forest tree pathogens and symbionts. *Publs. Wichtige Krankheiten der Waldbaume* (1874) [English translation *Phytopathological Classics* 12, 1975]; *Die Zersetzungerscheinungen des Holzes der Nadelholzbäume und der Eiche* (1878); *Lehrbuch der Baumkrankheiten* (1882) [in French, 1891; in English, 1894; as *Lehrbuch der Pflanzenkrankheiten*, 1900]. *Biogs, obits etc.* Meinecke (*Phytopathology* 5: 1, 1915) [portrait]; Merrill *et al.* (*Phytopathological Classics* 12, 1975) [bibliography, portrait]; Ostrofsky & Ostrofsky (*Review of Tropical Plant Pathology* 7: 237, 1993).
- Hartig net**, the intercellular hyphal network formed by an ectomycorrhizal fungus upon the surface of a root.
- Hartigiella** P. Syd. (1900) = *Meria* fide Vuillemin (*Annl. mycol.* 3: 340, 1905).
- Harzia** Costantin (1888), anamorphic *Melanospora*, Hso.0eP.1. 3, widespread. See Holubová-Jechová (*Folia geobot. phytotax.* 9: 315, 1974).
- Harziella** Costantin & Matr. (1899), anamorphic *Pezizomycotina*, Hso.0eH.15. 1 (on *Lepista nuda*), Europe. See Fontana (*Allionia* 6: 35, 1960).
- Harziella** Kuntze (1891) ≡ *Trichocladium*.
- Hasegawaea** Y. Yamada & I. Banno (1987), *Schizosaccharomycetaceae*. 1, Japan. See Yamada & Banno (*Yeast Special Issue* 5: S393, 1989), Jeffery *et al.* (*Antonie van Leeuwenhoek* 72: 327, 1997; lipid composition).
- Hassallia** Trevis. (1848), *Algae*. *Algae*.
- Hassea** Zahlbr. (1902), *Dothideomycetes* (L). 1, USA.
- Hassiella** T.N. Taylor, Krings & Kerp (2006), *Fossil Fungi*. 1, British Isles.
- Hasskarlinda** Kuntze (1891) ≡ *Corallomyces* Fr.
- hastate**, like a spear-head or arrow-head in form.
- Hastifera** D. Hawksw. & Poelt (1986) = *Micareia* Fr. (1825) [nom. cons.] fide Hafellner (*Herzogia* 9: 167, 1992).
- Hauerslevia** P. Roberts (1998), *Auriculariales*. 1, Europe. See Roberts (*Cryptog. Mycol.* 19: 277, 1998).
- haustorial cap**, an electron-dense, cap-like mass at the end of a lobe of the haustorial apparatus of *Exobasidium camelliae* (Mims, *Mycol.* 74: 188, 1982).
- haustorium**, a special hyphal branch, esp. one within a living cell of the host, for absorption of food (see Karling, *Am. J. Bot.* 19: 41, 1932). Honegger (*New Phytol.* 103: 785, 1986) distinguishes three main types of fungus-plant cell interactions: (1) **wall-to-wall apposition** with no penetration; (2) **intracellular haustoria** where the fungus penetrates into the plant cell, with or without the formation of special sheath, neckband, or collar; (3) **intraparietal haustoria** where penetration is restricted to the wall layers (common in some groups of lichens).
- Haustoria of *Phytophthora* (Blackwell, *TBMS* 36: 138, 1953), of *Peronosporales* (Fraymouth, *TBMS* 39: 79, 1956); in lichens (Honegger, 1986); evolution in rusts (Rajendren, *Bull. Torrey bot. Cl.* 99: 84, 1972); ultrastructure (Beckett *et al.*, *Atlas of fungal ultrastructure*, 1974); cf. rhizoid. Used in addition, by de Bary, for organs of attachment (appressoria).
- Hawksworthia** Manohar., N.K. Rao, D.K. Agarwal & Kunwar (2004), anamorphic *Pezizomycotina*. 1, India. See Manoharachary *et al.* (*Indian Phytopath.* 57: 499, 2004).
- Hawksworthiana** U. Braun (1988), anamorphic *Pezizomycotina*, Hso.0-1eH.10. 1 (on lichens), north temperate. See Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 1, 1995), Hafellner *et al.* (*Mycotaxon* 84: 293, 2002; N America).
- Haynaldia** Schulzer (1866) [non *Haynaldia* Schur 1866, *Gramineae*] = *Helicostylum* fide Hesseltine (*Mycol.* 47: 344, 1955).
- hazard groups** (of fungi), see Safety, Laboratory.
- Hazardia** J. Weiser (1977), *Microsporidia*. 1.
- Hazlinszkya** Körb. (1861) ? = *Melaspilea* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- heart rot**, decay of the inner wood of trees, caused by basidiomycetes.
- heather rags**, common name for *Hypogymnia physodes*.
- Hebeloma** (Fr.) P. Kumm. (1871), *Strophariaceae*. c. 150, widespread (esp. north temperate). See Bruchet (*Bull. Soc. linn. Lyon* 39 Suppl. 6: 1, 1970; key European spp.), Smith *et al.* (*The veiled species of Hebeloma in the western United States*, 1983; key N. Amer. spp.), Vesterholt (*Nordic J. Bot.* 9: 289, 1989; key Europ. spp. sect. *Hebeloma*), Vesterholt (*Symb. bot. Upsal.* 30 no. 3: 129, 1995; key Europ. spp. *H. crustuliniforme*-complex), Aanen & Kuyper (*Mycol.* 91: 783, 1999; taxonomy), Marmeisse *et al.* (*Hebeloma – Ectomycorrhizal fungi, key genera in profile*, 1999; ecology), Aanen *et al.* (*Mycol.* 92: 269, 2000; phylogeny), Moncalvo *et al.* (*Syst. Biol.* 49: 278, 2000; phylogeny), Bon (*Docums Mycol.* 31 no. 123: 3, 2002; key European spp.), Aanen & Kuyper (*Persoonia* 18: 285, 2004; species concept), Vesterholt (*Fungi of Northern Europe* 3: 146 pp., 2005; N. Europ. spp.), Boyle *et al.* (*MR* 110: 369, 2006; molecular phylogeny Europ. spp.).
- Hebelomataceae** Locq. (1977) nom. rej. = *Strophariaceae*.

- Hebelomatis** Earle (1909) = *Hebeloma* fide Singer (*Agaric. mod. Tax.*, 1951).
- Hebelomina** Maire (1925), Strophariaceae. 4, N. Africa; Europe. The genus is polyphyletic and contains albino forms of both *Hebeloma* (*H. domardiana*) and *Gymnopilus* (*H. neerlandica*). See Huijsman (*Persoonia* 9: 485, 1978; distinction from *Hebeloma*), Gennari (*Rivista di Micologia* 45: 311, 2002; key), Fraiture & Hayova (*Acta Mycologica Warszawa* 41: 177, 2006).
- Hectocerus** Raf. (1806) nom. nud., Fungi. See Merrill (*Index Rafinesq.*, 1949).
- Hegermila** Raitv. (1995), Hyaloscyphaceae. 4, S. America. See Raitviir & Järv (*Eesti NSV Tead. Akad. Toim. Biol. seer* 44: 23, 1995).
- Heim** (Roger; 1900-1979; France). Préparateur (1927-1929) then assistant (1929-1933) then Deputy Director (1933-1945), then Professor (1945-1973) and Director (1951-1965), Muséum National d'Histoire Naturelle, Paris; a member of the French resistance during World War II, arrested by the Gestapo, interned in Buchenwald and subsequently awarded the Croix de Guerre. Widely travelled; main interests: larger basidiomycetes, mycetism, termite fungi, tropical mycology and ethnomycology (q.v.) with Wasson (q.v.). *Publs.* Le genre *Inocybe*. *Encyclopédie Mycologique* (1938); *Les Champignons d'Europe* (1969) [edn 2]; *Les Champignons Toxiques et Hallucinogènes* (1973); *Termites et Champignons* (1977). *Biogs, obits etc.* Ainsworth (*TBMS* 76: 177, 1981) [portrait]; Batra (*Mycol.* 72: 1063, 1981) [portrait]; Dorst (*Comptes Rendu de l'Académie des Sciences, Paris* 290: 120, 1980); Grumann (1974: 326); Romagnesi (*BSMF* 96: 117, 1980) [portrait]; Stafleu & Cowan (*TL-2* 2: 137, 1979).
- Heimatomyces** Peyr. (1873) = *Chitonomyces* fide Thaxter (*Memoirs of the American Academy of Arts and Sciences* 12: 187, 1896).
- Heimiella** Boedijn (1951) [non *Heimiella* Lohmann 1913, *Haptophyceae*] = *Heimioporus*.
- Heimiella** Racov. (1959) nom. illegit., anamorphic *Pezizomycotina*, Cpd.1eH.?. 1, France; Rumania. See Racovitza (*Mémoires du Museum National d'Histoire Naturelle Paris* 10: 193, 1959).
- Heimiodiplodia** Zambett. (1955) = *Botryodiplodia* fide Petrak (*Sydowia* 16: 353, 1963).
- Heimiodora** Nicot (1960), anamorphic *Pezizomycotina*, Hso.0eH.10. 1 (from soil), Thailand. See Benjamin (*Aliso* 5: 278, 1963; posn), Rao & Pande (*Perspectives in Mycological Research* 2 (Prof. G.P. Agarwal Festschrift): 17, 1990).
- Heimiomyces** Singer (1942) = *Xeromphalina* fide Kuyper (*in litt.*).
- Heimioporus** E. Horak (2004), Boletaceae. c. 15, widespread (mainly (sub)tropical). See Singer (*Am. midl. Nat.* 37: 527, 1946; as *Heimiella*), Corner (*Beih. Nova Hedwigia*: 1, 1970; as *Heimiella*), Pegler & Young (*TBMS* 76, 1981; as *Heimiella*), Horak (*Sydowia* 56: 237, 2004).
- Heinemannomyces** Watling (1999), Agaricaceae. 1, Peninsular Malaysia. See Watling (*Belg. JI Bot.* 131: 133, 1998), Vellinga (*MR* 108: 354, 2004; phylogeny).
- Heleiosa** Kohlm., Volkm.-Kohlm. & O.E. Erikss. (1996), Dothideomycetes. 1, USA. See Kohlmeyer *et al.* (*CJB* 74: 1830, 1996).
- helenin** (helenine), an antiviral antibiotic from *Penicillium funiculosum*; considered to be RNA of viral origin (Banks *et al.*, *Nature* 218: 545, 1968).
- Heleococcum** C.A. Jørg. (1922), Bionectriaceae. 4 (in soil and sediments etc.), widespread. See Tubaki (*TMSJ* 8: 5, 1967), Rehner & Samuels (*CJB* 73 Suppl. 1: S816, 1995; phylogeny), Udagawa *et al.* (*Mycoscience* 36: 37, 1995), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Rossman *et al.* (*Mycol.* 93: 100, 2001; rDNA phylogeny), Bilanenko *et al.* (*Mycotaxon* 91: 497, 2005; Mongolia).
- Helgardia** Crous & W. Gams (2003), anamorphic *Oculimacula*, H??.?. 4, widespread. See Crous *et al.* (*Eur. J. Pl. Path.* 109: 845, 2003).
- Helhonia** B. Sutton (1980), anamorphic *Pezizomycotina*, St.1eH.15. 1, Europe. See Sutton (*The Coelomycetes*: 600, 1980).
- Heliastrium** Petr. (1931), *Pezizomycotina*. 1, Philippines.
- Helicascus** Kohlm. (1969), Pleosporales. 1 (marine), widespread. See Kohlmeyer (*CJB* 47: 1471, 1969), Hyde (*Bot. Mar.* 34: 311, 1991), Tam *et al.* (*Bot. Mar.* 46: 487, 2003).
- Helicia** Dearn. & House (1925) [non *Helicia* Lour. 1790, *Proteaceae*] = *Cylindrocolla* fide Sutton (*Mycol. Pap.* 141, 1977).
- Helicobasidiaceae** P.M. Kirk (2008), *Helicobasidiales*. 3 gen. (+ 4 syn.), 17 spp.
- Helicobasidiales** R. Bauer, Begerow, J.P. Samp., M. Weiss & Oberw. (2006). *Pucciniomycetes*. 1 fam., 3 gen., 17 spp. Fam.:
- Helicobasidiaceae**
- For *Lit.* see under gen.
- Helicobasidium** Pat. (1885), *Helicobasidiaceae*. Anamorphs *Thanatophytum*, *Tuberculina*. c. 6, widespread. *H. purpureum* (syn. *H. brebissonii* sensu Donk) (anamorph *Thanatophytum crocorum*) is the cause of violet root rot in a number of plants. See Donk (*Persoonia* 4: 156, 1966; synonymy), Aimi *et al.* (*Curr. Microbiol.* 44: 148, 2002; cytology), Lutz *et al.* (*MR* 108: 227, 2004), Lutz *et al.* (*Mycol.* 96: 1316, 2004), Nakamura *et al.* (*MR* 108: 641, 2004; violet root rot).
- Helicobasis** Clem. & Shear (1931) = *Helicobasidium*.
- Helicobolomyces** Matzer (1995), anamorphic *Arthonia*, Hso.0 = hH.1. 1 (on lichens), neotropics. See Grube *et al.* (*Lichenologist* 27: 28, 1995), Lücking *et al.* (*Global Ecology and Biogeography* 12: 21, 2003).
- Helicobolus** Wallr. (1833) = *Phloeospora* fide Sutton (*Mycol. Pap.* 141, 1977).
- Helicocephalidaceae** Boedijn (1959), *Zoopagales*. 3 gen., 12 spp.
- Lit.*: Boedijn (*Sydowia* 12: 355, 1958), Borowska (*Acta Mycologica Warszawa* 32: 129, 1997), Benny *et al.* in McLaughlin *et al.* (Eds) (*The Mycota A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research* 7A: 113, 2001).
- Helicocephalum** Thaxt. (1891), *Helicocephalidaceae*. 4 (obligate parasites of nematode eggs), widespread. See Thaxter (*Bot. Gaz.* 16: 201, 1891), Drechsler (*Mycol.* 26: 33, 1934), Drechsler (*Mycol.* 35: 134, 1943), Arnaud (*BSMF* 68: 181, 1952; possible anamorphic *Ascomycota*), Barron (*TBMS* 65: 309, 1975), Watanabe & Koizumi (*TMSJ* 17: 1, 1976), Kitz & Embree (*Mycol.* 81: 164, 1989), Roux & Botha (*Proc. Elect. Microsc. Soc. S. Afr.* 25: 40, 1994; SEM), Roux (*S. Afr. J. Bot.* 62: 104, 1996), Roux (*S. Afr. J. Bot.* 62: 285, 1996), Borowska (*Acta Mycologica Warszawa* 32: 129, 1997; possible ana-

- morphic *Ascomycota*).
- Helicoceras** Linder (1931), anamorphic *Pezizomycotina*, Hso.0≡ eP.1. 4, widespread (north temperate). See Moore (*Mycol.* 47: 90, 1955; key).
- Helicocoryne** Corda (1854) = *Helicoma* fide Hughes (*CJB* 36: 727, 1958).
- Helicodendron** Peyronel (1918), anamorphic *Lambertella*, Hso.0≡ hP.3. c. 27 (aero-aquatic), widespread. See Glen-Bott (*TBMS* 38: 17, 1955), Moore (*Mycol.* 47: 90, 1955; key), Abdullah (*TBMS* 81: 638, 1983), Goos *et al.* (*TBMS* 84: 423, 1985; keys), Abdullah (*Nova Hedwigia* 44: 339, 1987), Abdullah *et al.* (*Nova Hedwigia* 63: 425, 1996; Spain), Voglmayr (*Pl. Syst. Evol.* 205: 185, 1997; Austria), Voglmayr & Fisher (*MR* 101: 1122, 1997), Tsui & Berbee (*Mol. Phylogen. Evol.* 39: 587, 2006; phylogeny), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Helicodesmus** Linder (1925) = *Helicodendron* fide Linder (*Ann. Mo. bot. Gdn* 16: 329, 1929).
- Helicofilina** Matsush. (1983), anamorphic *Pezizomycotina*, Hso.0≡ h-bP.1. 1, India. See Matsushima (*Matsush. Mycol. Mem.* 3: 11, 1983), Goos (*Mycol.* 79: 1, 1987).
- Helicogermis** Lodha & D. Hawksw. (1983), *Xylariaceae*. 4, widespread. See Læssøe & Spooner (*Kew Bull.* 49: 1, 1994), Rappaz (*Mycol. Helv.* 7: 99, 1995), Lee & Crous (*Sydowia* 55: 109, 2003; South Africa), Petrini (*N.Z. J. Bot.* 41: 71, 2003; key, New Zealand), Ju *et al.* (*Mycol.* 96: 1393, 2004; key).
- Helicogloea** Pat. (1892), *Phleogenaceae*. c. 20, widespread. See Baker (*Mycol.* 38: 630, 1946), Donk (*Persoonia* 4: 157, 1966), Roberts (*Mycotaxon* 87: 187, 2003; Caribbean), Kirschner (*Frontiers in Basidiomycete Mycology*: 165, 2004; anam.).
- Helicogonium** W.L. White (1942), *Endomycetaceae*. 1 (on *Corticium*), Canada. See Malloch & Hoog in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 197, 1998), Baral (*Nova Hedwigia* 69: 1, 1999), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Helicogoosia** Hol.-Jech. (1991), anamorphic *Pezizomycotina*, Hso.0≡ hP.1. 1, Czech Republic. See Holubová-Jechová (*Mycotaxon* 41: 445, 1991).
- Helicoma** Corda (1837), anamorphic *Tubeufia*, Hso.0≡ hH.10. 45, widespread. See Goos (*Mycol.* 78: 744, 1986; key), Castañeda Ruíz *et al.* (*MR* 102: 58, 1998; Cuba), Tsui & Berbee (*Mol. Phylogen. Evol.* 39: 587, 2006; phylogeny), Tsui *et al.* (*Mycol.* 98: 94, 2006; phylogeny).
- Helicomina** L.S. Olive (1948) = *Pseudocercospora* fide Deighton (*Mycol. Pap.* 140, 1976), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003).
- Helicominites** Barlinge & Paradkar (1982), Fossil Fungi, anamorphic *Pezizomycotina*. 1 (Cretaceous), India.
- Helicominopsis** Deighton (1960), anamorphic *Pezizomycotina*, Hso.0≡ hH.10. 1, Sierra Leone. See Deighton (*Mycol. Pap.* 78: 20, 1960), Goos (*Mycol.* 79: 1, 1987).
- Helicomyses** Link (1809), anamorphic *Acanthostigma*, Hso.0≡ hH.10. 12 (aero-aquatic), widespread. See Goos (*Mycol.* 77: 606, 1985; keys), Réblová & Barr (*Sydowia* 52: 258, 2000; teleomorph), Kodsueb *et al.* (*Mycol.* 96: 667, 2004; Hong Kong), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny), Tsui *et al.* (*Mycol.* 98: 94, 2006; phylogeny).
- Helicomycetaceae** Nann. (1934) = *Tubeufiaceae*.
- Helicomysa** R. Kirschner & Chee J. Chen (2004), anamorphic *Hyaloriaceae*. 1, Taiwan. See Kirschner & Chen (*Stud. Mycol.* 50: 338, 2004).
- Helicoön** Morgan (1892), anamorphic *Tubeufiaceae*, Hso.0≡ hH.10. 19, N. America; Europe. See Moore (*Mycol.* 47: 90, 1955; key), Goos (*TBMS* 87: 115, 1986; key 8 spp.), van der Aa & Samson (*MR* 98: 74, 1994; key amendment), Goh & Hyde (*MR* 100: 1485, 1996; key), Voglmayr (*MR* 101: 337, 1997), Chang (*Bot. Bull. Acad. sin. Taipei* 42: 149, 2001; Taiwan), Tsui & Berbee (*Mol. Phylogen. Evol.* 39: 587, 2006; phylogeny).
- Helicoönites** Kalgutkar & Sigler (1995), Fossil Fungi, anamorphic *Pezizomycotina*. 1 (Eocene), Canada. See Kalgutkar & Sigler (*MR* 99: 519, 1995).
- Helicopsis** P. Karst. (1889) = *Helicoma* fide Linder (*Ann. Mo. bot. Gdn* 16: 302, 1929).
- Helicorhoidion** S. Hughes (1958), anamorphic *Pezizomycotina*, Hso.0≡ hH-P.10. 5, widespread. See Sutton (*Sydowia* 41: 336, 1989; relationships), Hyde *et al.* (*MR* 103: 1409, 1999; on palms).
- Helicosingula** P.S. van Wyk, Marasas, Baard & Knox-Dav. (1985), anamorphic *Pezizomycotina*, Hso.0≡ hP.1. 1, S. Africa. See van Wyk *et al.* (*TBMS* 85: 183, 1985), Crous *et al.* (*CBS Diversity Ser.* 2, 2004).
- Helicosporangium** H. Karst. (1865) ? = *Papulospora* fide Kendrick & Carmichae in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 390, 1973).
- helicospore**, a non-septate or septate spore, with a single (usually elongated) axis curved through at least 180° but may describe one or more complete rotations, in two or three dimensions (cf. amerospore, scolecospore); any protuberances, other than setulae, <1/4 spore body length (cf. staurospore). See Goos (*Mycol.* 79: 4, 1987; terminology). See also Anamorphic fungi.
- Helicosporella** Arnaud (1954) nom. inval., anamorphic *Pezizomycotina*, Hso.0≡ hP.1. 1, Europe.
- Helicosporiaceae** Nann. (1934) = *Tubeufiaceae*.
- Helicosporiates** Kalgutkar & Sigler (1995), Fossil Fungi, anamorphic *Pezizomycotina*. 1 (Eocene), Canada. See Kalgutkar & Sigler (*MR* 99: 520, 1995).
- Helicosporidium** Keilin (1921), *Chlorococcaceae*. 2 (in *Insecta* and *Acari*), widespread (tropical). See Wesier (*J. Protozool.* 17: 436, 1970; ? *Ascomycota*), Lindegren & Hoffman (*J. Invert. Path.* 27: 105, 1976; ? *Protozoa*), Avery & Undeen (*J. Invert. Path.* 49: 246, 1987; effect on mosquitoes), Eriksson & Hawksworth (*SA* 8: 68, 1989; posn), Tartar *et al.* (*Int. J. Syst. Evol. Microbiol.* 52: 273, 2002; member of *Chlorophyta*).
- Helicosporina** Arnaud (1954) nom. inval., anamorphic *Pezizomycotina*.
- Helicosporina** G. Arnaud ex Rambelli (1960), anamorphic *Pezizomycotina*, Hso.0≡ hP.10. 1, Italy. See Sutton (*in litt.*; ? Synonym of *Troposporella*).
- Helicosporium** Nees (1816), anamorphic *Tubeufia*, Hso.0≡ hP.10. 20, widespread. See Goos (*Mycol.* 81: 356, 1989; key), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny), Tsui & Berbee (*Mol. Phylogen. Evol.* 39: 587, 2006; phylogeny), Tsui *et al.* (*Mycol.* 98: 94, 2006; phylogeny).
- Helicostilbe** Höhn. (1902), anamorphic *Pezizomycotina*, Hso.0≡ hP.10. 1, Austria.
- Helicostilbe** Linder (1929) = *Trochophora* fide Moore (*Mycol.* 47: 90, 1955).
- Helicostylum** Corda (1842), *Mucoraceae*. 2, widespread. See Upadhyay (*Mycol.* 65: 735, 1973; key), Benny (*Mycol.* 87: 253, 1995; key), Voigt & Wöste-

- meyer (*Gene* 270: 113, 2001; phylogeny), Schmidt *et al.* (*Microbial Ecology* 56: in press, 2008; coenocytic 'snow molds').
- Helicothyrium** I. Hino & Katum. (1961), anamorphic *Pezizomycotina*, Cpt.0≡ hH.?. 1, Japan. See Hino & Katumoto (*Bulletin of the Faculty of Agriculture, Yamaguchi University* 11: 11, 1961).
- Helicotrichum** Nees & T. Nees (1818) = *Helicosporium* fide Hughes (*CJB* 36: 727, 1958).
- Helicoubisia** Lunghini & Rambelli (1979), anamorphic *Pezizomycotina*, Hso.0≡ hP.10. 1, Ivory Coast. See Lunghini & Rambelli (*Micol. Ital.* 8: 21, 1979), Pinoi *et al.* (*Sydowia* 56: 72, 2004).
- Heliocephala** V.G. Rao, K.A. Reddy & de Hoog (1984), anamorphic *Pezizomycotina*, Hso.≡ eP.1. 1, India; S. Africa. See Kuyper (*in litt.*), Decock *et al.* (*Mycol.* 90: 330, 1998; S Africa), White *et al.* (*Stud. Mycol.* 45: 95, 2000; India).
- Heliocybe** Redhead & Ginns (1985) = *Neolentinus* fide Rune (*MR* 98: 543, 1994).
- Heliomyces** Lév. (1844) = *Marasmius* fide Singer (*Agaric. mod. Tax.*, 1951).
- heliophilous**, preferring direct sunlight. Cf. *anheliophilous*.
- heliozoid**, amoeba-like, but having well-marked ray-like pseudopodia.
- Heliscella** Marvanová (1980), anamorphic *Pezizomycotina*, Hso.1bH.15. 2 (aquatic), widespread. See Marvanová (*TBMS* 75: 224, 1980).
- Heliscina** Marvanová (1980), anamorphic *Pezizomycotina*, Hso.1eH/1bH.19. 2 (aquatic), Czech Republic. See Marvanová (*TBMS* 75: 227, 1980).
- Heliscus** Sacc. (1880), anamorphic *Nectria*, Hsp.≡ eH.15. 4 (aquatic), widespread. See Petersen (*Mycol.* 55: 570, 1963; key), Baschien *et al.* (*Nova Hedwigia* 83: 311, 2006; phylogeny).
- Helmichia** J.I.R. Larsson (1982), Microsporidia. 2. See Larsson (*Protistologica* 18: 353, 1982).
- Helminthascus** Tranzschel (1898), ? Clavicipitaceae. 1 (on *Insecta*), former USSR.
- Helminthocarpon** Fée (1837), Graphidaceae (L). 2, tropical. See Awasthi & Joshi (*Norw. J. Bot.* 29: 165, 1979), Aptroot (*Myconet* 2: 15, 1999).
- Helminthocarponomyces** Cif. & Tomas. (1953) nom. dub., ? Graphidaceae. See Lücking & Hawksworth (*Taxon* 56: 1274, 2007).
- helminthoid**, worm-like in form; vermiform.
- Helminthopeltis** Sousa da Câmara (1950), ? Microthyriaceae. 1, Europe. See Sousa da Câmara (*Agron. lusit.* 12: 102, 1950).
- Helminthophana** Peyr. (1873) = *Arthrorhynchus* fide Thaxter (*Proc. Amer. Acad. Arts & Sci.* 36: 395, 1901).
- Helminthophora** Bonord. (1851), anamorphic *Pezizomycotina*, Hso.≡ eH.15. 1 (fungicolous), widespread (temperate). See de Hoog (*Persoonia* 10: 55, 1978).
- Helminthosphaeria** Fuckel (1870), Helminthosphaeriaceae. Anamorph *Diplococcium*. 2 or 8 (on *Clavulina*, *Peniophora* and wood), widespread (north temperate). See Samuels *et al.* (*Mycol.* 89: 141, 1997), Goh & Hyde (*Fungal Diversity* 1: 65, 1998; anam.), Réblová (*Mycotaxon* 70: 387, 1999), Réblová (*Sydowia* 51: 223, 1999), Miller & Huhndorf (*MR* 108: 26, 2004; phylogeny).
- Helminthosphaeriaceae** Samuels, Cand. & Magni (1997), Sordariomycetidae (inc. sed.). 8 gen. (+ 6 syn.), 163 spp.
Lit.: Samuels *et al.* (*Mycol.* 89: 141, 1997), Goh & Hyde (*Fungal Diversity* 1: 65, 1998), Goh & Hyde (*CJB* 76: 1698, 1998), Réblová (*Sydowia* 51: 223, 1999), Réblová (*Mycotaxon* 70: 387, 1999), Wang & Sutton (*CJB* 76: 1608, 1998), Huhndorf *et al.* (*Mycol.* 96: 368, 2004), Miller & Huhndorf (*MR* 108: 26, 2004).
- helminthosporal**, a terpenoid mycotoxin from the *Drechslera* anamorph of *Cochliobolus sativus* toxic to wheat and barley.
- Helminthosporiaceae** Corda (1837) = Massarinaceae.
- Helminthosporiopsis** Speg. (1880) nom. dub., anamorphic *Pezizomycotina*. See Seifert (*Sydowia* 45: 103, 1993).
- Helminthosporites** Chitaley & M.T. Sheikh (1971), Fossil Fungi. 1 (Palaeocene), India.
- Helminthosporites** Pia (1927), Fossil Fungi. 1 (Carboniferous), Europe.
- Helminthosporium** Link (1809) nom. cons., anamorphic *Massarinaceae*, Hso.≡ eP.27. c. 35 (lignicolous), widespread. *Bipolaris*, *Drechslera*, *Exserohilum* were once placed within this genus. Molecular data suggests placement in the *Massarinaceae*; the link with *Splanchnonema* (*Pleomass.*) needs further study. See Ellis (*Mycol. Pap.* 82, 1961; key 10 spp.), Luttrell (*Mycol.* 55: 643, 1963; spore development; terminology for characters), Subramanian & Sekar (*Kavaka* 15: 87, 1987; teleomorph), Olivier *et al.* (*Mycol.* 92: 736, 2000; phylogeny), Errampalli *et al.* (*J. Microbiol. Meth.* 44: 59, 2001; PCR detection), Eriksson & Hawksworth (*Mycol.* 95: 426, 2003; phylogeny).
- helminthosporoside**, a host-specific toxin produced by *Drechslera sacchari* in sugarcane (Strobel & Steiner, *Physiol. Pl. Pathol.* 2: 129, 1972).
- Helmisporium** Link (1809) nom. rej. prop. = *Helminthosporium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Helocarpaceae** Hafellner (1984), Lecanorales. 1 gen., 4 spp.
Lit.: Hafellner (*Beih. Nova Hedwigia* 79: 241, 1984).
- Helocarpon** Th. Fr. (1860), Helocarpaceae (L). 4, widespread. See Borghesi & Fantini (*Bollettino del Circolo Micologico 'Giovanni Carini'* 41: 29, 2001; Pacific Northwest), Andersen & Ekman (*MR* 109: 21, 2005; phylogeny).
- Helochora** Sherwood (1979), ? Phyllachoraceae. 1 (from leaves of *Puya*), Chile. See Cannon (*Stud. Mycol.* 31: 49, 1989), Pearce & Hyde (*Fungal Diversity* 6: 83, 2001).
- Helodiomyces** F. Picard (1913), Ceratomycetaceae. 1, Europe; N. Africa. See Santamaría (*Fl. Mycol. Iberica* 5, 2003; Iberian peninsula).
- Helolachnum** Torrend (1910) = *Lachnum* fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).
- Helopodium** Ach. ex Michx. (1803) = *Cladonia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Helostroma** Pat. (1902) = *Microstroma* fide Saccardo (*Michelia* 1: 273, 1878).
- Helote** Hazsl. (1881) = *Microglossum* Gillet fide Durand (*Annls mycol.* 6: 387, 1908).
- Helotiaceae** Rehm (1886) nom. cons., Helotiales. 117 gen. (+ 73 syn.), 826 spp.
Lit.: Dennis (*Mycol. Pap.* 62, 1956; UK), Korf *in* Ainsworth *et al.* (Eds) (*The Fungi* 4A: 249, 1973), Korf (*Acta Mycol. Sin. Suppl.*, 1973) The *Helotiaceae* as recognized here is still very varied in

form despite removal of the *Leotiaceae* and transfer of *Encoelia* to the *Sclerotiniaceae*, and it is likely that it will be further divided in future.

Lit.: Baral (*Z. Mykol.* 53: 119, 1987), Zhuang (*Mycotaxon* 32: 97, 1988; key 19 gen. *Encoelioideae*) See also *Leotiaceae*, Petrini *et al.* (*CJB* 67: 2805, 1989), Verkley (*Persoonia* 15: 405, 1994; asci), Verkley (*The Ascus Apical Apparatus in Leotiales* An Evaluation of Ultrastructural Characters as Phylogenetic Markers in the Families *Sclerotiniaceae*, *Leotiaceae* and *Geoglossaceae*: 209 pp., 1995), Korf *et al.* (*Taxon* 45: 683, 1996; nomencl.), Triebel & Baral (*Sendtnera* 3: 199, 1996), Döbbeler (*Biodiv. Cons.* 6: 721, 1997), Gamundí & Romero (*Fl. criptog. Tierra del Fuego* 10: 130 pp., 1998), Gamundí & Romero (*Fl. criptog. Tierra del Fuego* 10 no. 5, 1998), Monreal *et al.* (*CJB* 77: 1580, 1999), Verkley (*Stud. Mycol.* 44: 180 pp., 1999), Baral & Marson (*Micologia* 2000: 23, 2000), Vrålstad *et al.* (*New Phytol.* 155: 131, 2002), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006).

Helotiales Nannf. ex Korf & Lizoň (2000). Leotiomyces. 10 fam., 501 gen., 3881 spp. Stromata usually absent, if present sclerotial. Ascomata apothecial, usually small, often brightly coloured, sessile or stipitate, cupulate or discoid, rarely convex, sometimes surrounded by conspicuous hairs; wall tissues often separated into 2-3 distinct layers with differing cell types. Interascal tissue of simple paraphyses, variously shaped, the apices sometimes swollen. Asci usually small, thin-walled, without separable wall layers, with an apical pore surrounded by a J+ or J-ring which is rather varied in form (14 types in Verkley, 1995). Ascospores usually small, simple or transversely septate, mostly hyaline, usually not quite longitudinally symmetrical, usually smooth. Anamorphs varied, not known from many, hyphomycetous or coelomycetous. Saprobes and plant parasites, few lichenized or lichenicolous.

Inoperculate discomycetes; cup fungi. The taxonomy of the order is unsettled, and molecular data are inadequate to elucidate relationships in many cases. Fams:

- (1) **Ascocorticiaceae**
- (2) **Dermateaceae**
- (3) **Helotiaceae**
- (4) **Hemiphacidiaceae**
- (5) **Hyaloscyphaceae**
- (6) **Loramycetaceae**
- (7) **Phacidiaceae**
- (8) **Rutstroemiaceae**
- (9) **Sclerotiniaceae**
- (10) **Vibrisseaceae**

Lit.: Arendholz (*Blattbewohnenden Ascomyceten aus der Ordnung der Helotiales*, 1979), Baral (*Z. Mykol.* 53: 119, 1987; ascus ultrastr., *Mycotaxon* 44: 333, 1992; microscopic preparation), Carpenter (*Mycol.* 80: 127, 1988; ordinal nomencl.), Gamundí (*Fl. Cript. Tierra de Fuego* 10(4), 1987), Gamundí & Romero (*Fl. Cript. Tierra de Fuego* 10(5), 1998), Hennebert & Bellemère (1979; anamorphs), Huhtinen (*in* Hawksworth (Ed.), 1994: 295), Korf (*in* Ainsworth *et al.* (Eds), *The Fungi* 4A: 249, 1973; keys gen.), Korf & Lizoň (*Mycotaxon* 75: 501, 2000; nomencl.), Landvik *et al.* (*Mycoscience* 37: 237, 1996; *Mycoscience* 39: 49, 1998), Nannfeldt (1932), Pfister & Kimbrough (*in* McLaughlin *et al.* (Eds),

The Mycota 7A: 257, 2001), Spooner (*Bibl. Mycol.* 116, 1987), Verkley (*Persoonia* 15: 303, 1993; 15: 405, 1994; *Hymenoscyphoideae* asci; *The ascus apical apparatus in Leotiales*, 1995, ultrastr.), Weber (*Bibl. Mycol.* 140, 1992; reprod. system), see also under *Ascomycota*, *Discomycetes*, *Macromycetes*.

Helotidium Sacc. (1884) = *Allophylaria* fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).

Helotiella Sacc. (1884) nom. dub., Helotiales. 1, Europe. See Galán (*Riv. Micol.* 36: 149, 1993).

Helotiopsis Höhn. (1910) = *Pithyella* fide Korf & Zhuang (*Mycotaxon* 29: 1, 1987).

helotism, the physiologic relation of alga to fungus in a lichen (obsol.).

Helotium Pers. (1801) = *Cudoniella* fide Dennis (*Persoonia* 3: 29, 1964; redisp. spp.), Holm (*TBMS* 67: 333, 1976; nomencl.).

Helotium Tode (1790) nom. utique rej. = *Hemimycena* fide Kuyper (*in litt.*).

Helvella L. (1753), *Helvellaceae*. c. 52 (saddle fungi, false morels), widespread (north temperate). See Dissing (*Dansk bot. Ark.* 25 no. 1: 1, 1966), Harmaja (*Karstenia* 14: 102, 1974; gen. concept), Weber (*Beih. Nova Hedwigia* 51, 1975; W.N. Am.), Harmaja (*Karstenia* 17: 45, 1977), Harmaja (*Karstenia* 19: 33, 1979; cupulate spp.), Liu *et al.* (*Acta Mycol. Sin.* 4: 208, 1985; key 16 Chinese spp.), Häffner (*Z. Mykol. Beih.*: 7, 1987; key 43 spp., illustr.), Abbott & Currah (*Mycotaxon* 33: 229, 1988; key 16 spp. Alberta), Gibson & Kimbrough (*CJB* 66: 771, 1988; ascosporeogenesis), Calonge & Arroya (*Mycotaxon* 39: 203, 1990; key 21 spp. Spain), Abbott & Currah (*Mycotaxon* 62: 1, 1997; 5 subgen.), Landvik *et al.* (*Nordic JI Bot.* 17: 403, 1997), Landvik *et al.* (*Mycol.* 91: 278, 1999; polyphyly), Wang & Chen (*Fungal Science Taipei* 17: 11, 2002; Taiwan), Zhuang (*Mycotaxon* 90: 35, 2004; China), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny).

Helvellaceae Fr. (1823), *Pezizales*. 6 gen. (+ 20 syn.), 63 spp.

Lit.: Dissing (*Dansk Bot. Ark.* 25, 1966), Donadini (*BSMF* 102: 373, 1986; characterization of mitochondrial DNA), Donadini (*Bull. trimest. Soc. mycol. Fr.* 102: 373, 1986), Gibson & Kimbrough (*CJB* 66: 771, 1988), Calonge & Arroyo (*Mycotaxon* 39: 203, 1990), Kimbrough & Gibson (*Mycol.* 81: 914, 1989), Kimbrough (*MR* 95: 421, 1991), Zhang (*Mycotaxon* 42: 155, 1991), Pegler *et al.* (*British truffles*, 1993), Kimbrough *et al.* (*Mycol.* 88: 38, 1996), Abbott & Currah (*Mycotaxon* 62: 1, 1997), Landvik *et al.* (*Nordic JI Bot.* 17: 403, 1997), O'Donnell *et al.* (*Mycol.* 89: 48, 1997; phylogeny), Harrington *et al.* (*Mycol.* 91: 41, 1999; phylogeny), Landvik *et al.* (*Mycol.* 91: 278, 1999), Percudani *et al.* (*Mol. Phylogen. Evol.* 13: 169, 1999; phylogeny), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).

Helvellella S. Imai (1932) = *Pseudorhizina* fide Eckblad (*Nytt Mag. Bot.* 15: 1, 1968).

hemi- (prefix), half; in part. Cf. semi-.

Hemialysidium Hol.-Jech. (1992) nom. inval., anamorphic *Pezizomycotina*, Hso.?.?. 1, Europe. See Holubova-Jechova (*Abstracts, XI Congress of European Mycologists* Kew, England, 7-11 September 1992: 19, 1992).

hemiamyloidity, The red colouration when iodine solutions are applied to the hymenium of most *Ascomycetes* (Baral, *Mycotaxon* 29: 399, 1987).

hemiangiocarpous (of a sporocarp), opening before quite mature.

Hemiasci (sensu Varitchak, *Botaniste* 25: 370, 1933), *Dipodascus* + *Ascoidea*.

Hemiascomycetes. *Ascomycota* in which the asci are not produced in ascomata. In addition the thallus usually comprises poorly developed mycelium or is represented by separate cells; mainly included in *Saccharomycetales* here.

hemiascospore, ascospore of a hemiascus.

Hemiascosporiaceae L.R. Batra (1973) = *Ascodesmidae*.

Hemiascosporium L.R. Batra (1973) = *Eleutherascus* fide von Arx (*Persoonia* 9: 393, 1977), Batra in Subramanian (Ed.) (*Taxonomy of fungi* 1: 187, 1978).

hemiascus, the atypical multisporous ascus of the *Hemiasci* (q.v.).

Hemibasidiomycetes. See *Pucciniales* and *Ustilaginales*.

Hemibeltrania Piroz. (1963), anamorphic *Pezizomycotina*, Hsy.0eP.10. 8, widespread (esp. tropical). See Castañeda Ruiz *et al.* (*MR* 102: 930, 1998), Shin & Braun (*Mycotaxon* 67: 317, 1998), Cooper (*N.Z. J Bot.* 43: 323, 2005; New Zealand).

Hemicarpenteles A.K. Sarbhoy & Elphick (1968), *Trichocomaceae*. Anamorph *Aspergillus*. 2, widespread. See Kuraishi *et al.* (*NATO ASI Series A: Life Sciences* 185: 407, 1990; ubiquinones), Chang *et al.* (*J. gen. appl. Microbiol.* Tokyo 37: 289, 1991; DNA), Pitt *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 9, 2000; accepted names), Tamura *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 357, 2000; phylogeny), Udagawa & Uchiyama (*Mycoscience* 43: 3, 2002; separation of *H. acanthosporus*).

hemicompatible, see compatible.

Hemicorynespora M.B. Ellis (1972), anamorphic *Chaetosphaeria*, Hso.0-1eH-P.25. 9, widespread (tropical). See Ellis (*Mycol. Pap.* 131: 19, 1972), Mercado Sierra *et al.* (*Mycotaxon* 63: 155, 1997; Mexico), Sivanesan & Chang (*MR* 101: 845, 1997; key, teleomorph).

Hemicorynesporella Subram. (1992), anamorphic *Pezizomycotina*, Hso.≡ eP.24. 1, Solomon Islands. See Subramanian (*Proc. Indian natn Sci. Acad.* Part B. Biol. Sci. 58: 189, 1992).

Hemicybe P. Karst. (1879) = *Lentinellus* fide Singer (*Agaric. mod. Tax.*, 1951).

Hemicyphe Corda (1831) nom. dub., ? Fungi.

Hemidiscia Lázaro Ibiza (1916) = *Postia* fide Donk (*Verh. K. ned. Akad. Wet.* tweede sect. 62: 1, 1974).

Hemidothis Syd. & P. Syd. (1916), anamorphic *Pezizomycotina*, St.0fH.?. 1 or 2, America (tropical). See Petrak (*Annls mycol.* 27: 374, 1929), Sydow (*Annls mycol.* 28: 193, 1930).

hemifissitunicate, see ascus.

hemiform, see *Pucciniales* and Table 5.

Hemigaster Juel (1895), *Hemigasteraceae*. 1, Sweden. See Singer (*Agaric. mod. Tax.* 4th ed: 845, 1986).

Hemigasteraceae Gäum. & C.W. Dodge (1928), *Agaricales*. 1 gen., 1 spp.

Lit.: Singer (*Agaric. mod. Tax.* 4th ed, 1986), Reijnders (*MR* 104: 900, 2000).

Hemiglossum Pat. (1890), *Helotiales*. 2, China; Japan. See Imai (*J. Fac. Agric. Hokkaido Imp. Univ.* 45: 155, 1941), Zhuang (*Mycotaxon* 32: 97, 1988; posn).

Hemigrapha (Müll. Arg.) R. Sant. ex D. Hawksw.

(1975), ? *Parmulariaceae*. 9 (on lichens), widespread. See Matzer (*Mycol. Pap.* 171, 1996), Diederich & Wedin (*Nordic J Bot.* 20: 203, 2000; on *Peltigerales*).

Hemigyalecta, see *Semigyalecta*.

Hemihysteriaceae Sacc. & Traverso (1907) = *Asterinaceae*.

Hemileccinum Šutara (2008) = *Boletus* Fr. fide Kuyper (*in litt.*).

Hemileia Berk. & Broome (1869), *Pucciniales*. c. 40 (on angiosperms (II, III only)), widespread (esp. tropical). *H. vastatrix* (coffee rust). See Gopalkrishnan (*Mycol.* 43: 271, 1951; morphology), Stevenson & Bean (*Spec. Publ. Div. Mycol. Dis. Survey, USDA* 4, 1953; annotated bibliogr.), Rajendren (*Mycol.* 59: 918, 1967; telial urediniospores (II^{III}) in which meiosis occurs in *H. vastatrix*), Rajendren (*Mycopath. Mycol. Appl.* 47: 81, 1972; morphology), Fulton (Ed.) (*Coffee rust in the Americas*, 1984), Anon. (*IMI Descr. Fungi Bact.* 162, 2004), Gouveia *et al.* (*Mycol.* 97: 396, 2005; RAPD), Ritschel (*Biblthca Mycol.* 200: 132 pp., 2005; monogr.).

Hemileiopsis Racib. (1900) = *Hemileia* fide Dietel (*Nat. Pflanzenfam.* 6, 1928) but see, Ono *et al.* (*Mycol.* 78: 253, 1986; suggests this might be the nomenclaturally correct name for *Hemileia*).

Hemilichenes, Lichens of uncertain systematic position because sporocarps are unknown (obsol.); usually = *Phycolichenes*, *Deuterolichenes*.

Hemimycena Singer (1938), *Mycenaceae*. c. 50, widespread. Perhaps *Marasmiaceae*. See Courtecuisse (*Agarica* 6: 108, 1985; France), Gröger (*Boletus* 12: 59, 1988; *Hemimycena cucullata* in Germany), Desjardin (*Mycotaxon* 42: 187, 1991; USA), Lepp (*Australasian Mycologist* 23: 105, 2004; *Hemimycena tortuosa* in Australia), Moreau *et al.* (*Mycotaxon* 91: 323, 2005; new cistophilous sp.).

Hemimyriangium J. Reid & Piroz. (1966) = *Mollerella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).

hemiparasite, a facultative parasite.

Hemiphacidiaceae Korf (1962), *Helotiales*. 9 gen. (+ 6 syn.), 26 spp.

Lit.: Korf (*Mycol.* 54: 481, 1962), Reid & Cain (*Mycol.* 54: 481, 1962), Sherwood-Pike *et al.* (*CJB* 64: 1849, 1986), Minter (*Shoot and Foliage Diseases in Forest Trees* Proceedings of a Joint Meeting of the Working Parties: Canker & Shoot Blight of Conifers, Foliage Diseases: 65, 1995), Gernandt *et al.* (*Mycol.* 89: 735, 1997), Gernandt *et al.* (*Mycol.* 93: 915, 2001), Stone & Gernandt (*Mycotaxon* 91: 115, 2005), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).

Hemiphacidium Korf (1962) = *Sarcotrochila* fide Reid & Cain (*Mycol.* 54: 481, 1962), Stone & Gernandt (*Mycotaxon* 91: 115, 2005; phylogeny, placement), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).

Hemipholiota (Singer) Bon (1986) = *Pholiota* fide Kuyper (*in litt.*).

Hemisartorya J.N. Rai & H.J. Chowdhery (1976) = *Neosartorya* fide von Arx (*Gen. Fungi Sporul. Cult.* Edn 3, 1981).

Hemiscyphe, see *Hemicyphe*.

Hemisphaeria Klotzsch (1843) nom. rej. prop. ≡ *Daldinia*.

Hemisphaeriales Theiss. (1913). Obsol., a poorly defined assemblage including *Microthyriales* and several other groups with flattened ascomata.

Hemisphaeropsis Petr. (1947), anamorphic *Pezizomy-*

- cotina*, Cpt.1eP.?. 1, USA.
- Hemisporea** Vuill. (1906) = *Wallemia* fide Carmichael *et al.* (*Genera of Hyphomycetes*, 1980).
- Hemisporaceae** M. Ota (1928) = *Wallemiaceae*.
- hemispore** (esp. of dermatophytes), (1) a cell at the end of a filament, which later becomes by division deuterconidia; protoconidium (after Vuillemin); (2) one of the two cells produced by a primary trans-septum in an ascospore (Eriksson, *Ark. Bot.* II 6: 339, 1967), see septum.
- Hemistropharia** Jacobsson & E. Larss. (2007), Cortinariaceae. 1, USA. See Jacobsson & Larsson (*Mycotaxon* 102: 235, 2007).
- Hemisynnema** Subram. (1995), anamorphic *Pezizomycotina*, Hsy.≡ eP.1. 1, Malaysia. See Subramanian (*Kavaka* 20/21: 58, 1992).
- Hemithecium** Trevis. (1853), Graphidaceae (L). 1, pantropical. See Nakanishi *et al.* (*Bull. natn. Sci. Mus. Tokyo*, B 29: 83, 2003; Japan), Adawadkar & Makhija (*Mycotaxon* 92: 387, 2005; India), Archer (*Telopea* 11: 59, 2005; Australia), Makhija *et al.* (*Mycotaxon* 93: 365, 2005; India), Archer (*Biblthca Lichenol.* 94, 2006; revision), Archer (*Systematics & Biodiversity* 5: 9, 2007; Solomon Is).
- Hemmesomyces** Gilb. & Nakasone (2003), Corticiaceae. 1, Hawaii. See Gilbertson & Nakasone (*Mycol.* 95: 467, 2003).
- Hendersonia** Berk. (1841) nom. rej. = *Stagonospora* fide Swart & Walker (*TBMS* 90: 633, 1988; redispotion spp. on *Eucalyptus*).
- Hendersonia** Sacc. (1884) ≡ *Hendersonia* Berk.
- Hendersoniella** (Sacc.) Sacc. (1902) ≡ *Hendersoniella* Tassi fide Sutton (*Mycol. Pap.* 141, 1977).
- Hendersoniella** Tassi (1900), anamorphic *Pezizomycotina*, Cpd.?.?. 1, Italy. See Sutton (*Mycol. Pap.* 141, 1977).
- Hendersonina** E.J. Butler (1913), anamorphic *Pezizomycotina*, St.0-1eP.15. 1, Asia.
- Hendersoniopsis** Höhn. (1918), anamorphic *Pezizomycotina*, St.≡ eP.15. 1, widespread (temperate).
- Hendersoniopsis** Woron. (1922) = *Stenocarpella* fide Sutton (*Mycol. Pap.* 141, 1977).
- Hendersonula** Speg. (1880), anamorphic *Botryosphaeriales*, St.≡ eP.19. 5 (on fungi), widespread (tropical). See Sutton & Dyko (*MR* 93: 466, 1989; revision, key).
- Hendersonulina** Petr. (1951), anamorphic *Pezizomycotina*, St.≡ eP.?. 6, widespread. See Petrak (*Sydowia* 5: 421, 1951).
- Hendersonulina** Tassi (1902), anamorphic *Pezizomycotina*, Cpd.≡ eP.?. 43, widespread. See Sutton (*Mycol. Pap.* 141, 1977).
- Hendrickxia** P.A. Duvign. (1942) = *Everniopsis* fide Santesson (*Svensk bot. Tidskr.* 43: 547, 1949).
- Henicospora** P.M. Kirk & B. Sutton (1980), anamorphic *Pezizomycotina*, Hso.≡ eP.2. 5, widespread. See Kirk & Sutton (*TBMS* 75: 249, 1980), Kuthubutheen & Nawawi (*MR* 98: 677, 1994; Malaysia).
- Hennebertia** M. Morelet (1969), anamorphic *Pezizomycotina*, Hso.0eP.10+19. 1, Europe. See Hennebert (*TBMS* 51: 749, 1968).
- Hennenia** Buriticá (1995), Pucciniales. 1 (on *Annona* (*Annonaceae*)), Colombia. See Buriticá C. (*Revta Acad. colomb. cienc. exact. fis. nat.* 19: 465, 1995) Cf. *Esqualia*.
- Hennings** (Paul Christoph; 1841-1908; Germany). Self-taught, beginning as a postal worker; worked at Kiel Botanic Garden (1860-1864, 1874-1879); assistant (1880-1891) then Kustos (1891-1902) then Professor (1902-1908), Berlin Botanic Garden; Royal Professor (1902-1908). Described over 120 fungal genera and many species mainly from tropical material (particularly Africa, but also the Amazon basin, India, Japan and New Guinea), sent to Berlin by contemporary collectors; also an amateur poet. Collections mostly in Berlin (B); Batista *et al.*, *Fungi Paraenses, Publicações. Instituto de Micologia da Universidade do Recife* 506, 1966, listed Hennings' specimens in the Emílio Goeldi Museum, Pará. *Publs. Fungi. In O. Warburg [ed.] Monsunia. Beiträge zur Kenntnis der Vegetation des Süd- und Östasiatischen Monsungebietes* (1899, published 1900); also numerous papers published in *Engler's Botanisches Jahrbücher* and *Hedwigia* from c. 1891 onwards. (*Biogs, obits etc.* Grummann (1974: 18); Lindau (*Hedwigia* 48: 1, 1909; bibliography); Perkins (*Botanical Gazette* 47: 239, 1909); Stafleu & Cowans (*TL-2* 2: 157, 1979).
- Henningsia** Möller (1895), Meripilaceae. 1, widespread (neotropical). See Ryvarden (*Gen. Polyp.*: 158, 1991), Corner (*Mycologist* 9: 127, 1995; close to *Rigidoporus*).
- Henningsiella** Rehm (1895), Schizothyriaceae. 2, S. America.
- Henningsina** Möller (1901) = *Phylacia* fide Dennis (*Kew Bull.* 12: 297, 1959), Müller & von Arx in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 87, 1973), Læssøe (*SA* 13: 43, 1994; ? synonym of *Xylaria*).
- Henningsomyces** Kuntze (1898), Marasmiaceae. c. 20, widespread. See Reid (*Persoonia* 3: 118, 1964), Agerer (*Persoonia* 7: 389, 1973).
- Henningsomyces** Sacc. (1905) [non *Henningsomyces* Kuntze 1898] ≡ *Dysrhynchis*.
- Henrica** B. de Lesd. (1921), Verrucariaceae (L). 3, Europe; N. America. See Navarro-Rosinés & Hladun (*Cryptog. Bryol.-Lichénol.* 13: 125, 1992), Breuss (*Bryologist* 105: 398, 2002; N America).
- Henriquesia** Pass. & Thüm. (1879) [non *Henriquesia* Spruce ex Benth. 1854, *Rubiaceae*] ≡ *Delpinoia*.
- Hepataria** Raf. (1808) ? = *Tremella* Pers. fide Merrill (*Index Rafinesq.*: 69, 1949).
- hepatic** (1) concerning the liver; (2) a liverwort.
- hepaticolous**, growing on liverworts (*Hepaticae*); see *Bryophilous fungi*.
- Heppia** Nägeli ex A. Massal. (1854), Lichinaceae (L). 7, widespread (esp. desert or dry areas). See Wetmore (*Ann. Mo. bot. Gdn* 57: 158, 1971; N. Am.), Swinscow & Krog (*Norw. Jl Bot.* 26: 213, 1979; E. Afr.), Filson (*Muelleria* 6: 495, 1988; Australia), Egea (*Biblthca Lichenol.* 31, 1989; W. Eur. & N. Afr.), Henssen (*Acta Bot. Fenn.* 15: 57, 1994; key), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key), Schultz & Büdel (*Lichenologist* 35: 151, 2003; posn).
- Heppiaceae** Zahlbr. (1906) = Lichinaceae.
- Lit.*: Büdel (*Biblthca Lichenol.* 23: 105 pp., 1987), Upreti & Büdel (*J. Hattori bot. Lab.* 68: 279, 1990), Henssen (*Acta Bot. Fenn.* 150: 57, 1994), Schultz *et al.* (*Pl. Biol.* 3: 116, 2001), Schultz & Büdel (*Lichenologist* 35: 151, 2003; phylogeny), Jørgensen (*Nordic Lichen Flora* 3: Cyanolichens: 43, 2007).
- Heppiomyces** Cif. & Tomas. (1953) ≡ *Heppia*.
- Heppsora** D.D. Awasthi & Kr.P. Singh (1977), Tephromelataceae (L). 1, India; Middle East. See Hafellner (*Beih. Nova Hedwigia* 79: 241, 1989), Poelt & Grube (*Nova Hedwigia* 57: 1, 1993; status), Mies & Schultz (*Biblthca Lichenol.* 88: 433, 2004;

- Yemen).
- Heptameria** Rehm & Thüm. (1879), Dothideomycetes. 2, Europe. See Lucas & Sutton (*TBMS* 57: 283, 1971).
- Heptasporium** Bref. (1908) = *Sistotrema* Fr. fide Rogers (*Mycol.* 36: 70, 1944).
- Heptaster** Cif., Bat. & Nascim. (1956), anamorphic *Capnodiales*, Hsy.0bP.?. 2, Brazil. See Hughes (*Mycol.* 68: 810, 1976; ? = *Tripaspermum*).
- Heraldoa** Bat. (1959) = *Lembosia* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Herbampulla** Scheuer & Nogrsek (1993), ? Magnaporthaceae. 1 (on grasses), Austria. See Scheuer & Nogrsek (*Mycotaxon* 47: 415, 1993).
- herbarium** (pl. -ia), (1) a collection of dried plants; (2) the place in which such a collection is stored. Often also used for dried Reference collections (q.v.) of fungi, especially when curated along with plant specimens.
- herbarium beetle**, *Stegobium paniceum*, may eat the spores of certain fungi, esp. *Lycoperdon* and smuts. See Gordon (*TBMS* 21: 193, 1938), Bridson & Forman (*The herbarium handbook*, rev. edn, 1992; control), Pinniger (*Biodet. Abstr.* 5: 125, 1991; control).
- herbicolous**, living on herbs.
- Hercospora** Fr. (1825), Diaporthales. Anamorph *Rabenhorstia*. 2 (from bark), Europe. See Petrak (*Annls mycol.* 36: 44, 1938), Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Herculea** Fr. (1823) = *Podaxis* fide Kuyper (*in litt.*).
- Hericiaceae** Donk (1964), Russulales. 3 gen. (+ 9 syn.), 12 spp.
Lit.: Donk (*Persoonia* 3: 199, 1964), Ginns (*Windahlia* 16: 35, 1986), Koski-Kotiranta & Niemelä (*Karstenia* 27: 43, 1987), Stalpers (*Stud. Mycol.* 40: 185 pp., 1996), Hibbett & Donoghue (*Syst. Biol.* 50: 215, 2001), Larsson & Larsson (*Mycol.* 95: 1037, 2003).
- Hericiales** = Russulales.
- Heridium** Fr. (1825) = *Heridium* Pers. fide Hall & Stuntz (*Mycol.* 63: 1103, 1971; subgen. key).
- Heridium** Pers. (1794), Hericiaceae. 5, widespread (north temperate). See Stalpers (*Stud. Mycol.* 40: 79, 1996; key), Arnolds (*Coolia* 46 3, Suppl.: 96 pp., 2003; The Netherlands and Belgium), Bohlin (*MR* 108: 3, 2004; conservation status).
- Hericius** Juss. (1789) = *Heridium* Pers.
- Heringia** Schwein. ex Berk. & Curtis (1853) nom. nud., ? Fungi.
- Hermanniasporidium** Thor (1930) nom. dub., ? Fungi. 1, Svalbard.
- Hermatomyces** Speg. (1910), anamorphic *Pezizomycotina*, Hsp.#eP.1. 3, widespread (tropical). See Hughes (*Mycol. Pap.* 50: 100, 1953).
- Herminia** R. Hilber (1979) = *Eosphaeria* fide Petrini *et al.* (*TBMS* 82: 554, 1984), Barr (*Mycotaxon* 39: 43, 1990; status), Hilber & Hilber (*The genus Lasiosphaeria and Allied Taxa*, 2002).
- Herpobasidium** Lind (1908), Eocronartiaceae. Anamorph *Glomopsis*. 4, widespread. See Donk (*Persoonia* 4: 158, 1966), Donk (*Persoonia* 4: 214, 1966), Oberwinkler & Bandoni (*TBMS* 83: 639, 1984), Bauer & Oberwinkler (*CJB* 72: 1229, 1993; ultrastr., posn).
- Herpocladiella** J. Schröt. (1894) nom. dub., ? Mucorales. See Hesseltine (*Mycol.* 47: 344, 1955).
- Herpocladium** J. Schröt. (1886) [non *Herpocladium* Mitt. 1873, *Hepaticae*] = *Herpocladiella*.
- Herpomyces** Thaxt. (1903), Herpomycetaceae. 25 (on cockroaches), widespread. See Tavares (*Mycol.* 57: 104, 1965; development), Tavares (*Mycotaxon* 11: 485, 1980), Santamaria (*Fl. Mycol. Iberica* 5, 2003; Iberian peninsula).
- Herpomycetaceae** I.I. Tav. (1981), Laboulbeniales. 1 gen., 25 spp.
Lit.: Majewski & Sugiyama (*Trans. Mycol. Soc. Japan* 26: 295, 1985), Tavares (*Mycol. Mem.* 9: 627 pp., 1985), Majewski (*Trans. Mycol. Soc. Japan* 29: 33, 1988), Santamaria *et al.* (*Treb. Inst. Bot. Barcelona* 14: 1, 1991).
- Herposira** Syd. (1938), anamorphic *Pezizomycotina*, Hsy/Cpd.0eP.?. 1, Australia.
- Herpothallaceae** Tomas. ex Tomas. (1950) = *Arthoniaceae*.
- Herpothallon** Tobler (1937) = *Cryptothecia* fide Thor (*Bryologist* 94: 278, 1991).
- Herpothallonomyces** Cif. & Tomas. (1954) = *Herpothallon*.
- Herpothrix** Clem. (1909) ? = *Chaetomastia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Herpotrichia** Fuckel (1868), Pleosporales. Anamorph *Pyrenochaeta*. 28, widespread. *H. juniperi* (brown felt blight, snow moulds, of conifers in cold regions). See Sivanesan (*Mycol. Pap.* 127, 1972; key), Barr (*Mycotaxon* 20: 1, 1984; key 4 spp., gen. concept), von Arx & Müller (*Sydowia* 37: 6, 1984), Hyde & Aptroot (*Nova Hedwigia* 66: 247, 1998), Silva-Hanlin & Hanlin (*MR* 103: 153, 1999; phylogeny), Chen & Hsieh (*Sydowia* 56: 24, 2004; Taiwan), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Herpotrichiella** Petr. (1914) = *Capronia* fide Müller *et al.* (*TBMS* 88: 63, 1987).
- Herpotrichiellaceae** Munk (1953), Chaetothyriales. 13 gen. (+ 22 syn.), 84 spp.
Lit.: Barr (*Rhodora* 78: 53, 1976), Müller *et al.* (*TBMS* 88: 63, 1987), Janex-Favre (*Cryptog. Mycol.* 9: 133, 1988; ontogeny), Braun & Feiler (*Microbiol. Res.* 150: 81, 1995), Untereiner *et al.* (*MR* 99: 897, 1995; molec. taxonomy), Untereiner *et al.* (*MR* 99: 897, 1995), Haase *et al.* (*J. Clin. Microbiol.* 34: 2049, 1996), Uijthof & Hoog (*Culture Collections to Improve the Quality of Life, Proceedings of the Eighth International Congress for Culture Collections, Veldhoven, The Netherlands, 25-29 August 1996*: 389, 1996), Untereiner (*Mycol.* 89: 120, 1997), Hoog *et al.* (*Medical Mycology* 36 Suppl. 1: 52, 1998), Au *et al.* (*Mycol.* 91: 326, 1999), de Hoog (*Stud. Mycol.* 43, 1999; ecology, phylogeny), Gerrits van den Ende & Hoog (*Stud. Mycol.* 43: 151, 1999), Haase *et al.* (*Stud. Mycol.* 43: 80, 1999), Hoog *et al.* (*Stud. Mycol.* 43: 133, 1999), McKemy *et al.* (*Mycol.* 91: 200, 1999), Rogers *et al.* (*Stud. Mycol.* 43: 122, 1999), Untereiner & Naveau (*Mycol.* 91: 67, 1999), Gams (*Stud. Mycol.* 45: 192, 2000), Untereiner (*Stud. Mycol.* 45: 141, 2000), Abliz *et al.* (*FEMS Immunol. Med. Microbiol.* 40: 41, 2004).
- Herpotrichiopsis** Höhn. (1914) = *Pyrenochaeta* fide Clements & Shear (*Gen. Fung.*, 1931).
- Herpotrichum** Fr. [not traced] nom. dub. = *Protonema* fide Fries (*Syst. orb. veg.*, 1825) based on mycelium fide, Fries (*Summa veg. Scand.*, 1849).
- Herreromyces** R.F. Castañeda & W.B. Kendr. (1991), anamorphic *Pezizomycotina*, Hso.0eH.15. 1, Cuba. See Castañeda Ruiz & Kendrick (*Univ. Waterloo Biol. Ser.* 35: 60, 1991).
- Herteliana** P. James (1980), Ramalinaceae (L.). 4,

- widespread. See James (*Lichenologist* 12: 106, 1980).
- Hertelidea** Printzen & Kantvilas (2004), ? Stereocaulaceae (L). 4, widespread. See Printzen & Kantvilas (*Bibliotheca Lichenol.* 88: 541, 2004), Kantvilas & Elix (*Australasian Lichenology* 59: 30, 2006; Australia).
- Hertella** Henssen (1985), Placynthiaceae (L). 2, southern hemisphere. See Henssen (*Mycotaxon* 22: 382, 1985), Henssen (*Bibliotheca Lichenol.* 88: 195, 2004).
- Hesperomyces** Thaxt. (1891), Laboulbeniaceae. 5, widespread. See Weir & Beakes (*Mycol.* 88: 677, 1996; ontogeny), Weir & Blackwell (*Mycol.* 93: 802, 2001; DNA extraction), Santamaria (*Fl. Mycol. Iberica* 5, 2003; Iberian peninsula).
- Hessea** Ormieres & Sprague (1973), Microsporidia. 1.
- Hesseltinella** H.P. Upadhyay (1970), Cunninghamellaceae. 1, Brazil. See Upadhyay (*Persoonia* 6: 111, 1970), Stuart & Young (*TBMS* 89: 392, 1987; morphology), Benny & Khan (*Scanning Microsc.* 2, 1988), Benny & Samson (*Mem. N. Y. bot. Gdn* 49: 11, 1989), Benny & Benjamin (*Mycol.* 83: 713, 1991), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny), White *et al.* (*Mycol.* 98: 872, 2006; phylogeny).
- Heterina** Nyl. (1858) = *Heppia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- hetero-** (prefix), other; not normal; different.
- Heteroacanthella** Oberw. (1990), Auriculariales. Anamorph *Acanthellorhiza*. 2, Taiwan; USA; British Isles. See Duhem & Trichiès (*Bulletin, Société Mycologique du Limousin* 121: 119, 2005; France).
- Heteroacanthellaceae** P. Roberts (1998) = Ceratobasidiaceae.
- Heterobasidiaceae** Jülich (1982) = Bondarzewiaceae.
- Heterobasidiomycetes** R.T. Moore (1980), see *Basidiomycota*.
- Heterobasidion** Bref. (1888), Bondarzewiaceae. Anamorph *Spiniger*. 6, widespread (temperate). *H. annosum* (syn. *Fomes annosus*), serious root rot of conifers. See Stalpers (*Stud. Mycol.* 40: 79, 1996; key), Bahnweg *et al.* (*J. Phytopath.* 150: 382, 2002; PCR detection), Dai *et al.* (*MR* 106: 1435, 2002; sexuality and intersterility in *Heterobasidion insulare* complex), Johannesson & Stenlid (*Mol. Phylogen. Evol.* 29: 94, 2003; phylogeography), Ota *et al.* (*Mycol.* 98: 717, 2006; phylogeny Japanese species).
- Heterobasidium** Masee (1889) nom. conf., Agaricomycetes.
- heterobasidium**, see basidium.
- Heterobotrys** Sacc. (1880) = *Seuratia* fide Meeker (*CJB* 53: 2462, 1975).
- Heterocarpon** Müll. Arg. (1885), Verrucariaceae. 1, USA. See Harada (*SA* 10: 1, 1991).
- Heterocephalacria** Berthier (1980) = *Syzygospora* fide Ginns (*Mycol.* 78: 619, 1986).
- Heterocephalum** Thaxt. (1903), anamorphic *Pezizomycotina*, Hsy.0eH.15. 1, widespread (tropical). See Onofri *et al.* (*TBMS* 87: 551, 1987; SEM), Persiani & Maggi (*TBMS* 87: 631, 1986; Cote d'Ivoire), Sharma *et al.* (*Journal of Mycology and Plant Pathology* 34: 69, 2004; India).
- Heteroceras** Sacc. (1915) = *Neoheteroceras* fide Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993).
- Heterochaete** Pat. (1892), Auriculariaceae. c. 40, widespread (esp. tropical). See Bodman (*Lloydia* 15: 193, 1952), Roberts (*Mycotaxon* 87: 25, 2003; Venezuela), Roberts (*Mycotaxon* 96: 83, 2006; Jamaica).
- Heterochaetella** (Bourdot) Bourdot & Galzin (1928), Auriculariales. c. 2, widespread. See Luck-Allen (*CJB* 38: 559, 1960), Roberts (*Mycotaxon* 69: 209, 1998), Weiss & Oberwinkler (*MR* 105: 403, 2001; phylogeny).
- Heterochlamys** Pat. (1895) [non *Heterochlamys* Turcz. 1843, *Euphorbiaceae*] = *Gilletiella*.
- Heteroconidium** Sawada (1944), anamorphic *Pezizomycotina*, Hsy. = eH+0eH.?. 1 (dimorphic), Taiwan.
- Heteroconium** Petr. (1949), anamorphic *Antennulariella*, Hso. = eP.3. 11, S. America; S. Africa. See Ellis (*More Dematiaceous Hyphomycetes*, 1976), Morgan-Jones (*Mycotaxon* 4: 498, 1976), Chaudhary *et al.* (*MR* 95: 1070, 1991; India), Castañeda Ruiz *et al.* (*Mycotaxon* 71: 295, 1999), Hughes & Crane (*Mycol.* 98: 141, 2006), Hughes (*Mycol.* 99: 628, 2007), Narisawa *et al.* (*Mycoscience* 48: 274, 2007; root endophyte), Usuki & Narisawa (*Mycol.* 99: 175, 2007; symbiosis with *Cruciferae*).
- Heterocyphellium** Vain. (1927), Lecanorales (L). 1, widespread. See Tibell (*Beih. Nova Hedwigia* 79: 597, 1984), Tibell (*Symb. bot. upsal.* 27 no. 1, 1987), Tibell (*Fl. Neotrop. Monogr.* 69: 78 pp., 1996).
- heterocytic**, see astatocoenocytic.
- Heterodea** Nyl. (1868), Cladoniaceae (L). 2, Australia. See Filson (*Lichenologist* 10: 13, 1978; key), Wedin *et al.* (*Lichenologist* 32: 171, 2000; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Zhou *et al.* (*J. Hattori bot. Lab.* 100: 871, 2006; phylogeny).
- Heterodeaceae** Filson (1978) = Cladoniaceae.
Lit.: Rambold (*Cryptog. Bot.* 5: 111, 1995), Wedin *et al.* (*Lichenologist* 32: 171, 2000).
- Heterodermia** Trevis. (1868), Physciaceae (L). c. 80, widespread (esp. tropical). See Swinscow & Krog (*Lichenologist* 8: 103, 1976; E. Afr. spp.), Kashiwadani *et al.* (*Bull. natn. Sci. Mus. Tokyo*, B 16: 147, 1990; Peru), Trass (*Folia Cryptog. Estonica* 29: 2, 1992; tab. key), Esslinger & Bratt in Glenn *et al.* (Eds) (*Lichenogr. Thomsoniana*: 25, 1998; N. Am., distr.), Kurokawa (*Folia Cryptog. Estonica* 32: 21, 1998; checklist), Moberg & Nash (*Bryologist* 102: 1, 1999; Sonoran Desert), Lohtander *et al.* (*Mycol.* 92: 728, 2000; Scandinavia), Chen & Wang (*Mycotaxon* 77: 107, 2001; China), Grube & Arup (*Lichenologist* 33: 63, 2001; morphology, phylogeny), Trass (*Folia cryptog. Estonica* 37: 93, 2000; Russia etc.), Helms *et al.* (*Mycol.* 95: 1078, 2003; phylogeny), Moberg (*Bibliotheca Lichenol.* 88: 453, 2004; Europe), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Lücking *et al.* (*Systematics & Biodiversity* 6: 31, 2008; Costa Rica).
- Heterodoassansia** Vánky (1993), Doassansiaceae. 7 (on aquatic plants), widespread. See Vánky (*Mycotaxon* 48: 28, 1993).
- Heterodothis** Syd. & P. Syd. (1914) = *Strigula* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- heteroecious** (n., **heteroecism**), undergoing different parasitic stages on two unlike hosts, as in the *Pucciniales* (q.v.).
- Heteroepichloë** E. Tanaka, C. Tanaka, Gafur & Tsuda (2002), Clavicipitaceae. 2, Japan; Java. See Tanaka *et al.* (*Mycoscience* 43: 92, 2002).
- heterogametes**, gametes of different form.
- heterogamy**, the copulation of heterogametes; cf. isogamy.
- Heterogastridiaceae** Oberw. & R. Bauer (1990), Het-

erogastridiales. 4 gen., 7 spp.

Lit.: Seeler (*Farlowia* 1: 119, 1943), Bandoni & Oberwinkler (*CJB* 59: 1613, 1981), Oberwinkler *et al.* (*Mycol.* 82: 48, 1990), Swann *et al.* (*Mycol.* 91: 51, 1999), Scorzetti *et al.* (*FEMS Yeast Res.* 2: 495, 2002).

Heterogastridiales Oberw. & R. Bauer (1990). Microbotryomycetes. 1 fam., 4 gen., 7 spp. Fam.:

Heterogastridiaceae

For *Lit.* see under fam.

Heterogastridium Oberw. & R. Bauer (1990), Heterogastridiaceae. Anamorph *Hyalopycnis*. 1, widespread (north temperate). See Oberwinkler & Bauer (*Mycol.* 82: 57, 1990), Bauer *et al.* (*Mycol. Progr.* 5: 41, 2006).

Heterographa Fée (1824) = *Polymorphum* fide Hawksworth & Punithalingam (*TBMS* 60: 501, 1973).

heterokaryosis (adj. **heterokaryotic**), (1) (of cells), the condition of having two or more genetically different nuclei, sometimes as a result of anastomosis, cf. dikaryotic; (2) (of mycelia), being made up of heterokaryotic cells; see Parmeter *et al.* (*Ann. Rev. Phytopath.* 1: 51, 1963; in plant pathogenic fungi), Caten & Jinks (*TBMS* 49: 81, 1966; occurrence in nature).

heterokaryotic (1) having two or more slightly (< 5%) genetically different nuclei in common cytoplasm (fungi); (2) showing nuclear dimorphism (protists).

heterokaryotise (of rusts and pyrenomycetes), fusion of haploid structures of opposite sex which does not give a conjugate arrangement of the nuclei, cf. diploidization.

heterokont (1) condition whereby a flagellum possesses two rows of tripartite tubular hairs (heterokont flagellum, syn. flimmergeissel, tinsel flagellum); (2) of an organism possessing flagella in pairs, the members of which differ in length; type of motion; external appendages. Usually with kinetosomes mutually attached at a wide angle. Cf. isokont.

heteromerous (1) (of a lichen thallus), having the mycobiont and photobiont in well-marked layers, usually between the medulla and the upper cortex; (2) (of trama in *Russulaceae*), having sphaerocyst nests among filamentous hyphae; cf. homoiomerous.

heteromixis, see heterothallism.

heteromorphic (**heteromorphous**), (1) having variation from normal structure; (2) having organs of different length; (3) (of agaric lamella edge), sterile due to the pressure of cystidia; cf. homomorphous.

Heteromyces L.S. Olive (1957) = *Oliveonia*.

Heteromyces Müll. Arg. (1889), Cladoniaceae (L). 1, Brazil. See Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998; DNA).

Heteromycophaga P. Roberts (1997), anamorphic *Tremellomycetes*. 2, Great Britain. See Roberts (*Mycotaxon* 63: 210, 1997).

Heteronectria Penz. & Sacc. (1898) = *Cercophora* fide Lundqvist (*Symb. bot. upsal.* 20 no. 1, 1972).

Heteropatella Fuckel (1873), anamorphic *Heterosphaeria*, St. = eH.10. 5, widespread (temperate). *H. antirrhini* (*Antirrhinum* shot hole). See Leuchtmann (*Mycotaxon* 28: 261, 1987), Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993; key).

Heteropera Theiss. (1917) = *Phomatospora* fide Petrak (*Sydowia* 14: 347, 1960).

Heterophracta (Sacc. & D. Sacc.) Theiss. & Syd. (1918) = *Merismatium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

heterophytic, the equivalent in the sporophyte generation of dioecious in the gametophyte generation (Blakeslee, *Bot. Gaz.* 42: 161, 1906); cf. homophytic.

Heteroplacidium Breuss (1996), Verrucariaceae (L). 9, widespread. See Breuss (*Annln naturh. Mus. Wien Ser. B, Bot. Zool.* 98: 40, 1996), Mies & Schultz (*Biblthca Lichenol.* 88: 433, 2004; Socotra), Gueidan *et al.* (*MR* 111: 1145, 2007; phylogeny).

heteroplastic, see heterokaryotic.

Heteroplegma Clem. (1903) = *Peziza* Fr. fide Eckblad (*Nytt Mag. Bot.* 15: 1, 1968).

Heteroporimyces M.K. Elias (1966), Fossil Fungi. 1, New Zealand.

Heteroporus Lázaro Ibiza (1916) = *Abortiporus* fide Fidalgo (*Rickia* 4: 99, 1969).

Heteroradulum Lloyd (1917) nom. dub., Fungi.

Heterorepetobasidium Chee J. Chen & Oberw. (2002), Auriculariales. 2, Taiwan. See Chen *et al.* (*Mycol.* 94: 515, 2002).

Heteroscypha Oberw. & Agerer (1979), Auriculariales. 1, S. Africa. See Oberwinkler & Agerer (*Beih. Sydowia* 8: 31, 1979).

Heteroscyphaceae Jülich (1979) = Auriculariaceae.

Heteroseptata E.F. Morris (1972), anamorphic *Pezizomycotina*, Hsy. = eP.15. 1, Costa Rica. See Morris (*Mycol.* 64: 889, 1972).

Heterospermales. Le Gal's (1953) term for inoperculate discomycetes; cf. *Homospermales*.

Heterosphaeria Grev. (1824), Helotiaceae. Anamorph *Heteropatella*. 6, Europe. See Leuchtmann (*Mycotaxon* 28: 261, 1987; key 8 spp.).

Heterosphaeriaceae Rehm (1888) = Helotiaceae.

Heterosphaeriopsis Hafellner (1979), Dothideomycetes. 1, Ecuador. See Hafellner (*Nova Hedwigia Beih.* 62: 175, 1979).

Heterosporiopsis Petr. (1950), anamorphic *Pezizomycotina*, Hsy. = eP.?. 1, S. America. See Petrak (*Sydowia* 4: 521, 1950), Hughes & Seifert (*Sydowia* 50: 192, 1998; revision).

Heterosporis Schubert (1969), Microsporidia. 3.

Heterosporium Klotzsch ex Cooke (1877) = *Cladosporium* fide Hughes (*CJB* 36: 727, 1958), David (*Mycol. Pap.* 172: 157 pp., 1997; revision), Braun *et al.* (*Mycol. Progr.* 2: 3, 2003; phylogeny).

Heterosporula (Singer) Kühner (1980) = *Gamundia* fide Kuyper (*in litt.*).

heterospory (1) having asexually produced spores of more than one kind (de Bary, 1887: 496) (obsol.); (2) having spores which differ in the mating type (+ or -) in heterothallic fungi (e.g. in *Mucorales*) (Blakeslee, *Bot. Gaz.* 42: 161, 1906); (3) polymorphism of basidiospores in *Agaricales* associated with extreme conditions (Heim, *Rev. Mycol.* 8: 32, 1943).

Heterostomum Fr. [not traced] nom. dub., *Pezizomycotina*.

Heterotextus Lloyd (1922) = *Guepiniopsis* fide Reid (*TBMS* 62: 474, 1974).

Heterothallism. Condition of sexual reproduction in which 'conjugation is possible only through the interaction of different thalli' (Blakeslee, 1904). Heterothallism and homothallism (q.v.) were first applied by Blakeslee to the methods of zygospore formation in the *Mucorales*, and he considered the terms to correspond to dioecism and monoecism for higher plants. Heterothallism has, however, been used as the equivalent of haplodioecism or dioecism (as in *Dictyuchus monosporus*, where male and female organs are produced on different individuals), and self-

sterility or self-incompatibility (as in *Ascobolus magnificus*, where male and female organs are developed on one individual). Whitehouse (*Biol. Rev.* 24: 411, 1949) distinguished the first type (haplodioecism) as 'morphological -', and the second (haploid incompatibility) as 'physiological -'. Physiological heterothallism may be determined either by two allelomorphs at one locus or by multiple allelomorphs at one or two loci (Whitehouse, *New Phytol.* 48: 212, 1949). Multiple-allelomorph physiological heterothallism is characteristic of the hymenomycetes and gasteromycetes, among which Whitehouse has estimated 35% are heterothallic and bipolar (with one locus), 55% are heterothallic and tetrapolar (with two loci). Pontecorvo (*Adv. Genetics* 5: 194, 1953) designated as **relative** - the formation of crossed asci in excess of 50% by the combination of certain homothallic strains of *Aspergillus nidulans*. Drayton & Groves (*Mycol.* 44: 132, 1952) proposed to restrict heterothallism to morphological heterothallism, Korf (*Nature* 170: 534, 1952) proposed to use heterothallism in a wide physiological sense, distinguishing a morphologically heterothallic organism as being both haplo-dioecious (dioecious) and heterothallic.

Burnett (*New Phytol.* 55: 50, 1956) proposed the following terminology for mating systems of fungi: **heteromixis** (adj. heteromictic) for fusion of genetically different nuclei which includes **dimixis** when 2 types of nuclei (= heterothallism sensu Blakeslee, morphological, and 2-allelomorph physiological heterothallism), **diaphoromixis** when more than 2 types of nuclei (= multiple allelomorph physiological heterothallism), and **homoheteromixis** = secondary homothallism, amphithallism; **homomixis** (adj. homomictic) = homothallism; **amixis** (adj. amictic), apomixis in haploid organisms.

Manipulation of the mating locus MAT which governs heterothallism in many ascomycetes has been used experimentally to change the reproductive strategy of one species (*Gibberella zeae* from homothallic to heterothallic, making possible simple procedures to obtain sexual recombinants of this species of value in genetic analysis of pathogenicity and the ability to produce mycotoxins (Lee *et al.*, *Molecular microbiology* 50: 145, 2003). Heterothallism has also been observed in *Peronospora* and *Pythium* and is thus not confined to true Fungi (Danielsen, *J. basic microbiol.* 41: 305, 2001). See Bistis (*Fungal genetics and biology* 23: 213, 1998; review in Euascomycetes), Feofilova (*Prikl. biokhim. Mikrobiol.* 42, 2006; review for Mucoraceae of biological implications and uses in biotechnology).

Heterothecium Flot. (1850) = *Megalospora* Meyen fide Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952).

Heterothecium Mont. (1852) nom. illegit. = *Lopadium*.

Heterotolypoosporium Vánky (1997), Anthracoideaceae. 2 (on *Cyperaceae*, *Juncaceae*), Australasia; S. Africa. Has two kinds of spores. See Vánky (*Mycotaxon* 63: 143, 1997), Vánky & McKenzie (*Fungal Diversity Res. Ser.* 8: 259 pp., 2002; New Zealand).

heterotroph (adj. **heterotrophic**) (of living organisms), using organic compounds as primary sources of energy, cf. autotrophic.

Heterovesicula C.E. Lange, C.M. Macvean, J.E. Henry, D.A. Streett (1995), Microsporidia. 1.

heteroxenous, having more than one host.

heterozygous, having heterokaryosis resulting from the fusion of gametes.

Heuflera Bail (1860), Pezizomycotina. 1, Europe.

Heufleria Auersw. (1869), Rhytismatales. 1 (on *Elyna*), Europe.

Heufleria Trevis. (1853) = *Astrothelium*.

Heufleria Trevis. (1861) [non *Heufleria* Trevisan 1853; fide Trevisan 1861] = *Cryptothelium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Heufleridium Müll. Arg. (1883), Pyrenulales (L). 2, widespread (tropical; New Zealand).

Hexacladium D.L. Olivier (1983), anamorphic *Pezizomycotina*, Hso.1bH.1/10. 1 (on pollen grains), S. Africa. See Olivier (*TBMS* 80: 237, 1983).

Hexagona, see *Hexagonia* Fr.

Hexagonella F. Stevens & Guba ex F. Stevens (1925), Schizothyriaceae. 1, Hawaii.

Hexagonia Fr. (1838), Polyporaceae. 16, widespread (esp. tropical). See Bondartzev & Singer (*Polyporaceae of the European part of the U.S.S.R. and Caucasus*: 1106 pp., 1953) = *Polyporus* (*Polypor.*) sensu, Fidalgo (*Mem. N. Y. bot. Gdn* 17: 35, 1968), Fidalgo (*Taxon* 17: 37, 1968), Pegler (*The polypores [Bull. BMS Suppl.]*, 1973), Ryvarden & Johansen (*Prelim. Polyp. Fl. E. Afr.*: 366, 1980; key 11 Afr. spp.), Jülich (*Persoonia* 12: 107, 1984; nomencl.) = *Apoxona* (Coriol.) sensu.

Hexagonia Pollini (1816) nom. rej. = *Polyporus* P. Micheli ex Adans. fide Ryvarden (*Syn. Fung.* 5, 1991).

Hexajuga Fayod (1889) = *Clitopilus*.

Heydenia Fresen. (1852), anamorphic *Pezizomycotina*. 4, widespread (north temperate). See Carmichael *et al.* (*Genera of Hyphomycetes*, 1980), Hairaud & Moreau (*Bulletin Mycologique et Botanique Dauphiné-Savoie* 42 no. 166: 47, 2002; France).

Heydeniopsis Naumov (1915) = *Chaenotheca* fide Seifert & Brodo (*Sydowia* 45: 101, 1993).

Heyderia Link (1833), ? Hemiphacidiaceae. 6, widespread. See Maas Geesteranus (*Persoonia* 3: 87, 1964), Knudsen (*Bot. Tidsskr.* 69: 248, 1978; Denmark), Benkert (*Gleditschia* 10: 141, 1983; key 5 spp.), Siepe (*Beitr. Kenntn. Pilze Mitteleur.* 2: 193, 1986; key 3 spp. Eur.), Malaval (*Docums Mycol.* 19: 9, 1989; ascus ultrastr.), Wang *et al.* (*Am. J. Bot.* 92: 1565, 2005; phylogeny), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).

hiascent, becoming wide open.

Hiatula (Fr.) Mont. (1854) ? = *Mycena* fide Singer (*Agaric. mod. Tax.* 4th ed: 846, 1986).

Hiatulopsis Singer & Grinling (1967), Agaricaceae. 2, Brazil; Congo. See Singer & Grinling (*Persoonia* 4: 364, 1967), Singer (*Fieldiana, New Series* 21: 1, 1989).

Hidakaea I. Hino & Katum. (1955), ? Microthyriaceae. 1, Japan. See Hino & Katumoto (*Bulletin of the Faculty of Agriculture, Yamaguchi University* 6: 38, 1955).

Hiemsia Svrček (1969), Pyronemataceae. 1 or 2, Europe. See Hohmeyer (*Mitt. Arbeitg. Pilzk.Niederrhein* 6: 11, 1988).

Higginsia Nannf. (1932) [non *Higginsia* Pers. 1805, *Rubiaceae*] = *Blumeriella*.

higher fungi, *Ascomycota*, *Basidiomycota*, Anamorphic fungi.

hilar appendage (of basidiospores), the small wart-like or cone-like projection which connects the spore with

- the sterigma; sterigmatal appendage (Smith); apicule (Josserand). Cf. apophysis.
- Hilberina** Huhndorf & A.N. Mill. (2004), Sordariomycetes. 1. See Miller & Huhndorf (*MR* 108: 31, 2004).
- Hildebrandiella** Naumov (1917) ? = *Syzygites* fide Hesselstine (*Mycol.* 47: 344, 1955).
- Hildenbrandia** Nardo (1834), Algae. Algae.
- Hilidicellites** Kalgutkar & Janson. (2000), Fossil Fungi, anamorphic *Ascomycota*. 18, widespread. See Kalgutkar & Jansonius (*AASP Contributions Series* 39: 133, 2000).
- Hilitzeria** Dyr (1941) nom. nud. ? = *Dichotomocladium* fide Benny (*A taxonomic revision of the Thamnidiaceae* (Mucorales), 1973).
- Hillia**, see *Sillia*.
- hilum**, a mark or scar, esp. that on a spore at the point of attachment to a conidiogenous cell or sterigma.
- Himanthites**, see *Himantites*.
- Himantia** (Fr.) Zoll. (1844) = *Cylindrobasidium* fide Donk (*Taxon* 12: 161, 1963; nomencl.).
- Himantia** Pers. (1801), anamorphic *Fungi*. c. 4 (sterile mycelium), Europe. See Donk (*Taxon* 11: 85, 1962; refs).
- himantioid** (of mycelium), in spreading fan-like cords, as in *Himantia*.
- Himantites** Debey & Ettingsh. (1859), Fossil Fungi. 1, Europe.
- Himantormia** I.M. Lamb (1964), Parmeliaceae (L). 1, Antarctica. See Kärnefelt *et al.* (*Nova Hedwigia* 67: 71, 1998), Fryday (*Lichenologist* 37: 313, 2005), Thell *et al.* (*Bibliotheca Lichenol.* 95: 531, 2007; phylogeny).
- Hindersonia** Lév. (1846) = *Hendersonia* Berk. fide Holm (*Taxon* 24: 275, 1975).
- Hindersonia** Moug. & Nestl. ex J. Schröt. (1897) = *Ceriospora*.
- Hinoa** Hara & I. Hino (1961), anamorphic *Pezizomycotina*. 2, Japan. See Hara & Hino (*Icones Fungorum Bamb. Jap.*: 67, 1961).
- Hinomyces** Narumi & Y. Harada (2006), anamorphic *Grovesinia*. 2, Japan. See also *Cristulariella*. See Narumi-Saito *et al.* (*Mycoscience* 47: 351, 2007).
- Hiospira** R.T. Moore (1962), anamorphic *Brooksia*, Hso.0 = hP.1. 1, widespread (tropical). See Moore (*TBMS* 45: 145, 1962).
- Hippocrepeidea** Sérus. (1997), Gomphillaceae (L). 1, Papua New Guinea. See Aptroot *et al.* (*Bibliotheca Lichenol.* 64: 68, 1997).
- Hippocrepidium** Sacc. (1874) = *Hirudinaria* fide Hughes (*Mycol. Pap.* 39, 1951).
- Hippoperdon** Mont. (1842) nom. rej. = *Calvatia* fide Stalpers (*in litt.*).
- Hiratsuka** (Naohide; 1903-2000; Japan). Undergraduate (1923-1926) then graduate (1926-1928) then lecturer (1928-1929), Department of Agricultural Biology, Hokkaido Imperial University; Professor of Botany and Plant Pathology, Tottori Agricultural College (1929-1946); Professor of Mycology and Plant Pathology, College of Agricultural Education, Tokyo (1946-1949); Professor of Mycology and Plant Pathology, Tokyo University of Education, 1949-1967); Director, Tottori Mycological Institute (1967-1994). Celebrated for his studies on rusts and widely recognized as the foremost authority on taxonomy and biology of east Asian rust fungi; he named more than 250 species in 31 different rust genera. *Publs. A Monograph of the Pucciniastreae* (1936); *Uredinological Studies* (1955); *Revision Monograph of the Pucciniastreae* (1958); *Rust Flora of Japan* (1992). Azbukina & Kakishima ([*Mikologiya i Fitopatologiya*] 33: 61, 1999) [portrait, in Russian]; Bandoni (*Mycoscience* 41: 651, 2000) [portrait].
- Hiratsukaia** Hara (1948), Pucciniales. 1, Japan. See Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983; Excluded from *Pucciniales*).
- Hiratsukamyces** Thirum., F. Kern & B.V. Patil (1975), Pucciniales. 2 (on *Salacia* (Celastraceae)), India. See Thirumalachar *et al.* (*Sydowia* 27: 80, 1973-4).
- Hirneola** Fr. (1825) nom. rej. = *Mycobonia*.
- Hirneola** Fr. (1848) nom. cons. = *Auricularia* fide Lowy (*Mycol.* 44: 656, 1952).
- Hirneola** Velen. (1939) [non *Hirneola* Fr. 1825, nec *Hirneola* Fr. 1848, nom. cons.] = *Clitopilopsis*.
- Hirneolina** (Pat.) Bres. (1905) = *Heterochaete* fide Lowy (*Nova Hedwigia* 19: 407, 1971), Donk (*Persoonia* 8: 33, 1974; = *Eichleriella*).
- Hirschioporus** Donk (1933) = *Trichaptum* fide Ryvarden (*Syn. Fung.* 5, 1991).
- hirsute**, having long hairs.
- Hirsutella** Pat. (1892), anamorphic *Ophiocordyceps*, Hso/Hsy.0eH.15. c. 46 (on insects), widespread. See Macleod (*CJB* 37: 695, 1959), Macleod (*CJB* 37: 819, 1959; nutrition), Minter & Brady (*TBMS* 74: 271, 1980), Minter *et al.* (*TBMS* 81: 455, 1983; on eriophyid mites), Samson *et al.* (*Persoonia* 12: 123, 1984; troglomorphic hyphomycetes), Evans & Samson (*CJB* 64: 2098, 1986; with *Tetracrium* synanamorph), Fernández-García *et al.* (*MR* 94: 1111, 1990; on mealybug), Strongman *et al.* (*J. Invert. Path.* 55: 11, 1990; spp. on spruce budworm), Samson & Evans (*MR* 95: 887, 1991; *Didymobotryopsis*, a synonym), Strongman & MacKay (*Mycol.* 85: 65, 1993; RAPDs used for varietal discrimination), Tedford *et al.* (*MR* 98: 1127, 1994; RAPDs analysis of variation in *H. rhossiliensis*), Hodge *et al.* (*MR* 101: 1377, 1997; *Harposporium* synanamorphs), Hywel-Jones (*MR* 101: 1202, 1997; Thailand), Guzmán *et al.* (*Mycotaxon* 78: 115, 2001; Mexico), Liu *et al.* (*MR* 105: 827, 2001; teleomorph), Liu *et al.* (*MR* 106: 1100, 2002; phylogeny), Stensrud *et al.* (*MR* 109: 41, 2005; phylogeny), Sung *et al.* (*Stud. Mycol.* 57, 2007; revision).
- Hirsutoporus** Batson (1983), Microsporidia. 1.
- hirtose** (hirtous), having hairs; hirsute.
- Hirudinaria** Ces. (1856), anamorphic *Pezizomycotina*, Hso.0bP.1. 1, Europe; N. America. See Hughes (*Mycol. Pap.* 39, 1951).
- hispid**, having hairs or bristles.
- Hispidicarpomyces** Nakagiri (1993), Hispidicarpomycetaceae. 1 (on marine red alga, *Galaxaura*), Japan. See Nakagiri (*Mycol.* 85: 638, 1993), Nakagiri & Ito (*Mycol.* 89: 484, 1997), Inderbitzin *et al.* (*MR* 108: 737, 2004; phylogeny).
- Hispidicarpomycetaceae** Nakagiri (1993), Lulworthiales. 1 gen., 1 spp.
Lit.: Nakagiri (*Mycol.* 85: 638, 1993), Nakagiri & Ito (*Mycol.* 89: 484, 1997).
- Hispidocalyptella** E. Horak & Desjardin (1994), Marasmiaceae. 1, Australia. See Horak & Desjardin (*Aust. Syst. Bot.* 7: 165, 1994).
- Hispidula** P.R. Johnst. (2003), Hyaloscyphaceae. 4, Australasia. See Johnston (*N.Z. Jl Bot.* 41: 687, 2003).
- hispidulous**, somewhat, or delicately; cf. hispid.
- Histeridomyces** Thaxt. (1931), Laboulbeniaceae. 6,

widespread. See Rossi (*Mycol.* 72: 430, 1980), Weir (*Mycotaxon* 79: 81, 2001; New Zealand).

histogenous (1) produced from tissue; (2) (of spores), produced from hyphae or cells, without conidiogenous cells.

histolysis, the disappearance or solution of a wall or tissue.

Histoplasma Darling (1906), anamorphic *Ajellomyces*, *Emmonsii*, Hso.0eH.1. 2, widespread. *H. capsulatum* on humans and animals (**histoplasmosis**). See Sweany (Ed.) (*Histoplasmosis*, 1960), Cooke (*Mycopathologia* 39: 1, 1969; 2,300 ref.), Ajello *et al.* (Eds) (*Histoplasmosis symposium*, 1971), Kwong-Chung (*Science* N.Y. 177: 368, 1972; teleomorphs), Vincent *et al.* (*J. Bact.* 165: 813, 1986; RFLP and classification), Maresca & Kobayashi (*Microbiol. Rev.* 53: 186, 1989; dimorphism and cell differentiation in *H. capsulatum*), Fukushima *et al.* (*Mycopathologia* 116: 151, 1991; re-evaluation of teleomorph by ubiquinone), Carter *et al.* (*J. Clin. Microbiol.* 34: 2577, 1996; recombination), Guého *et al.* (*Mycoses* 40: 69, 1997; phylogeny, epidemiology), Lasker *et al.* (*Medical Mycology* 36: 205, 1998; introns), Okeke *et al.* (*Mycoses* 41: 355, 1998; rDNA analysis), Poonwan *et al.* (*J. Clin. Microbiol.* 36: 3073, 1998; Thailand), Kasuga *et al.* (*J. Clin. Microbiol.* 37: 653, 1999; phylogeny), Reyes-Montes *et al.* (*J. Clin. Microbiol.* 37: 1404, 1999; Mexico), Jiang *et al.* (*J. Clin. Microbiol.* 38: 241, 2000; strain typing), Taylor *et al.* (*Fungal Genetics Biol.* 30: 207, 2000; Mexico), Muniz *et al.* (*J. Clin. Microbiol.* 39: 4487, 2001; genetic diversity), Tamura *et al.* (*Jap. J. Med. Mycol.* 43: 11, 2002; phylogeny), Bracca *et al.* (*J. Clin. Microbiol.* 41: 1753, 2003; molecular detection), Kasuga *et al.* (*Mol. Ecol.* 12: 3383, 2003; phylogeography), Canteros *et al.* (*FEMS Immunol. Med. Microbiol.* 45: 423, 2005; karyotypes), Komori *et al.* (*Jap. J. Med. Mycol.* 46: 291, 2005; phylogeny), Zancopé-Oliveira *et al.* (*FEMS Immunol. Med. Microbiol.* 45: 443, 2005; Brazil), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny).

Histoplasmataceae Redaelli & Cif. (1934) = *Ajellomycetaceae*.

histoplasmin, an antigen prepared from *Histoplasma capsulatum*, esp. for skin testing.

histoplasmosis, see *Histoplasma*.

History. Basidiomycetes and larger ascomycetes, including larger lichen-forming species have been used by man as food and in other ways since early times. There are references to fungi, including lichen-forming species in Greek and Roman literature (see Buller, *TBMS* 5: 21, 1915) and illustrated accounts can be found in the European printed herbals of the sixteenth and seventeenth centuries (e.g. those of Bauhin, Dodoens, Parkinson) but their systematic investigation stems mainly from the studies of Tournefort, Dillenius, and, particularly, Micheli in the eighteenth century. Many of the earliest studies include a wide range of groups, but as the nature of lichens was not accepted until the end of the nineteenth century lichenology tended to be a rather independent study; integration of the two specialities has accelerated only since the 1970s, and the first well-integrated classifications are even later (see *Ascomycota*).

The first phase of mycology was mainly systematic. The chief contribution of Linnaeus was binomial nomenclature, but before 1800 advances were made by Tode and others. Outstanding among later workers

before 1900 were Persoon, Fries, Berkeley, Corda, the Tulasne brothers, de Bary, Brefeld, and Saccardo – for all of whom (and selected others) there are short biographical notices (see Authors' names). The twentieth century saw major developments in the knowledge of cytology, sex, genetics, physiologic specialization, etc. in fungi and a great expansion in medical and industrial mycology and mycological aspects of plant pathology. There was also a growing awareness that fungi need protection and conservation no less than other organisms. In the early twenty-first century, molecular and digital technologies are being applied to mycology, the one revolutionizing classifications, and the other enabling huge amounts of information to be processed and disseminated.

At the beginning of the nineteenth century Acharius put lichenology on a sound scientific basis and many terms and currently accepted genera were introduced by him. With improvements in the microscope by the mid-century spore characters were first used in lichen taxonomy, particularly by de Notaris, Massalongo, Trevisan, and Körber; and the dual nature of lichens was recognized by de Bary and Schwendener. During the latter part of the nineteenth century important regional and monographic studies were made by Nylander, Müller-Argoviensis, Hue, and Crombie. From the 1950s particularly metabolic products (q.v.) came to play an increasing role in lichen systematics, and physiological (see Physiology) and ultrastructural (see Ultrastructure) studies have increased the understanding of their symbiotic nature.

Literature: General: Ainsworth (*Introduction to the history of mycology*, 1976). **Mycology:** Bo & Johnson (*Mycol.* 73: 1098, 1981; mycology in China), Krieger (*Mycol.* 14: 311, 1922; mycological illustrations), Lazzari (*Storia della micologia italiana*, 1973), Lutjeharms (*Meded. nederl. mycol. Vereen.* 23, 1936; 18th century), Machol (*Mycologist* 4: 129, 184, 1990; 5: 28, 1991; early mushroom books), Ramsbottom (*Proc. Linn. Soc. Lond.* 151: 280, 1941; mycology since Linnaeus), Raychaudhuri *et al.* (*History of plant pathology of south east Asia with special reference to India*, 1996), Rea (*TBMS* 5: 211, 1916), Rogers (*A brief history of mycology in North America*, edn 2, 1981), Singer (*Mycologists and other taxa*, 1984). **Lichenology:** Krempelhuber (*Geschichte und Literatur der Lichenologie* 1, 1867; 2, 1869-72), Smith (*Lichens*, 1921 [reprint 1975]), Grumann (*Biographisch-bibliographisches handbuch der Lichenologie*, 1974), Hawksworth & Seaward (*Lichenology in the British Isles 1568-1975*, 1977).

See also Authors' names, Ethnomycology, Literature, Medical and Veterinary mycology, Plant pathogenic fungi.

Hjortstamia Boidin & Gilles (2003), *Phanerochaeta*-ceae. 12, widespread. See Boidin & Gilles (*BSMF* 118: 99, 2002), Hjortstam & Ryvarden (*Syn. Fung.* 20: 33, 2005).

HMAS, Mycology Herbarium, Systematic Mycology and Lichenology Laboratory, Institute of Microbiology (Beijing, China); founded 1953; a specialist Institute of Academia Sinica; the Laboratory was established in 1985; genetic resource collection **CGMCC** (Centre for General Microbiological Culture Collections).

hoary (esp. of a pileus or stipe), covered thickly with silk-like hairs; canescent.

- Hobsonia** Berk. ex Masee (1891), anamorphic *Atractiellales*, Hsp.0= hH.1. 1, widespread. See Sikaroodi *et al.* (*MR* 105: 453, 2001; phylogeny), Aime *et al.* (*Mycol.* 98: 896, 2006; phylogeny).
- Hobsoniopsis** D. Hawksw. (2001), anamorphic *Pezizomycotina*. 1, Sweden. See Sikaroodi *et al.* (*MR* 105: 457, 2001).
- Hochkultur**, see Normkultur.
- Hodophilus** R. Heim (1965) = *Camarophyllopsis* fide Kuyper (*in litt.*).
- Hoehneliella** Bres. & Sacc. (1902), anamorphic *Pezizomycotina*, Ccu.1eP.15. 1, Austria. See Vasant Rao & Sutton (*Kavaka* 3: 21, 1976).
- Hoehnelogaster** Lohwag (1926) nom. dub., ? *Boletales*.
- Hoehnelomyces** Weese (1920) = *Atractiella* fide Oberwinkler & Bauer (*Sydowia* 41: 224, 1989).
- Hoehnelomycetaceae** Jülich (1982) = *Phleogenaceae*.
- Hohenbuehelia** Schulzer (1866) nom. rej., *Pleurotaceae*. Anamorph *Nematoctonus*. c. 50, widespread. See Barron & Dierkes (*CJB* 55: 3054, 1977; ecology, anamorph), Thorn & Barron (*Mycotaxon* 25: 321, 1986; N. Am. spp.), Thorn *et al.* (*Mycol.* 92: 241, 2000; phylogeny), Fazio & Albertó (*Mycotaxon* 77: 117, 2001; Argentina).
- Höhnel** (Franz Xavier Rudolf von; 1852-1920; Austria). PhD, Strassburg (1877); Professor of Botany, Vienna Technical College, 1884-1920. Proposed 250 new genera and 500 species of fungi; his taxonomic research on coelomycetes being particularly noted. His most important work was disseminated through two extensive but dispersed groups of papers, both aptly named *Fragmente*. See also (by Weese) v. Höhnel's mykologischen Nachlass-Schriften 1-150. *Mitteilungen der Botanischen Institut der Technischen Hochschule, Wien* 1-12 (1924-1935) [(index 12: 33]. Most of his collections are in Harvard (FH). *Publs. Fragmente zur Mykologie. Sitzungsberichten der Kaiserliche Akademie der Wissenschaften in Wien Mathematische-Naturwissenschaftliche Klasse Abt. I* (1902-1923) [index for fragmente 1-1000 printed separately 1916; index to fragmente 1001-1225, see *Mitteilungen der Botanischen Institut der Technischen Hochschule, Wien* 9: 66, 1932; see also the facsimile reprint by J. Cramer, *Fragmente zur Mykologie i-xxiv* (1967)]. *Mykologische Fragmente Annales Mycologici* 1-18 (1903-1920) [reprint 1967]. *Biogs, obits etc.* Stafleu & Cowan (*TL-2* 2: 229, 1979); Weese (*Bericht der Deutschen Botanischen Gesellschaft* 38: (103), 1921).
- Holcomyces** Lindau (1904) = *Diplodia* fide Höhnel (*Annl's mycol.* 3: 187, 1905).
- holdfast**, a process from the thallus for attachment, e.g. appressorium, hyphopodium, stigmatopodium, and stomatopodium; cf. rhizoid, hapteron, haustorium.
- Holleya** Y. Yamada (1986) = *Eremothecium* fide Yamada & Nagahama (*J. gen. appl. Microbiol.* Tokyo 37: 199, 1991), Kurtzman (*J. Industr. Microbiol.* 14: 523, 1995), Prillinger *et al.* (*Yeast* Chichester 13: 945, 1997), de Hoog *et al.* in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 201, 1998).
- Hollosia** Gyeln. (1939) = *Scutula* fide Santesson (*Svensk bot. Tidskr.* 43: 141, 1949).
- Holmiella** Petrini, Samuels & E. Müll. (1979), *Patellariaceae*. Anamorph *Corniculariella*. 1 (on *Juniperus*), widespread. See Kutorga & Hawksworth (*SA* 15: 1, 1997).
- Holmiodiscus** Svrček (1992), *Helotiaceae*. 1, Sweden. See Holm & Nannfeldt (*Thunbergia* 16: 19, 1992).
- holo-** (prefix), all; whole; entire.
- Holobasidiomycetes**, see *Basidiomycota*.
- Holobasidiomycetidae**, see *Basidiomycota*.
- holobasidium**, see basidium.
- Holobispora** Voronin (1986), *Microsporidia*. 1.
- holoblastic**, see blastic.
- holocarpic**, having all the thallus used for the fruit-body.
- holocarpous** (of lichen thalli), ones formed by colonies of a free-living photobiont being invaded by a mycobiont and developing directly into fruiting bodies (Henssen, *Lichenologist* 18: 51, 1986).
- Holocoenis** Clem. (1909) = *Coenogonium* Ehrenb. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995) but see Rivas Platas *et al.* (*Fungal Diversity* 23: 255, 2006; Costa Rica).
- holocoenocytic**, see astatocoenocytic.
- Holocoryne** (Fr.) Bonord. (1851) = *Clavaria* fide Corner (*Ann. Bot. Mem.* [A monograph of *Clavaria* and allied genera] 1, 1950).
- Holocotylon** Lloyd (1906), *Agaricaceae*. 3, Mexico; N. America (subtropical). See Zeller (*Mycol.* 39: 282, 1947).
- Holocryptia** Gryzenh. & M.J. Wingf. (2006), *Cryphonectriaceae*. 1 (on *Eucalyptus* and *Tibouchina*), widespread. See Venter *et al.* (*Sydowia* 54: 98, 2002), Myburg *et al.* (*Mycol.* 96: 990, 2004; phylogeny), Gryzenhout *et al.* (*FEMS Microbiol. Letters* 258: 161, 2006; phylogeny), Gryzenhout *et al.* (*Stud. Mycol.* 55: 48, 2006), Heath *et al.* (*Australas. Pl. Path.* 36: 560, 2006; *Tibouchina* as host), Nakabonge *et al.* (*Australas. Pl. Path.* 37: 154, 2008; population biology).
- Holocyphis** Clem. (1909) = *Thelomma* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- hologamy**, the condition in which all the thallus becomes a gametangium, i.e. there is fusion between two mature individuals as in *Polyphagus*.
- Hologloea** Pat. (1900) = *Favolaschia* fide Kuyper (*in litt.*).
- Hologymnia** Nyl. (1900) = *Evernia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- holomorph**, see States of fungi.
- holomorphum**, two or more accepted species, each comprising teleomorph and anamorph, but scarcely distinguishable in one of the morphs (Tribe, *Bull. BMS* 17: 94, 1983).
- holophyte**, a physiologically self-supporting green plant.
- holosaprophyte**, a true saprophyte (Johow).
- Holospora** Tomas. & Cif. (1952) = *Polyblastia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Holosporomyces** Cif. & Tomas. (1953) = *Holospora*.
- holosporous** (of conidial maturation), the conidium approaches its final size and shape before delimiting cells and maturing as a whole (Luttrell, 1963).
- Holothelis** Clem. (1909) = *Thelopsis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- holotype**, see type.
- Holstiella** Henn. (1895) = *Trypethelium* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Holtermannia** Sacc. & Traverso (1910), *Tremellaceae*. 7, S.E. Asia; Brazil. See Kobayasi (*Sci. Rep. Tokyo Bunrika Daig.* B 50: 75, 1937), Mahamulkar *et al.* (*Indian Phytopathology* 55: 464, 2002; India n.sp.).
- Holtumia** Lloyd (1924), *Xylariaceae*. 1, E. & S.E.

- Asia. See Læssøe (SA 13: 43, 1994), Rogers & Ju (*Mycotaxon* 68: 358, 1998; synonym of *Kretzschmaria*).
- Holubovaea** Mercado (1983), anamorphic *Pezizomycotina*, Hso.≡ eP.19. 1, Cuba. See Mercado (*Acta Bot. Cubana* 15: 5, 1983), Mercado Sierra *et al.* (*Monografie Museo Regionale di Scienze Naturali*, Torino 23, 1997).
- Holubovaniella** R.F. Castañeda (1985), anamorphic *Pezizomycotina*, Hso.≡ eP.1. 2, Cuba; Kenya. See Castañeda (*Deuteromycotina de Cuba Hyphomycetes III*: 14, 1985).
- Holwaya** Sacc. (1889), ? Bulgariaceae. Anamorph *Crinula*. 1, widespread (north temperate). See Korf & Abawi (*CJB* 49: 1879, 1971), Krieglsteiner & Häffner (*Z. Mykol.* 51: 131, 1985), Aronsson (*Svensk bot. Tidskr.* 85: 9, 1991), Roth (*Schweiz. Z. Pilzk.* 69: 197, 1991; anamorph), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006; phylogeny), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Holwayella** H.S. Jacks. (1926) = *Chrysocyclus* fide Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983).
- Homalopeltis** Bat. & Valle (1961), anamorphic *Pezizomycotina*, Cpt.1eP.?. 1, Brazil. See Batista & Valle (*Publicações Inst. Micol. Recife* 337: 5, 1961).
- Homaromyces** R.K. Benj. (1955), Laboulbeniaceae. 1, USA; Europe. See Benjamin (*Aliso* 3: 183, 1955), Tavares (*Mycol. Mem.* 9: 627 pp., 1985).
- homeostasis**, the maintenance of constant chemical and physical conditions within a living organism. See Whittenbury *et al.* (Eds) (*Homeostatic mechanisms in micro-organisms*, 1987).
- homo-** (prefix), one and the same.
- Homobasidiomycetes** R.T. Moore (1971), see *Basidiomycota*.
- homobasidium**, see basidium.
- homobium**, a self-supporting association of a fungus and an alga, as in lichens.
- Homodium** Nyl. ex H. Olivier (1903) = *Leptogium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- homohetromixis**, see heterothallism.
- homohylic vesicle**, sporangial vesicle, the wall of which is continuous with, and of the same material as the wall layer, or one of the wall layers of the sporangium. See also plasmamembranic vesicle, precipitative vesicle.
- homoimerous** (1) (of a lichen thallus), having the mycobiont and phycobiont evenly intermixed throughout the thallus, as in *Collema*; (2) (of trama in agarics), composed of hyphal tissue only; cf. heteromerous.
- homokaryotic**, having genetically identical nuclei, as in a line of isolates without variation (Brierley, *Ann. appl. Biol.* 18: 429, 1931).
- homokaryotic diplospory**, incorporation of one or more homogenetic diploid nuclei in an oospore formed in response to abortive meioses in the oogonium (Dick, 1972).
- homologous**, showing a resemblance in form or structure, but not necessarily function, which is considered to be evidence of evolutionary relatedness; cf. analogous. See Poelt (*in* Hawksworth (Ed.), *Frontiers in mycology*: 85, 1991; homologous characters in lichens). See also alternation of generations, Cladistics.
- homomixis**, haplo-monoecism or monoecism. Whitehouse (*Biol. Rev.* 24: 428, 1949) recognized two types: **primary homothallism** such as occurs in a homokaryotic individual and **secondary homothallism** (= pseudo heterothallism or facultative heterothallism (Dodge), **amphithallism**, Lange, 1952) as in a thallus derived from one heterokaryotic spore containing nuclei of compatible mating types; cf. heterothallism.
- homomorphous** (of an agaric lamella edge), hymenium on edge not differentiated from that on the faces; cf. heteromorphous.
- Homonemeae**, the *Algae* and *Fungi* (obsol.).
- homonym**, a name which (under the *Code*) must not be used because of an earlier name in a different sense, i.e. the names are the same but the types different; Donk (*Bull. bot. Gard. Buitenzorg* ser. 3 18: 282, 1949) in addition to heterotypic homonyms recognizes homotypic, non-synonymous, synonymous, and monadelphous homonyms, the last being derived from a common source, particularly from one devaluated name.
- Homophron** (Britzelm.) W.B. Cooke (1953) = *Psathyrella* fide Kuyper (*in litt.*).
- homophytic**, the equivalent in the sporophyte generation of monoecious in the gametophyte generation (Blakeslee, *Bot. Gaz.* 42: 161, 1906); cf. heterophytic.
- homoplasmic**, see karyotic.
- Homopsella** Nyl. (1887) = *Porocyphus* fide Henssen (*Symb. bot. upsala.* 18 no. 1, 1963).
- Homopsellomyces** Cif. & Tomas. (1953) = *Homopsella*.
- Homospermales**. Le Gal's (1953) term for operculate discomycetes; cf. *Heterospermales*.
- homospory** (1) having asexually produced spores of only one kind (= isospory); (2) having spores which are not differentiated according to mating type (c.f. heterospory).
- Homostegia** Fuckel (1870), Dothideomycetes. 1 or 5 (on lichens), Europe. See Hawksworth *et al.* (*Bibliotheca Lichenol.* 88: 187, 2004).
- homothallism** (adj. **homothallic**), the condition in which sexual reproduction can occur without the interaction of two differing thalli.
- Homothecium** A. Massal. (1853), Collemataceae (L). 3, widespread (temperate; S. America). See Henssen (*Lichenologist* 3: 29, 1965).
- homozygous**, with identical alleles at the same locus on homologous chromosomes.
- honey agaric (honey fungus)**, *Armillaria mellea*; shoe-string or boot-lace fungus.
- honey-dew** (1) a secretion, attractive to insects, associated with the *Sphacelia* phase of *Claviceps* (Mower & Hancock, *CJB* 53: 2826, 1975); (2) a secretion by aphids.
- Honoratia** Cif., Vegni & Montemart. (1963) = *Preussia* fide von Arx & Storm (*Persoonia* 4: 407, 1967).
- Hoornsmania** Crous (2007), anamorphic *Davidiellaceae*. 1, Europe. See Crous (*Fungal Planet* 11, 2007).
- Horakia** Oberw. (1976) = *Verrucospora*.
- Horakiella** Castellano & Trappe (1992), Sclerodermataceae. 1, Australia. See Castellano & Trappe (*Aust. Syst. Bot.* 5: 641, 1992).
- Horakomyces** Raithelh. (1983) ? = *Melanomphalia* fide Kirk (*in litt.*).
- Hormiactella** Sacc. (1886), anamorphic *Pezizomycotina*, Hso.1eP.3. 4, Europe; West Indies. See Holubová-Jechová (*Folia geobot. phytotax.* 13: 433, 1978), Borisova (*Mikol. Fitopatol.* 34: 26, 2000).

- Hormiactina** Bubák (1916) ? = *Hormiactis* fide Carmichael *et al.* (*Genera of Hyphomycetes*, 1980).
- Hormiactis** Preuss (1851), anamorphic *Pezizomycotina*, Hso.1eH.3. 5, Europe; Sri Lanka.
- Hormiokrypsis** Bat. & Nascim. (1957), anamorphic *Ophiocapnocomma*, Hso.0bP.28. 1, USA. See Hughes (*N.Z. Jl Bot.* 5: 117, 1967), Hughes (*N.Z. Jl Bot.* 10: 225, 1972).
- Hormisciella** Bat. (1956) = *Antennatula* fide Hughes (*N.Z. Jl Bot.* 8: 153, 1970).
- Hormiscioideus** M. Blackw. & Kimbr. (1979), anamorphic *Pezizomycotina*, Hso.?.?. 1 (on *Insecta*), USA. See Blackwell & Kimbrough (*Mycol.* 70: 1275, 1978).
- Hormisciomyces** Bat. & Nascim. (1957), anamorphic *Euantennaria*, Hso.0eP.15. 1, Cuba. See Hughes (*N.Z. Jl Bot.* 12: 299, 1974), Hughes & Arnold (*Mem. N. Y. bot. Gdn* 49: 198, 1989).
- Hormisciopsis** Sumst. (1914), anamorphic *Pezizomycotina*, Hso.0eP.3. 1, N. America.
- Hormiscium** Kunze (1817) = *Torula* fide Hughes (*CJB* 36: 727, 1958), Crane & Schoknecht (*Mycol.* 78: 86, 1986).
- Hormoascus** Arx (1972) = *Ambrosiozyma* fide van der Walt & von Arx (*Syst. Appl. Microbiol.* 6: 90, 1985), Goto & Takami (*J. gen. appl. Microbiol.* Tokyo 32: 271, 1986), Kurtzman & Robnett (*CJB* 73 Suppl. 1: S824, 1995), Smith in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 129, 1998).
- Hormocephalum** Syd. (1939), anamorphic *Pezizomycotina*, Hso.≡ eP.4. 1, Ecuador.
- Hormocladium** Höhn. (1923), anamorphic *Pezizomycotina*, Hso.0-1eP.?. 1, Japan. See Braun & Melnik (*Trudy Botanicheskogo Instituta im. V.L. Komarova* 20: 18, 1997).
- Hormococcus** Preuss (1852) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Hormococcus** Robak (1956), anamorphic *Pezizomycotina*, Cpd.0eH.15. 1, Norway. See Robak (*Friesia* 5: 379, 1956).
- Hormoconis** Arx & G.A. de Vries (1973), *Amorphothecaceae*. 1. See Partridge & Morgan-Jones (*Mycotaxon* 83: 335, 2002), Braun *et al.* (*Mycol. Progr.* 2: 8, 2003), Seifert *et al.* (*Stud. Mycol.* 58: 235, 2007; phylogeny, nomenclature).
- hormocyst**, a propagule or diaspore produced in a special **hormocystangium** comprising a few cyanobacterial cells and fungal hyphae (Fig. 22I); produced by a few gelatinous lichens, e.g. *Lempholemma cladodes*, *L. vesiculiferum*. See Degelius (*Svensk bot. Tidsk.* 39: 419, 1945), Henssen (*Lichenologist* 4: 99, 1969).
- hormocystangium**, see **hormocyst**.
- Hormodendraceae** Nann. (1934) = *Davidiellaceae*.
- Hormodendroides** M. Moore & F.P. Almeida (1937) = *Rhinocladia* Nannf. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Hormodendron** (orthographic variant), see *Hormodendrum*.
- Hormodendrum** Bonord. (1851) = *Cladosporium* fide de Vries (*Contribution to the knowledge of the genus Cladosporium Link ex Fr.*, 1952), David (*Mycol. Pap.* 172, 1997).
- Hormodochis** Clem. (1909) = *Trullula* fide Sutton (*Mycol. Pap.* 141, 1977).
- Hormodochium** (Sacc.) Höhn. (1911) = *Trullula* fide Sutton (*Mycol. Pap.* 141, 1977).
- Hormographiella** Guarro & Gené (1992), anamorphic *Coprinellus*, Hso.0eH.38/39. 3 (from humans, coprophilous), Europe. See Guarro *et al.* (*Mycotaxon* 45: 179, 1992), Cáceres *et al.* (*Antonie van Leeuwenhoek* 89: 79, 2006; anamorphs of *Coprinellus domesticus*).
- Hormographis** Guarro, Punsola & Arx (1986), anamorphic *Pezizomycotina*, Hsy.0eH.40. 1 (from soil), Spain. See Guarro *et al.* (*Mycol.* 78: 969, 1986).
- Hormomitaria** Corner (1950) = *Physalacria* fide Kuyper (*in litt.*).
- Hormomyces** Bonord. (1851), anamorphic *Tremella*, Hsp.0eH.3. 3, widespread (temperate). See Tubaki (*TMSJ* 17: 243, 1976; culture), Roberts (*Mycotaxon* 63: 195, 1997; UK), Zang & Wang (*Acta Bot. Yunn.* 19: 324, 1997; China).
- Hormonema** Lagerb. & Melin (1927), anamorphic *Dothiora*, Hso.0eH.1/10. 5, widespread. Apparently polyphyletic. See Hermanides-Nijhof (*Stud. Mycol.* 15: 166, 1977), Funk *et al.* (*CJB* 63: 1579, 1985), Shin *et al.* (*J. Clin. Microbiol.* 36: 2157, 1998; in humans), Yurlova *et al.* (*Stud. Mycol.* 43: 63, 1999), Peláez *et al.* (*Syst. Appl. Microbiol.* 23: 333, 2000; endophyte), Bills *et al.* (*Stud. Mycol.* 50: 149, 2004; Spain).
- hormones** (sex or sexual), of fungi, see antheridiol, progamones, sirenin, trisporic acids; also erogen, etc. Machlis (*Mycol.* 64: 235, 1972), Gooday (*Ann. Rev. Biochem.* 43: 35, 1974), reviews. Cf. pheromone.
- Hormopeltis** Speg. (1912) = *Micropeltis* fide Clements & Shear (*Gen. Fung.*, 1931).
- Hormosperma** Penz. & Sacc. (1897) = *Lasiosphaeria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Hormosphaeria** Lév. (1863) nom. dub., ? Arthoniales. 1, S. America. See Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952).
- Hormospora** De Not. (1844) [non *Hormospora* Bréb. 1839, *Algae*] = *Bombardioidea* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Hormosporites** Grüss (1928), Fossil Fungi ? Fungi. 1 (Devonian), Europe.
- Hormotheca** Bonord. (1864) = *Coleroa* fide Corlett & Barr (*Mycotaxon* 25: 255, 1986), Müller (*SA* 5: 310, 1986).
- Hormyllum** Clem. (1909) ≡ *Hormococcus* Robak fide Sutton (*Mycol. Pap.* 141, 1977).
- horn of plenty**, basidioma of the edible *Craterellus cornucopioides*.
- Hornodermoporus** Teixeira (1993) = *Perenniporia* fide Decock (*in litt.*).
- horse mushroom**, basidiomata of the edible *Agaricus arvensis*.
- horse-hair blight fungi**, the rhizomorphic mycelia of tropical species of *Marasmius*, e.g. *M. equicrinis* (E. trop.) and *M. sarmentosus* (W. Indies). See Petch (*Ann. R. bot. Gdns Peradeniya* 6: 43, 1915). Cf. thread blight.
- horse-tail lichen**, see rock hair.
- Hortaea** Nishim. & Miyaji (1984), anamorphic *Terasphaeriaceae*, Hso.1eP.21. 1, widespread. See Mittag (*Mycoses* 36: 242, 1993; fine structure), Uijthof *et al.* (*Mycoses* 37: 307, 1994; genotypes of *H. werneckii*), Piontelli L. *et al.* (*Bol. Micol. Valparaíso* 12: 89, 1997; saline environments, Chile), Rogers *et al.* (*Stud. Mycol.* 43: 122, 1999; phylogeny), Haritani *et al.* (*Jap. J. Med. Mycol.* 43: 175, 2002; from guinea pig), Hölker *et al.* (*Antonie van Leeuwenhoek* 86: 287, 2004; from lignite), Ng *et al.* (*Mycopathologia* 159: 495, 2005; from blood), Ster-

- flinger (*The Yeast Handbook* [1]: 501, 2006; review), Crous *et al.* (*Stud. Mycol.* 58: 1, 2007).
- Hosseusia** Gyeln. (1940), ? Pannariaceae (L). 1, Argentina.
- host** (1) a living organism harbouring a parasite; frequently in the sense of 'suscept' (q.v.); sometimes, as in 'host index', in a general sense covering certain substrata; (2) a commercial computer operator keeping databases other than their own on its machines and making them available to others for on-line searching for a fee (see Literature).
- house fungus** (or **dry rot fungus**), *Serpula lacrimans*.
- Hrabyeia** J. Lom & I. Dykova (1990), Microsporidia. 1. See Lom & Dykova (*Eur. J. Protist.* 25: 243, 1990).
- hülle cells**, terminal or intercalary thick-walled cells which occur in large numbers in association with the ascomata of, e.g. *Aspergillus nidulans*.
- Huangshania** O.E. Erikss. (1992), Tribliidiaceae. 2, China. See Magnes (*Biblthca Mycol.* 165, 1997).
- Hubbsia** W.A. Weber (1965), Roccellaceae (L). 3, new world. See Follmann (*Nova Hedwigia* 31: 285, 1979), Tehler (*CJB* 68: 2458, 1990; cladistics), Tehler *et al.* (*Symb. bot. upsal.* 32 no. 1: 255, 1997), Myllys *et al.* (*Bryologist* 101: 70, 1998; phylogeny), Myllys *et al.* (*Lichenologist* 31: 461, 1999; phylogeny), Follmann (*J. Hattori bot. Lab.* 90: 251, 2001; key), Follmann (*Mitteilungen aus dem Institut für Allgemeine Botanik Hamburg* 30-32: 61, 2002; biogeography), Tehler & Irestedt (*Cladistics* 23: 432, 2007).
- Huea** C.W. Dodge & G.E. Baker (1938) = *Caloplaca* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Hueella** Zahlbr. (1926) nom. rej. prop. = *Fuscopannaria* fide Jørgensen (*Taxon* 49: 812, 2000; nomencl.).
- Hueidea** Kantvilas & P.M. McCarthy (2003), Fuscideaceae (L). 1, Australia. See Kantvilas & McCarthy (*Lichenologist* 35: 398, 2003).
- Hughesiella** Bat. & A.F. Vital (1956) = *Chalara* fide Nag Raj & Kendrick (*Monogr. Chalara Allied Genera*, 1975).
- Hughesinia** J.C. Lindq. & Gamundí (1970), anamorphic *Pezizomycotina*, Hso.0bP.28. 1, Chile; Cuba. See Lindquist & Gamundí (*Boln Soc. argent. Bot.* 13: 54, 1970), Delgado *et al.* (*Fungal Diversity* 20: 31, 2005; Cuba).
- Hugueninia** J.L. Bezerra & T.T. Barros (1970), ? Microthyriaceae. 1, New Caledonia. See Hyde (*Sydowia* 49: 1, 1997), Mouchacca (*Mycotaxon* 67: 99, 1998).
- Huillia** Zahlbr. (1930) = *Porpidia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Humaria** (Fr.) Boud. (1885) ≡ *Octospora*.
- Humaria** Fuckel (1870), Pyronemataceae. c. 16, widespread (north temperate). See Kanouse (*Mycol.* 39: 635, 1947), Denison (*Mycol.* 51: 612, 1961), Eriksson & Hawksworth (*SA* 11: 179, 1993; nomencl.), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny), Erős-Honti *et al.* (*Mycorrhiza* 18: 133, 2008; mycorrhizas, Hungary).
- Humariaceae** Velen. (1934) = Pyronemataceae.
- Humariella** J. Schröt. (1893) ≡ *Scutellinia*.
- Humarina** Seaver (1927) ≡ *Octospora*.
- Humboldtina** Chardón & Toro (1934) = *Leptosphaeria* fide Barr (*SA* 5: 134, 1986).
- Humicola** Traaen (1914), anamorphic *Chaetomiaceae*, Hso.0eP.1. 6, widespread. See Fassatová (*Česká Mykol.* 18: 102, 1964; key), Nicoli & Russo (*Nova Hedwigia* 25: 737, 1974; 8 spp.), de Bertoldi (*CJB* 54: 2755, 1976; 13 spp., physiol. analysis), Rodrigues *et al.* (*Revista de Microbiologia* 21: 232, 1990; cytology), Rodrigues *et al.* (*MR* 95: 169, 1991; cytology, biochemistry), Weinstein *et al.* (*Mycol.* 89: 706, 1997; ecology), Hambleton *et al.* (*Stud. Mycol.* 53: 29, 2005; phylogeny), Singh *et al.* (*Curr. Sci.* 89: 1745, 2005; in mushroom compost).
- Humicolopsis** Cabral & S. Marchand (1976), anamorphic *Pezizomycotina*, Hso.0eH.?. 1, Argentina. See Cabral & Marchand (*Boln Soc. argent. Bot.* 17: 69, 1976).
- Humicolopsis** Verona (1977), anamorphic *Pezizomycotina*, Hso.0eH.10. 1, Italy. See Verona (*G. bot. ital.* 111: 88, 1977).
- humicolous**, living in or on decaying organic matter, soil.
- Humidicutis** (Singer) Singer (1959), Hygrophoraceae. 10, widespread (north temperate). See Moncalvo *et al.* (*Syst. Biol.* 49: 278, 2000; molec.; related to *Pluteaceae*).
- Humphreya** Steyaert (1972), Ganodermataceae. 4, widespread (tropical). See Ryvarden & Johansen (*Prelim. Polyp. Fl. E. Afr.*: 94, 1980; key 4 Afr. spp.), Kotlaba & Pouzar (*Czech Mycol.* 55: 7, 2003; Cuba).
- Husseia** Berk. (1847) = *Calostoma* fide Stalpers (*in litt.*).
- Hyalacrotres** (Korf & L.M. Kohn) Raitv. (1991), Hyaloscyphaceae. 2, Europe. See Azbukina (*Nizshie Rasteniya, Griby i Mokhoobraznye Sovetskogo Dal'nego Vostoka* Griby. Tom 2. Askomitsety. Erizifal'nye, Klavitsipital'nye, Gelotsial'nye: 337, 1991), Raitviir (*Scripta Mycologica Tartu* 20, 2004).
- Hyalasterina** Speg. (1919) nom. dub., Fungi.
- Hyalina**, see *Hyalinia*.
- hyaline**, transparent or nearly so; translucent; frequently used in the sense of colourless.
- Hyalinia** Boud. (1885) [non *Hyalinia* Stackh. 1809, *Algae*] = *Orbilina* fide Baral (*SA* 13: 113, 1994).
- Hyalinocysta** E.I. Hazard & Oldacre (1975), Microsporidia. 2.
- hyalo-** (prefix) (of spores), hyaline or brightly coloured, esp. for groups of Anamorphic fungi (q.v.) (*hyalodidymae*, etc.).
- Hyalobelemnospora** Matsush. (1993), anamorphic *Subbaromyces*, Hso.0eH.19. 1, Peru. See Matsushima (*Matsush. Mycol. Mem.* 7: 54, 1993).
- Hyalobotrys** Pidopl. (1948) = *Stachybotrys* fide Kendrick & Carmichae *in* Ainsworth *et al.* (Eds) (*The Fungi* 4A: 390, 1973).
- Hyalocamposporium** Révay & J. Gönczöl (2007), anamorphic *Pezizomycotina*. 4, widespread. See Révay & Gönczöl (*Fungal Diversity* 25: 197, 2007).
- Hyalocapnias** Bat. & Cif. (1963) = *Scorias* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Hyaloceras** Durieu & Mont. (1849) = *Seiridium* fide Höhnelt (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt. 1* 125: 27, 1916), Sutton (*Mycol. Pap.* 141, 1977).
- Hyalochlorella** Poyton (1970) nom. dub., ? *Algae*. See Alderman (*Veröff. Inst. Meeresf. Bremerhaven Sonderband* 5: 251, 1974).
- Hyalocladium** Mustafa (1977), anamorphic *Pezizomycotina*, Hso.#eH.10. 1, Kuwait. See Mustafa (*TBMS* 67: 537, 1976).
- Hyalococcus** J. Schröt. (1889) ? = *Trichosporon* fide Barnett *et al.* (*Yeasts: Characteristics and Identification* 3rd edn, 2000).

- Hyalocrea** Syd. & P. Syd. (1917), Dothideomycetes. 4, widespread (tropical). See Pirozynski (*Kew Bull.* 31: 595, 1977), Rossman (*Mycol. Pap.* 157: 71 pp., 1987).
- Hyalocurreya** Theiss. & Syd. (1915) = *Uleomyces* fide von Arx (*Persoonia* 2: 421, 1963).
- Hyalocylindrophora** J.L. Crane & Dumont (1978) = *Dischloridium* fide Bhat & Sutton (*TBMS* 84: 723, 1985), Seifert & Gams (*Mycotaxon* 24: 459, 1985).
- Hyalodema** Magnus (1910) = *Coniodictyum* fide Donk (*Reinwardtia* 4: 115, 1956).
- Hyalodendriella** Crous (2007), anamorphic *Helotiales*. 1, Netherlands. See Crous *et al.* (*Stud. Mycol.* 58: 33, 2007).
- Hyalodendron** Diddens (1934) = *Trichosporon* fide Fell & Scorzetti (*Int. J. Syst. Evol. Microbiol.* 54: 995, 2004).
- Hyaloderma** Speg. (1884), *Pezizomycotina*. 1, S. America. See Pirozynski (*Kew Bull.* 31: 595, 1977), Rossman (*Mycol. Pap.* 157: 71 pp., 1987).
- Hyalodermella** Speg. (1918), *Pezizomycotina*. 1, S. America.
- Hyalodictys** Subram. (1962) = *Miuraea* fide Deighton (*Mycol. Pap.* 133, 1973).
- Hyalodictyum** Woron. (1916), anamorphic *Pezizomycotina*, Cac.#eH.1. 1, former USSR. See Mel'nik (*Opredelitel' Gribov Rossii Klass Coelomycetes Byp.* 1. Redkie i Maloizvestnye Rody, 1997).
- Hyalodothis** Pat. & Har. (1893) nom. dub. ? = *Melanodothis* fide Arnold (*Mycol.* 59: 246, 1967).
- Hyaloflorea** Bat. & H. Maia (1955) = *Cylindrocarpon* fide Carmichael *et al.* (*Genera of Hyphomycetes*, 1980).
- Hyalohelicomina** T. Yokoy. (1974), anamorphic *Pezizomycotina*, Hso.0= hH.1. 1, Japan. See Yokoyama (*TMSJ* 15: 159, 1974).
- hyalohyphomycosis**, a mycotic infection of humans or animals caused by a non-dematiaceous fungus. Cf. *phaeohyphomycosis*.
- Hyalomelanconis** Naumov (1954) = *Melanconis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Hyalomeliolina** F. Stevens (1924), *Pseudoperisporiaceae*. 2, C. & S. America. See Sivanesan (*SA* 6: 201, 1987), Hughes (*Mycol. Pap.* 166, 1993).
- Hyalopesotum** H.P. Upadhyay & W.B. Kendr. (1975) = *Pesotum* fide Upadhyay & Kendrick (*Mycol.* 67: 801, 1975), Harrington *et al.* (*Mycol.* 93: 111, 2001).
- Hyalopeziza** Fuckel (1870), *Hyaloscyphaceae*. Anamorph *Phialophora*-like. 20, widespread. See Raschle (*Sydowia* 29: 170, 1977; key, anam.), Korf & Kohn (*Mycotaxon* 10: 503, 1980), Huhtinen (*Karstenia* 29: 45, 1990), Raitviir & Huhtinen (*Mycotaxon* 62: 445, 1997), Baral & Galán (*Beitr. Kenntn. Pilze Mitteleur.* 12: 133, 1999), Raitviir (*Scripta Mycol.* 20, 2004).
- Hyalopleiochaeta** R.F. Castañeda, Guarro & Cano (1996), anamorphic *Pezizomycotina*, Hso.?.?. 1, Cuba. See Castañeda Ruiz *et al.* (*Mycotaxon* 57: 458, 1996).
- Hyalopsora** Magnus (1902), *Pucciniastraceae*. c. 11 (on *Abies* (0, I; where known) (*Pinaceae*); on *Pteridophyta* (II, III)), widespread (esp. north temperate). See Pady (*Ann. Bot.* 49: 71, 1985; cytology, morphology).
- Hyalopus** Corda (1838) ? = *Acremonium* fide Kendrick & Carmichael in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 390, 1973).
- Hyalopycnis** Höhn. (1918), anamorphic *Heterogastridium*. 1, Europe; N. America. See Seeler (*Farlowia* 1: 119, 1943), Scorzetti *et al.* (*FEMS Yeast Res.* 2: 495, 2002; phylogeny).
- Hyalopyrenia** H. Harada (1996), ? *Verrucariaceae* (L). 1, Japan. See Harada (*Lichenologist* 28: 415, 1996).
- Hyaloraphidium** Korshikov (1931), ? *Chytridiomycetes*. 1. See Ustinova *et al.* (*Protist* 151: 253, 2000), Forget *et al.* (*Mol. Biol. Evol.* 19: 310, 2002; mol. biol.).
- Hyalorbilia** Baral & G. Marson (2000), *Orbiliaceae*. Anamorph *Dactylella*. 1, widespread. See Baral & Marson (*Micologia* 2000: 44, 2000), Liu *et al.* (*Nova Hedwigia* 81: 145, 2005; China), Wu *et al.* (*Fungal Diversity* 25: 233, 2007).
- Hyalorhinocladia** H.P. Upadhyay & W.B. Kendr. (1975), anamorphic *Ceratocystiopsis*, *Ophiostoma*, Hso.0eH.10. 1, widespread. See Upadhyay & Kendrick (*Mycol.* 67: 800, 1975), Benade *et al.* (*Mycol.* 87: 298, 1995), Benade *et al.* (*CJB* 74: 891, 1996), Zipfel *et al.* (*Stud. Mycol.* 55: 75, 2006; phylogeny).
- Hyaloria** Möller (1895), *Hyaloriaceae*. 1, Brazil. See Wells (*Mycol.* 61: 77, 1969), Weiss & Oberwinkler (*MR* 105: 403, 2001), Weiss *et al.* (*Frontiers in Basidiomycote Mycology*: 7, 2004).
- Hyaloriaceae** Lindau (1897), *Auriculariales*. 3 gen., 8 spp.
Lit.: Wells (*Mycol.* 61: 77, 1969), Bandoni (*Trans. Mycol. Soc. Japan* 25: 489, 1984), Bononi & Capelari (*Rickia* 11: 109, 1984), Roberts (*Mycotaxon* 69: 209, 1998), Weiss & Oberwinkler (*MR* 105: 403, 2001), Kirschner & Chen (*Stud. Mycol.* 50: 337, 2004).
- Hyaloscolecostroma** Bat. & J. Oliveira (1967), ? *Capnodiaceae*. 1, Brazil. See Batista & Oliveira (*Atas Inst. Micol. Univ. Pernambuco* 5: 448, 1967).
- Hyaloscypha** Boud. (1885) nom. cons., *Hyaloscyphaceae*. Anamorphs *Clathrosphaerina*, *Pseudaegerita*, *Cheiromycella*. 38, widespread. See Svrček (*Česká Mykol.* 39: 205, 1985; spp. descr. by Velenovský), Huhtinen (*Karstenia* 29: 45, 1990; key), Cantrell & Hanlin (*Mycol.* 89: 745, 1997; DNA), Hosoya & Huhtinen (*Mycoscience* 43: 405, 2002; Japan), Raitviir (*Scripta Mycol.* 20, 2004), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006; phylogeny).
- Hyaloscyphaceae** Nannf. (1932), *Helotiales*. 74 gen. (+ 61 syn.), c. 933 spp.
Lit.: Dennis (*Mycol. Pap.* 32, 1949; UK), Korf (*Lloydia* 14: 129, 1951; *Arachnopezizae*), Dennis (*Kew Bull.*: 289, 1954; trop. Am.), Dennis (*Kew Bull.* 13: 32, 1958; Australia), Dennis (*Kew Bull.* 14: 418, 1960; Venezuela), Dennis (*Kew Bull.* 17: 319, 1963; redispos.), Dennis (*Persoonia* 2: 171, 1972; *Lachneae*), Hein (*Nova Hedwigia* 32: 31, 1980; SEM hairs), Korf & Kohn (*Mycotaxon* 10: 503, 1980; spp. glassy hairs), Sharma (*Nova Hedwigia* 43: 381, 1986; 76 spp. India), Baral (*Z. Mykol.* 53: 119, 1987), Huhtinen (*Mycotaxon* 29: 267, 1987; hairs, gen. limits), Raitviir (*Mikol. Fitopatol.* 21: 200, 1987; subfams.), Spooner (*Biblhca Mycol.* 116: 711 pp., 1987; Australasia), Svrček (*Česká Mykol.* 41: 193, 1987; key 50 gen. Eur.), Baral (*Beitr. Kenntn. Pilze Mitteleur.* 5: 209, 1989), Huhtinen (*Karstenia* 29: 45, 1989), Haines (*Nova Hedwigia* 54: 97, 1992), Galán *et al.* (*MR* 98: 1137, 1994), Verkley (*Nova Hedwigia* 63: 215, 1996), Cantrell & Hanlin (*Mycol.* 89: 745, 1997; phylogeny), Hosoya & Otani (*Mycoscience* 38: 187, 1997; Jap. spp.), Zhuang (*Mycotaxon* 69: 359, 1998),

- Leenurm *et al.* (*Sydowia* 52: 30, 2000; ultrastr.), Raitviir (*Scripta Mycol.* 20, 2004), Zhang & Zhuang (*Nova Hedwigia* 78: 475, 2004), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006).
- Hyaloseta** A.W. Ramaley (2001), Niessliaceae. Anamorph *Monocillium*. 1, USA. See Ramaley (*Mycotaxon* 79: 269, 2001).
- Hyalosphaera** F. Stevens (1917), Dothideomycetes. 3, C. & S. America. See Rossman (*Mycol. Pap.* 157, 1987; key).
- Hyalospora** Nieuwl. (1916) $\equiv$ Catharinia.
- Hyalostachybotrys** Sriniv. (1958) = *Stachybotrys* fide Barron (*Mycol.* 56: 313, 1964).
- Hyalosynnema** Matsush. (1975), anamorphic *Pezizomycotina*, Hsy. $\equiv$ eH.10. 1, Japan; Taiwan. See Matsushima (*Icon. microfung. Matsush. lect.*: 85, 1975), Kirschner *et al.* (*Fungal Science Taipei* 16: 47, 2001).
- Hyalotexis** Syd. (1925) = *Hyalosphaera* fide Petrak (*Annls mycol.* 26: 385, 1928).
- Hyalotheles** Speg. (1908), Elsinoaceae. 1, S. America.
- Hyalothyridium** Tassi (1900), anamorphic *Pezizomycotina*, Cpd.#eH.1. 3, widespread. See Latterell & Rossi (*Mycol.* 76: 506, 1984; reinstatement of genus), Nag Raj (*CJB* 67: 3169, 1989).
- Hyalothyris** Clem. (1909) $\equiv$ *Hyalothyridium*.
- Hyalotia** Guba (1961) = *Bartalinia* fide Nag Raj (*CJB* 53: 1615, 1975).
- Hyalotiastrum** Abbas, B. Sutton, Ghaffar & Abbas (2003), anamorphic *Pezizomycotina*. 1, Pakistan. See Abbas *et al.* (*Pakist. J. Bot.* 35: 449, 2003).
- Hyalotiella** Papendorf (1967), anamorphic *Pezizomycotina*, St. $\equiv$ eP.10. 2, widespread (tropical to subtropical; S. Africa). See Papendorf (*TBMS* 50: 69, 1967).
- Hyalotiopsis** Punith. (1970), anamorphic *Ellurema*, St. $\equiv$ eP.19. 1, India. See Punithalingam (*Mycol. Pap.* 119: 12, 1969).
- Hyalotricha** Dennis (1949) = *Hyalopeziza* fide Raschle (*Sydowia* 29: 170, 1977).
- Hyalotrochophora** Finley & E.F. Morris (1967) ? = *Delortia* fide Kendrick & Carmichae in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 390, 1973).
- Hybogaster** Singer (1964), Hybogasteraceae. 1, Chile. See Singer (*Sydowia* 17: 13, 1964).
- Hybogasteraceae** Jülich (1982), Russulales. 1 gen., 1 spp.
Lit.: Singer (*Sydowia* 17: 13, 1964).
- hybrid**, the result of a cross between organisms belong to different taxa which yield viable progeny. It is unclear how common the process is in nature with fungi; as with plants, hybridization can occur at levels from genus down; e.g. *Saccharomycopsis fibuligera* $\times$ *Yarrowia lipolytica* (Nga *et al.*, *J. gen. Microbiol.* 138: 223, 1992), *Cladonia grayi* $\times$ *C. merochlorophaea* (Culberson *et al.*, *Am. J. Bot.* 75: 1135, 1988); a **sexual** -. A **mechanical** - (in lichens) is formed by the growth together of propagules from different genera, species or genotypes to form a single thallus not involving sexual crossing (Hawksworth, in Street (Ed.), *Essays in plant taxonomy*: 211, 1978; see Lichens). The existing rules of nomenclature for hybrids and grafts are available to name both kinds of progeny (Hawksworth, *Internat. Lich. Newsl.* 21: 59, 1988).
- Hydnaceae** Chevall. (1826), Cantharellales. 9 gen. (+ 12 syn.), 190 spp.
Lit.: Coker & Beers (*Stipitate hydnums of the Eastern United States*, 1951), Maas Geesteranus (*Fungus (The stipitate hydnums of the Netherlands, I)* 26, 1956), Maas Geesteranus (*Fungus (The stipitate hydnums of the Netherlands, II)* 26, 1956), Maas Geesteranus (*Fungus (The stipitate hydnums of the Netherlands, III)* 27, 1957), Maas Geesteranus (*Persoonia (The stipitate hydnums of the Netherlands, IV)* 1: 115, 1959), Harrison (*The stipitate hydnums of Nova Scotia [Can. Dep. Agric. Res. Branch Publ. 1099]*, 1961), Nikolaeva (*Fl. Pl. Crypt. URSS* 6 Fungi 2, 1961), Donk (*Persoonia* 3: 199, 1964), Maas Geesteranus (*Hydnaceous fungi of the eastern old world*, 1971), Harrison (*Mycol.* 65: 277, 1973), Maas Geesteranus (*Verh. K. Ned. Akad. Wet., Natur.* 60, 1975; Eur. spp.), Maas Geesteranus (*Die terrestrischen Stachelpilze Europas: the terrestrial hydnums of Europe*, 1975), Grand & van Dyke (*J. Elisha Mitchell scient. Soc.* 92: 114, 1976; SEM spores), Harrison & Grund (*Mycotaxon* 28: 427, 1987), Harrison & Grund (*Mycotaxon* 28: 419, 1987), Wilkinson (*CJB* 65: 150, 1987; as *Sistotremataceae*), Ryvarden (*Syn. Fung.* 5: 363 pp., 1991; as *Sistotremataceae*), Gulden & Hanssen (*Sommerfeltia* 13: 58 pp., 1992), Larsson (*MR* 98: 1153, 1994; as *Sistotremataceae*), Agerer *et al.* (*Nova Hedwigia* 63: 183, 1996), Larsson (*Nordic J. Bot.* 16: 83, 1996; as *Sistotremataceae*), Larsson (*Nordic J. Bot.* 16: 73, 1996; as *Sistotremataceae*), Ginns (*Mycol.* 90: 19, 1998; as *Sistotremataceae*), Pine *et al.* (*Mycol.* 91: 944, 1999), Greslebin (*MR* 105: 1392, 2001; as *Sistotremataceae*), Binder & Hibbett (*Mol. Phylogen. Evol.* 22: 76, 2002), Hibbett & Binder (*Proc. R. Soc. Lond. B. Biol. Sci.* 269: 1963, 2002; as *Sistotremataceae*), Larsson *et al.* (*MR* 108: 983, 2004), Binder *et al.* (*Systematics and Biodiversity* 3: 113, 2005; as *Sistotremataceae*), Küffer & Senn-Irlet (*Mycol. Progr.* 4: 77, 2005; as *Sistotremataceae*).
- Hydnangiaceae** Gäum. & C.W. Dodge (1928), Agaricales. 2 gen. 76 spp.
Lit.: Bougher *et al.* (*MR* 97: 613, 1993; generic delimitation), Kropp & Mueller (*Laccaria – Ectomycorrhizal fungi, key genera in profile*, 1999; generic classification), Hibbett *et al.* (*Nature* 407: 506, 2000), Moncalvo *et al.* (*Syst. Biol.* 49: 278, 2000).
- Hydnangium** Wallr. (1839) = *Laccaria* fide Kuyper (*in litt.*); originally treated as a sequestrate genus.
- Hydnellum** P. Karst. (1879), Bankeraceae. 38, widespread. See Coker & Beers (*The Stipitate Hydnums of the Eastern United States*: 56, 1951), Maas Geesteranus (*Persoonia* 2: 388, 1962), Stalpers (*Stud. Mycol.* 35: 168 pp., 1993; key), Dickson (*Field Mycology* 1: 99, 2000; key British spp.), Arnolds (*Coolia* 46 3, Suppl.: 96 pp., 2003; Netherlands and Belgium), Parfitt *et al.* (*MR* 111: 761, 2007; molec. phylog. British spp.).
- Hydnellum** P. Karst. (1896) nom. dub., Basidiomycota. See Stalpers (*in litt.*).
- Hydnites** Mesch. (1892), Fossil Fungi. 2 (Tertiary), Europe.
- Hydnobolites** Tul. & C. Tul. (1843), Pezizaceae. 3 (hypogeous), N. America; Europe. See Kimbrough *et al.* (*Bot. Gaz.* 152: 408, 1991; posn), Hansen *et al.* (*Mycol.* 93: 958, 2001; phylogeny), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Hydnocaryon** Wallr. (1833) = *Genea* fide Trappe (*TBMS* 65: 496, 1975), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).

- Hydnochaete** Bres. (1896), Hymenochaetaceae. 8, widespread (esp. tropical). See Ryvarden (*Mycotaxon* 15: 425, 1982), Parmasto (*Mycotaxon* 91: 137, 2005).
- Hydnochaete** Peck (1897) $\equiv$ Hydnochaetella.
- Hydnochaetella** Sacc. (1898) $\equiv$ Asterodon fide Donk (*Taxon* 5: 96, 1956).
- Hydnocristella** R.H. Petersen (1971), Lentariaceae. 1, N. America. See Petersen (*Česká Mykol.* 25: 130, 1971).
- Hydnocystis** Tul. (1844), Pyronemataceae. 2 (hypogeous), Europe; Japan. See Burdsall (*Mycol.* 60: 503, 1968), van Brummelen in Hawksworth (Ed.) (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. 269 269: 398, 1994; posn), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Hydnodon** Banker (1913) = Trechispora fide Ryvarden (*Syn. Fung.* 15: 31, 2002).
- Hydnodontaceae** Jülich (1982), Trechisporales. 15 gen. (+ 7 syn.), 105 spp.
Lit.: Larsson (*MR* 111: 1040, 2007; phylogeny).
- Hydnofomes** Henn. (1900) = Echinodontium fide Banker (*Mycol.* 5: 293, 1914).
- Hydnogloea** Curr. (1871) = Pseudohydnum P. Karst. fide Donk (*Persoonia* 4: 173, 1966).
- hydroid**, of a form resembling *Hydnum*; specifically, with a teeth-like hymenium.
- Hydnomerulius** Jarosch & Besl (2001), Paxillaceae. 1. Perhaps *Boletaceae*. See Jarosch & Besl (*Pl. Biol.* 3: 447, 2001).
- Hydnophlebia** Parmasto (1967), Meruliaceae. 1, N. America. See Parmasto (*Consp. Syst. Cort.*: 384, 1967).
- Hydnophysa** Clem. (1909) $\equiv$ Hydnofomes.
- Hydnoplicata** Gilkey (1955), Pezizaceae. 1 (hypogeous), Australia. See Trappe (*Mycotaxon* 2: 109, 1975), Trappe & Claridge (*Australas. Mycol.* 25: 33, 2006).
- Hydnopolyporus** D.A. Reid (1962), Meripilaceae. 3, widespread. See Fildago (*Mycol.* 55: 713, 1963).
- Hydnoporia** Murrill (1907) = Hydnochaete Bres. fide Banker (*Mycol.* 5: 293, 1914).
- Hydnopsis** (J. Schröt.) Rea (1909) = Tomentella Pat. fide Donk (*Taxon* 5: 69, 1956).
- Hydnopsis** Tul. & C. Tul. (1865) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Hydnospongus** Wallr. (1839) = Gautieria fide Stalpers (*in litt.*).
- Hydnotrema** Link (1833) $\equiv$ Sistotrema Fr.
- Hydnotrya** Berk. & Broome (1846), Discinaceae. c. 15 (hypogeous), widespread. See Gilkey (*N. Amer. Fl.* 2, 1954; key), Zhang (*Mycotaxon* 42: 155, 1991), Pegler *et al.* (*British truffles*, 1993; key 4 Br. spp.), Abbott & Currah (*Mycotaxon* 62: 1, 1997; N. Am.), O'Donnell *et al.* (*Mycol.* 89: 48, 1997; phylogeny), Harrington *et al.* (*Mycol.* 91: 41, 1999; phylogeny), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Tedersoo *et al.* (*New Phytol.* 170: 581, 2006; ectomycorrhiza), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Hydnotryaceae** M. Lange (1956) = Discinaceae.
- Hydnotryopsis** Gilkey (1916), Pezizaceae. 2 (hypogeous), N. America. See Gilkey (*N. Amer. Fl.* 2, 1954; key, as *Choiromyces*), Trappe (*Mycotaxon* 2: 115, 1975), Hansen *et al.* (*Mol. Phylogen. Evol.* 36: 1, 2005; phylogeny), Tedersoo *et al.* (*New Phytol.* 170: 581, 2006; ectomycorrhiza), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Hydnum** L. (1753) nom. cons., Hydnumaceae. 120, widespread. Some spp. are a cause of heartwood-rot in living trees. See Petersen (*Taxon* 26: 144, 1977; typification).
- Hydrabasidium** Park.-Rhodes ex J. Erikss. & Ryvarden (1978) = Scotomyces fide Jülich (*Persoonia* 10: 334, 1979).
- Hydraeomyces** Thaxt. (1896), Laboulbeniaceae. 1, widespread. See Siemaszko & Siemaszko (*Polish Pismo Entom.* 12: 125, 1933), Tavares (*Mycol. Mem.* 9: 627 pp., 1985), Santamaría (*Fl. Mycol. Iberica* 5, 2003).
- Hydrocina** Scheuer (1991), Helotiales. Anamorph *Tricladium*. 1 (aquatic), British Isles. See Webster *et al.* (*Nova Hedwigia* 52: 65, 1991), Wang *et al.* (*Am. J. Bot.* 92: 1565, 2005; phylogeny), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Hydrocybe** (Fr. ex Rabenh.) Wünsche (1877) = Cortinarius fide Kauffman (*N. Amer. Fl.* 10, 1932).
- Hydrocybium** Earle (1909) = Cortinarius fide Kauffman (*N. Amer. Fl.* 10, 1932).
- hydrofungi**, aquatic fungi (Cooke, 1963).
- Hydrogen-ion concentration (pH)**. Like other organisms, fungi are sensitive to the pH of their environment, and there is a large literature on this topic, exemplified by the following: in plants, fungal cell wall-degrading enzymes are influenced by pH (Akimitsu *et al.*, *Physiological and molecular plant pathology* 65: 271, 2004); pathogenicity of some conifer needle endophytes has been related to their ability to change host pH, and host resistance to innate needle buffer capacity (Scholz & Stephan, *Eur. J. Forest Pathol.* 4: 118, 1974); soil pH can determine populations of keratinophilic fungi (Böhme & Ziegler, *Mycopathologia* 38: 247, 1969); gene expression can be pH regulated in *Aspergillus nidulans* (Denison, *Fungal genetics and biology* 29: 61, 2000; general review of pH regulation of gene expression in fungi); ambient pH affects gene expression in *Metarrhizium anisopliae* but can itself be altered by the fungus (St Leger *et al.*, *Microbiology* 145: 2691, 1999). In maintaining pure cultures of fungi, the medium pH is also important. Most fungi grow best at approximately pH 7 but tolerate a wide range from pH 3-10 (or even 11). This property is made use of for freeing fungal cultures from bacteria or inhibiting bacterial growth when making isolates from soil by using an acid medium (pH 4). See Webb (*Ann. Mo. bot. Gdn* 6: 201, 1919), MacInnes (*Phytopath.* 12: 290, 1922), acidiphilous, alkaphilic.
- Hydrogera** F.H. Wigg. ex Kuntze (1891) $\equiv$ Pilobolus.
- Hydrometrospora** J. Gönczöl & Révay (1985), anamorphic *Pezizomycotina*, Hso.1bH.1. 1 (aquatic), Hungary. See Gönczöl & Révay (*Nova Hedwigia* 40: 199, 1984).
- Hydromycus** Raf. (1808) = Dacrymyces fide Merrill (*Index Rafinesq.*: 69, 1949).
- Hydromyxa**les. An order of 'Myxomycetes' fide Jahn (*Nat. PflFam.* Aufl. 2, 2, 1928) but excluded from this *Dictionary* as protozoans not now studied by 'mycologists'. Cf. monads.
- Hydronectria** Kirschst. (1925), ? Nitschkiaceae (L.). 1 (algicolous), Europe. Marine species are now placed in *Kallichroma*. See Kohlmeyer & Volkmann-Kohlmeyer (*MR* 97: 753, 1993), Harris in Rossman *et al.* (Eds) (*Stud. Mycol.* 42, 1999).
- Hydronectriaceae** Riedl (1987) = Nitschkiaceae.

- Hydrophilomyces** Thaxt. (1908), Laboulbeniaceae. 12, widespread. See Santamaria (*Nova Hedwigia* 82: 349, 2006; Spain).
- Hydphora** Tode (1791) nom. rej. prop. = *Mucor* Fresen. fide Hesseltine (*Mycol.* 47: 344, 1955).
- Hydphorus** Battarra ex Earle (1909) = *Hygrocybe* fide Kuyper (*in litt.*).
- Hydropisphaera** Dumort. (1822) nom. rej., Bionectriaceae. Anamorph *Acremonium*-like. 18 (on dead plant material and old fungi), widespread (esp. tropical). See Gamundí (*Darwiniana* 18: 548, 1974), Samuels (*N.Z. J. Bot.* 14: 231, 1976), Rossman *et al.* (*Mycol.* 85: 685, 1993), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Rossman *et al.* (*Mycol.* 93: 100, 2001; phylogeny), Samuels *et al.* (*CBS Diversity Ser.* 4, 2006; USA), Zhang & Zhuang (*Mycosystema* 25: 15, 2006; phylogeny), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Hydropus** Kühner ex Singer (1948), Marasmiaceae. c. 100, widespread (esp. tropical). See Singer (*Fl. Neotrop.* 32, 1982; key), Robich (*Rivista di Micologia* 35: 155, 1992), Hausknecht *et al.* (*Öst. Z. Pilzk.* 6: 181, 1997; Austrian spp.), Pegler & Legon (*Mycologist* 15: 60, 2001), Moreau & Courtecuisse (*Mycotaxon* 89: 331, 2004; *Hydropus kauffmanii* from Europe).
- Hydrotelamonina** Rob. Henry (1957) nom. inval. = *Cortinarius* fide Kuyper (*in litt.*) used as a genus but only validly published at subgenus rank.
- Hydrothyria** J.L. Russell (1856) = *Peltigera* fide Feige *et al.* (*Herzogia* 8: 69, 1989), Miadlikowska & Lutzoni (*Int. J. Pl. Sci.* 161: 925, 2000; phylogeny, morphology, chemistry).
- hydrotropism**, see tropism.
- Hygramaricium** Locq. (1979) = *Cortinarius* fide Kuyper (*in litt.*).
- Hygroaster** Singer (1955), Tricholomataceae. 2, America (tropical). See Singer (*Sydowia* 9: 370, 1955), Ludwig (*Z. Mykol.* 63: 155, 1997), Lechner *et al.* (*Mycotaxon* 91: 9, 2005; Argentina).
- Hygrochroma** DC. [not traced] ? nom. dub. = *Phloeospora* fide Mussat (*Syll. fung.* 15: 170, 1901).
- Hygrocrocis** C. Agardh (1824) = *Typhoderma*.
- Hygrocybe** (Fr.) P. Kumm. (1871), Hygrophoraceae. c. 150, widespread. See Orton (*TBMS* 43: 248, 1960; key), Hesler & Smith (*North American species of Hygrophorus*, 1963; key), Heinemann (*Fl. Icon. Champ. Congo* 15: 280, 1966; keys 13 spp. Congo), Singer (*Agaric. mod. Tax.* edn 3, 1975), Bon (*Docums Mycol.* 7 no. 25: 1, 1976; keys), Boertmann (*The genus Hygrocybe. Fungi of Northern Europe* 1, 1995; N. Europ. spp., key), Boertmann (*Biblthca Mycol.* 192: 168 pp., 2002; monogr.).
- Hygromitra** Nees (1816) = *Leotia* fide Fries (*Syst. mycol.* 1: 1, 1821).
- Hygromyxacium** Locq. (1979) = *Cortinarius* fide Kuyper (*in litt.*).
- hygrophanous**, having a water-soaked appearance when wet.
- hygrophilous**, preferring a moist habitat.
- Hygrophoraceae** Lotsy (1907), Agaricales. 9 gen. (+ 14 syn.), 325 spp. Possibly polyphyletic but recent data are consistent with the monophyly of the taxon; not yet listed as nom. rej. against *Tricholomataceae*.
Lit.: Hesler & Smith (*North American species of Hygrophorus*, 1963; key), Chandrasrikul *et al.* (*Thai J. Agric. Sci.* 18: 287, 1985), Arnolds (*Persoonia* 14: 43, 1989), Boertmann (*Nordic J. Bot.* 10: 311, 1990), Horak (*N.Z. J. Bot.* 28: 255, 1990), Boertmann (*Fungi of Northern Europe* 1: 184 pp., 1995), Bougher & Young (*Mycotaxon* 63: 25, 1997), Young (*Australas. Mycol.* 18: 63, 1999), Hibbett (*Nature* 407: 506, 2000), Moncalvo *et al.* (*Syst. Biol.* 49: 278, 2000; phylogeny), Beisenherz (*Regensb. Mykol. Schr.* 10: 3, 2002), Boertmann (*Biblthca Mycol.* 192: 168 pp., 2002), Moncalvo *et al.* (*Mol. Phylogen. Evol.* 23: 357, 2002), Young & Mills (*Muelleria* 16: 3, 2002), Young & Mills (*Muelleria* 16: 3, 2002; Tasmania), Young (*Australas. Mycol.* 21: 114, 2002), Cantrell & Lodge (*MR* 108: 1301, 2004), Larsson & Jacobsson (*MR* 108: 781, 2004), Young (*Fungi of Australia: Hygrophoraceae*: 188 pp., 2005), Matheny *et al.* (*Mycol.* 98: 982, 2006; phylogeny).
- Hygrophoropsidaceae** Kühner (1980), Boletales. 2 gen., 18 spp.
Lit.: Šutara (*Česká Mykol.* 46: 50, 1992), Binder *et al.* (*Z. Mykol.* 63: 189, 1997), Bresinsky *et al.* (*Pl. Biol.* 1: 327, 1999), Watling (*MR* 105: 1440, 2001), Tuthill & Frisvad (*Mycol.* 94: 240, 2002).
- Hygrophoropsis** (J. Schröt.) Maire ex Martin-Sans (1929), Hygrophoropsidaceae. 5, widespread (esp. temperate). See Singer *et al.* (*Beih. Nova Hedwigia* 98: 6, 1990; key C. Am. spp.).
- Hygrophorus** Fr. (1836), Hygrophoraceae. c. 100 (usually mycorrhizal), widespread (esp. north temperate). See Heinemann (*Bull. Jard. Bot. État* 33: 421, 1963; keys Centr. Afr. spp.), Hesler & Smith (*North American species of Hygrophorus*, 1963; keys), Bon (*Docums Mycol.* 7 no. 27-28: 1, 1977; keys), Bird & Grund (*Proc. Nova Scotia Int. Sci.* 29: 1, 1979; keys 53 Can. spp.), Boertmann (*Biblthca Mycol.* 192: 168 pp., 2002; monogr.).
- Hygrophyllum**, see *Hypophyllum* Paulet.
- hygroscopic** (1) becoming soft in wet air, hard in dry; (2) (of a sporocarp), opening and discharging spores in dry air.
- Hygrotrama** Singer (1959) = *Camarophylloopsis* fide Kuyper (*in litt.*).
- Hylophila** Quél. (1886) [non *Hylophila* Lindl. 1833, *Orchidaceae*] = *Hebeloma*.
- Hylostoma** Pers. (1822), Pezizales. 1, Europe.
- Hymenagaricus** Heinem. (1981), Agaricaceae. 10, widespread (esp. tropical). See Heinemann & Sister Little Flower (*Bull. Jard. bot. nat. Belg.* 54: 151, 1984), Reid & Eicker (*South African Journal of Botany* 64: 356, 1998; key South African spp.).
- Hymenangiaceae** Corda (1842) = *Cortinariaceae*.
- Hymenangium** Klotzsch (1839) = *Descomyces*. *Descomyces* is not yet conserved against *Hymenangium*. fide Kuyper (*in litt.*).
- Hymenelia** Kremp. (1852), Hymeneliaceae (L.). 26, widespread (north temperate). See Lutzoni & Brodo (*Syst. Bot.* 20: 224, 1995), Lumbsch (*Bryologist* 100: 180, 1997), Wedin *et al.* (*MR* 109: 159, 2005; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Hymeneliaceae** Körb. (1855), Ostropomycetidae (inc. sed.) (L.). 5 gen. (+ 4 syn.), 37 spp. *Aspicilia* is now excluded and referred to the *Megasporaceae*.
Lit.: Janex-Favre (*Cryptog. Bryol.-Lichénol.* 6: 25, 1985; ontogeny), Lutzoni & Brodo (*Syst. Bot.* 20: 224, 1995), Lumbsch (*Bryologist* 100: 180, 1997), Buschbom & Mueller (*Mol. Phylogen. Evol.* 32: 66, 2004), Reeb *et al.* (*Mol. Phylogen. Evol.* 32: 1036, 2004), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Schmitt *et al.* (*J. Hattori bot. Lab.* 100:

- 753, 2006), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny).
- Hymenella** Fr. (1822), anamorphic *Pezizomycotina*, Cpd.0eH.?. 20, widespread. See Tulloch (*Mycol. Pap.* 130, 1972; typification).
- hymenial algae** (or gonidia), algal cells in the hymenium of a lichenized ascomycete, e.g. *Endocarpon*, *Staurothele*, *Thelendia*; - **cystidium**, see cystidium; - **veil**, see annulus.
- hymeniderm** (of basidiomata), an outer layer composed of an unstratified layer of single cells or hyphal tips; see *derm*.
- Hymeniopeltis** Bat. (1959), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, Brazil. See Batista (*An. Soc. Biol. Pernambuco* 16: 147, 1959), Farr (*Mycol.* 78: 269, 1986).
- hymenium**, the spore-bearing layer of a fruit-body; (of basidiomycetes) **euhymenium** (Donk, *Persoonia* 3: 210, 1964), a hymenium in which the basidia and their sterile homologues are the first elements to be formed, as a palisade; in a **static** (non-thickening) **euhymenium** the exhausted basidia are replaced at the same level by intercalation; in a **thickening euhymenium** the tramal hyphae grow between the exhausted basidia to form a new hymenium above the old, as in the Cantharellaceae; **catahymenium** (Lemke, *CJB* 42: 218, 1964), a hymenium in which hyphidia are the first-formed elements and the basidia embedded at various levels elongate to reach the surface and do not form a palisade. Cf. thecium, apothecium.
- Hymenoascomycetes**. A class proposed by Kimbrough (in Wheeler & Blackwell (Eds), *Fungus-insect relationships*: 184, 1984) for operculate and inoperculate discomycetes and pyrenomycetes; see *Ascohymeniales*.
- Hymenobactron** (Sacc.) Höhn. (1916), anamorphic *Pezizomycotina*, Hsp.0eH.?. 1 or 2, Europe.
- Hymenobia** Nyl. (1854), *Pezizomycotina*. 1 (on lichens), Europe. See Triebel (*Bibliotheca Lichenol.* 35, 1989; sub *Hymenobiella*).
- Hymenobiella** Triebel (1989) $\equiv$ *Hymenobia* fide Eriksson & Hawksworth (*SA* 9: 13, 1990).
- Hymenobolus** Durieu & Mont. (1845), Helotiales. 1 (on *Agave*), N. Africa. See Rieuf (*Al Awamia* 4: 127, 1962).
- Hymenochaetaceae** Imazeki & Toki (1954), Hymenochaetales. 27 gen. (+ 47 syn.), 487 spp.
Lit.: Donk (*Persoonia* 3: 199, 1964), Fiasson & Niemelä (*Karstenia* 24: 14, 1984; emend.), Dai *et al.* (*Mycotaxon* 65: 273, 1997), Müller *et al.* (*MR* 104: 1485, 2000), Parmasto (*Mycotaxon* 79: 107, 2001), Wagner (*Mycotaxon* 79: 235, 2001), Wagner & Fischer (*MR* 105: 773, 2001), Germain *et al.* (*Can. J. Pl. Path.* 24: 194, 2002), Góes-Neto *et al.* (*Mycotaxon* 84: 337, 2002), Gottlieb *et al.* (*Mycol. Progr.* 1: 299, 2002), Kauserud & Schumacher (*CJB* 80: 597, 2002), Wagner & Fischer (*Mycol. Progr.* 1: 100, 2002), Wagner & Ryvarden (*Mycol. Progr.* 1: 105, 2002), Nam *et al.* (*Mycobiology* 31: 133, 2003), Fischer & Binder (*Mycol.* 96: 799, 2004), Gatica *et al.* (*Phytopath. Mediterr.* 43: 59, 2004), Binder *et al.* (*Systematics and Biodiversity* 3: 113, 2005), Küffer & Senn-Irlet (*Mycol. Progr.* 4: 77, 2005), Parmasto (*Mycotaxon* 91: 137, 2005).
- Hymenochaetales** Oberw. (1977). Agaricomycetes. 2 fam., 48 gen., 610 spp. Fams:
- (1) **Hymenochaetaceae**
- (2) **Schizoporaceae**
 For *Lit.* see under fam.
- Hymenochaete** Lév. (1846) nom. cons., Hymenochaetaceae. 110, widespread (esp. tropical). *H. agglutinans* (canker of young hardwoods). See Job (*Mycol. helv.* 5: 1, 1990; temp. S. Hemisph. spp.), Léger (*Bibliotheca Mycol.* 171: 1, 19XX; world monograph).
- Hymenochaetella** P. Karst. (1889) = *Hymenochaete* fide Donk (*Persoonia* 3: 199, 1964).
- Hymenoconidium** Zukal (1888) ? = *Marasmius* fide Donk (*Beih. Nova Hedwigia* 5, 1962).
- Hymenodecton** Leight. (1854) nom. rej. prop. = *Phaeoglyphis* fide Lücking *et al.* (*Taxon* 56: 1296, 2007; nomencl.).
- Hymenogaster** Vittad. (1831), Strophariaceae. c. 100, widespread (temperate). See Smith (*Mycol.* 58: 100, 1966; keys N. Am.), Bougher & Castellano (*Mycol.* 85: 273, 1993), Peintner *et al.* (*Am. J. Bot.* 88: 2168, 2001), Binder & Bresinsky (*Mycol.* 7: 85, 2002; phylogeny).
- Hymenogasteraceae**, see *Hymenogastraceae*.
- Hymenogastraceae** Vittad. (1831) = Strophariaceae.
- Hymenogastrales** = Agaricales. See also *Lit.* under *Gasteromycetes*.
- Hymenogloea** Pat. (1900), Marasmiaceae. 1, America (tropical).
- Hymenogrammaceae** Jülich (1982) = Grammotheleaceae.
- Hymenogramme** Mont. & Berk. (1844), Polyporaceae. 1, S.E. Asia. See Ryvarden (*TBMS* 73: 9, 1979).
- Hymenomarasmius** Overeem (1927) ? = *Marasmius* fide Kuyper (*in litt.*).
- Hymenomycetes** Fr. (1821), see *Basidiomycota*.
- Hymenophallus** Nees (1816) = *Phallus* fide Stalpers (*in litt.*).
- hymenophore**, a spore-bearing structure, esp. a basidioma, or that part of it bearing the hymenium. Cf. sporophore., incl.
- Hymenoplella** Munk (1953) = *Lepteutypa* fide Shoemaker & Müller (*CJB* 43: 1457, 1965), Müller & von Arx in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 87, 1973).
- Hymenopodium** Corda (1837) = *Clasterosporium* fide Hughes (*TBMS* 34: 577, 1951).
- hymenopodium** (**hymenopode**), tissue under the hymenium; subhymenium or hypothecium.
- Hymenopsis** Sacc. (1886), anamorphic *Pezizomycotina*, Ccu.0eP.15/19. 13, widespread. See Sutton (*The Coelomycetes*, 1980), Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993), Kohlmeyer & Volkmann-Kohlmeyer (*MR* 105: 500, 2001).
- Hymenoscypha** (Fr.) W. Phillips (1887) $\equiv$ *Hymenoscyphus*.
- Hymenoscyphaceae** Bellem. (1978) = Helotiaceae.
- Hymenoscyphus** Gray (1821), Helotiaceae. Anamorphs *Idriella*, *Geniculospora*, *Dimorphospora*, *Helicodendron*, *Tricladium*, *Articulospora*, *Scytalidium*-like. c. 155, widespread. See Dennis (*Persoonia* 3: 29, 1964), Kimbrough & Atkinson (*Am. J. Bot.* 59: 165, 1972), Thind & Sharma (*Nova Hedwigia* 32: 121, 1980; Indian spp.), Dumont (*Mycotaxon* 12: 313, 1981; neotrop. spp.), Dumont (*Mycotaxon* 13, 1981; temp. spp.), Descals *et al.* (*TBMS* 83: 541, 1984), Lizoň (*Mycotaxon* 45: 1, 1992), Verkley (*Persoonia* 15: 303, 1993; asci), Baral (*SA* 13: 113, 1994; gen. concept), Hengstmengel (*Persoonia* 16:

191, 1996), Chambers *et al.* (*MR* 103: 286, 1999; sp. on liverworts), McLean *et al.* (*New Phytol.* 144: 351, 1999; DNA, ericoid mycorrhizas), Monreal *et al.* (*CJB* 77: 1580, 1999; DNA, ericoid mycorrhizas), Gernandt *et al.* (*Mycol.* 93: 915, 2001; phylogeny), Zhang & Zhuang (*Mycosystema* 21: 493, 2002; China), Sivichai *et al.* (*Mycol.* 95: 340, 2003; Thailand), Athipunyakom *et al.* (*Kasetsart Journal Natural Sciences* 38: 216, 2004; Spain), Baral *et al.* (*Sydowia* 58: 145, 2006; phylogeny, Spain), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006; phylogeny).

Hymenostilbe Petch (1931), anamorphic *Ophiocordyceps*, Hsy.0eH.?. 15, widespread. See Samson & Evans (*Proc. K. ned. Akad. Wet. Ser. C, Biol. Med. Sci.* 78: 73, 1975; key), Hywel-Jones (*MR* 99: 154, 1995; Thailand), Hywel-Jones (*MR* 99: 1201, 1995; on cockroaches), Guzmán *et al.* (*Mycotaxon* 78: 115, 2001; Mexico), Stensrud *et al.* (*MR* 109: 41, 2005; phylogeny), Sung *et al.* (*Stud. Mycol.* 57, 2007; review, phylogeny).

Hymenula Fr. (1825) ≡ *Hymenella*.

Hypasteridium Speg. (1923) nom. dub., ? Meliolaceae. See Eriksson & Hawksworth (*SA* 7: 74, 1988).

hyper- (prefix), above.

Hyperdermium J.F. White, R. Sullivan, Bills & Hywel-Jones (2000), Cordycipitaceae. 2, C. & S. America. See White *et al.* (*Mycol.* 92: 908, 2000), Sung *et al.* (*Stud. Mycol.* 57, 2007; review, phylogeny), Chaverri *et al.* (*Stud. Mycol.* 60, 2008; phylogeny, neotropics).

hyperepiphyllous, growing on epiphyllous or foliicolous lichens or bryophytes, esp. in tropical rain forests.

Hyperomyxa Corda (1839) = *Cheirospora* fide Hughes (*CJB* 36: 727, 1958).

hyperparasite, a parasite growing on another parasite (obsol.); Fungicolous fungi (q.v.) is a preferable general term where parasitism has not been established.

Hyperphyscia Müll. Arg. (1894), Physciaceae (L). 1 or 9, widespread (esp. tropical). See Hafellner *et al.* (*Herzogia* 5: 39, 1979), Kashiwadani (*Bull. natn. Sci. Mus. Tokyo, B* 11: 91, 1985), Moberg (*Nordic J Bot.* 7: 719, 1987; key 7 spp., E. Afr.), Scutari (*Mycotaxon* 61: 87, 1997), Lohtander *et al.* (*Mycol.* 92: 728, 2000; phylogeny), Nordin & Mattsson (*Lichenologist* 33: 3, 2001; phylogeny), Scheidegger *et al.* (*Lichenologist* 33: 25, 2001; evolution), Helms *et al.* (*Mycol.* 95: 1078, 2003; phylogeny), Cubero *et al.* (*MR* 108: 498, 2004; phylogeny).

hyperplasia, over-development of some sort (e.g. swellings, galls, witches' brooms) as a reaction to a disease-producing agent; cf. hypoplasia.

Hyperrhiza Spreng. (1827) ≡ *Uperhiza*.

hypersaprophyte, a saprophyte only found on substrates invaded by other saprophytes, e.g. *Herpotrichiellaceae*, *Lasiosphaeria*, *Nectria sanguinea*, etc. (Munk, *Sydowia, Beih.* 1, 1957).

hypersensitivity, increased sensitivity, as in the condition in which there is death of the host tissue at the point of attack by a pathogen, so that the infection does not spread; esp. of reaction to rusts for which the word was first used by Stakman; intolerance; (and see Allergy, Medical fungi).

hypertonic (of culture media), having an osmotic pressure higher than that of the organism cultured; cf. hypotonic.

hypertrophy (of organs, etc.), the state of having growth greater than normal.

hypertrophyte, a parasitic fungus causing hyperplasia in a plant (Wakker).

Hypha Pers. (1822) nom. dub., anamorphic *Fungi*. See Donk (*Taxon* 11: 86, 1962).

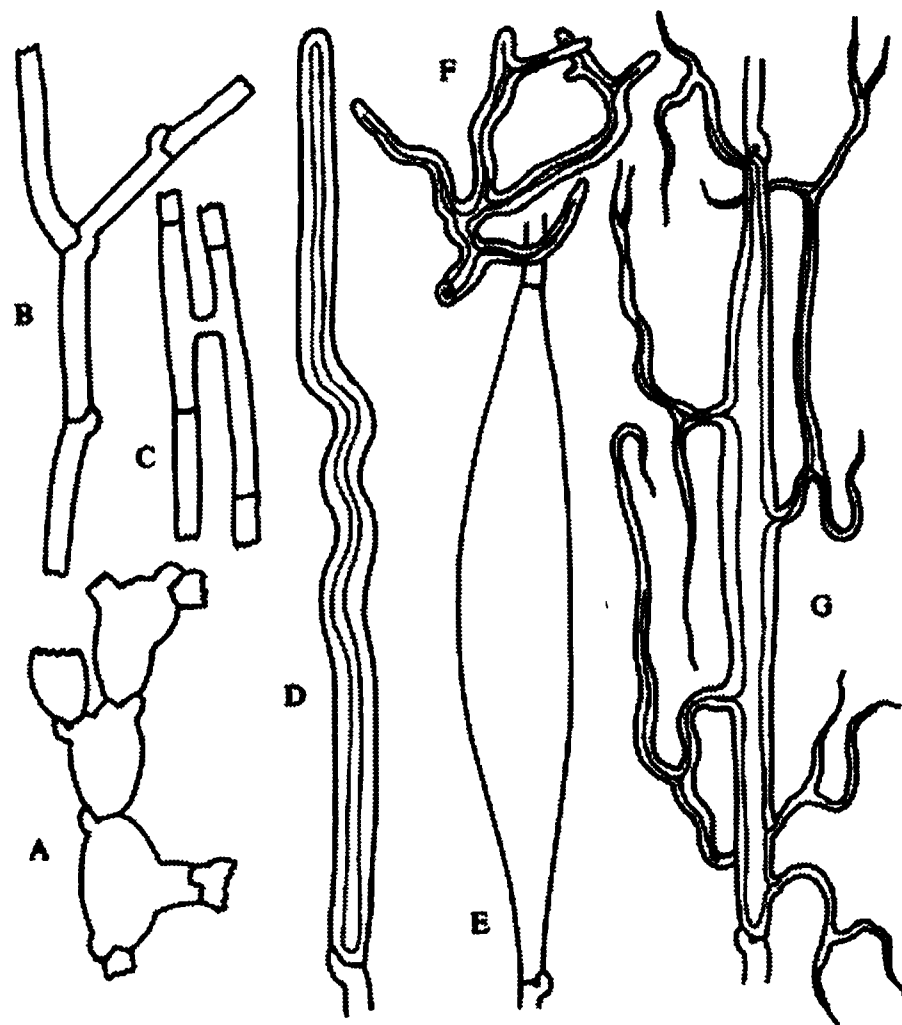


Fig. 16. Hyphal types. A, inflated generative hyphae; B, non-inflated generative hyphae with clamp connexions; C, generative hyphae without clamp connexions; D, unbranched skeletal hypha; E, sarco-hypha; F, highly branched ligative (binding) hypha; G, skeleto-ligative hypha. Not to scale

hypha (pl. **hyphae**), one of the filaments of a mycelium; Vuillemin restricted the term to septate filaments; cf. siphon; **ampoule** -, a swollen hypha as in certain basidiomycetes; **arboriform** -, much branched skeletal - of *Ganoderma*; **ascogenous** -, a dikaryotic hypha from which an ascus develops; **binding** -, see Hyphal analysis; **costiferous** -, transverse ribs (costae) on the inner surface of the hyphal wall of the gill trama in *Paxillus involutus* and *P. filamentosus*, non-amyloid, stained by Congo red and calcofluor but not toluidine blue; **endo-** (intrahyphal -), vegetative or fertile element initiated by the differentiation within a - from the innermost wall layer (Cole & Samson, 1979); **inflated** -, one in which cells behind the growing apex enlarge and cause the apparent rapid rate of growth characteristic of most agaric and gasteromycete basidiocarps; in an **uninflated** - no change of cell size occurs as in most polypores; **mediate** - and **mycelial** -, see Corner (*TBMS* 17: 54, 1932); **oleiferous** -, do not carry latex (cf. lactifer) but frequently resinous substances (Singer, 1960: 34); **oiliferous** -, a submerged hypha of an endolithic lichen having torulose, guttulate cells; see des Abbayes (*Traité de Lichenologie*, 1951); **racquet** -, one of racket cells (q.v.); **skeletal** -, see Hyphal analysis; **stuffing** -, see Corner (*TBMS* 17: 54, 1932). See flexuous hypha, hyphal analysis, hyphal peg, textura, Woronin's hypha.

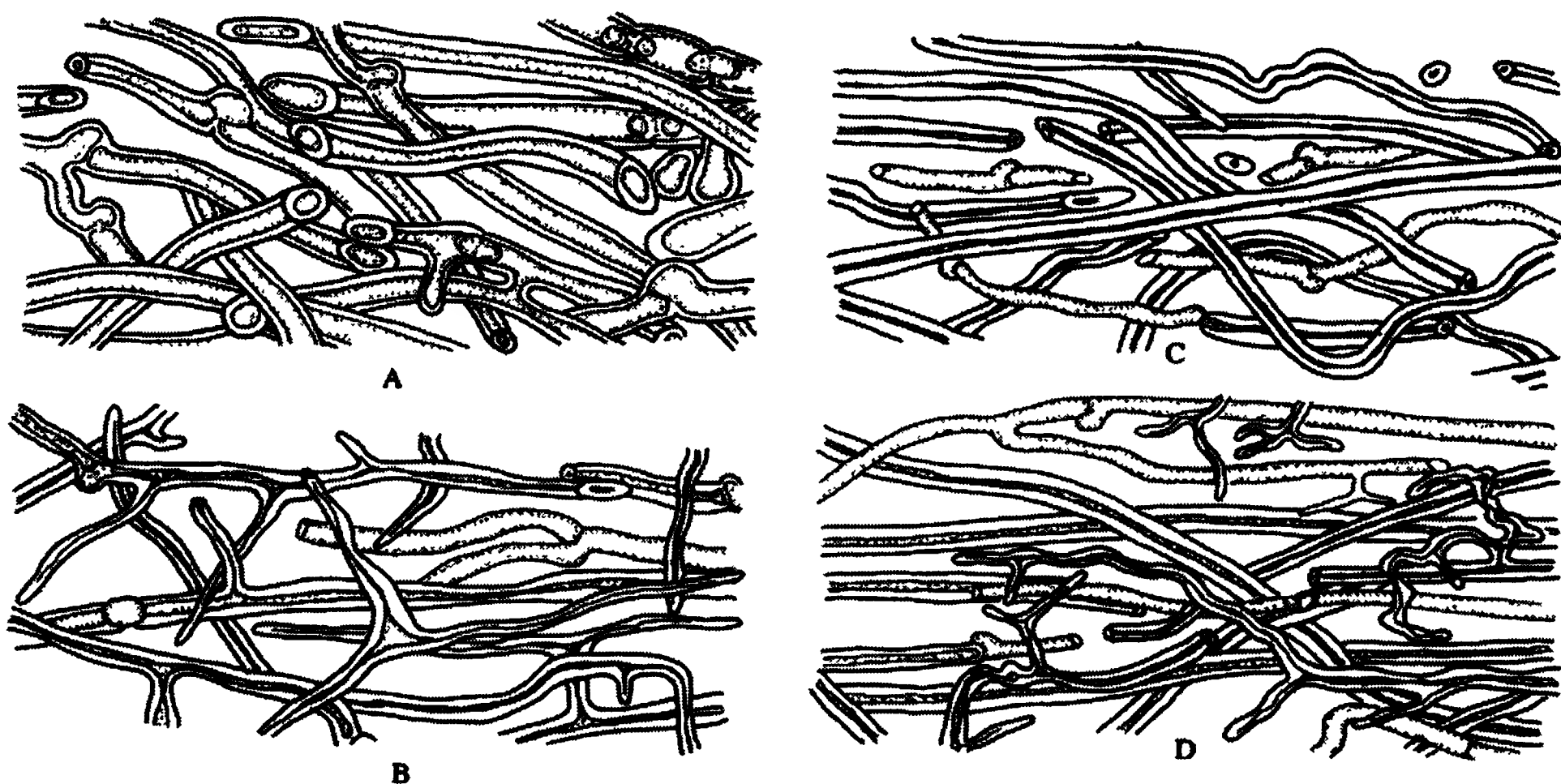


Fig. 17. Hyphal systems. See Pegler (*Bull. BMS* 7(suppl.), 1973). A, monomitic hyphal system, with thick-walled generative hyphae; B, dimitic hyphal system, with generative and ligative (binding) hyphae; C, dimitic hyphal system, with generative and skeletal hyphae; D, trimitic hyphal system, with generative, skeletal and ligative hyphae.

Hyphal analysis. A procedure by which the development and structure of basidiomata can be investigated, providing important taxonomic criteria. Three main types of hyphal systems of increasing complexity were recognized by Corner (*TBMS* 17: 51, 1932) (Figs 16, 17): **monomitic**, having hyphae of one kind (generative hyphae which are branched, septate, with or without clamp-connexions, thin- to thick-walled, and of unlimited length; they give rise both to other hyphal types and to the hymenium) (Teixeira, *Mycol.* 52: 30, 1961; gen. hyphae of polypores); **dimitic**, having hyphae of two kinds (generative and skeletal hyphae which are thick-walled, aseptate, and of limited length, with thin-walled apices, generally unbranched but when terminal they can develop arboriform branching or taper) or generative and binding (see below); **trimitic**, having hyphae of three kinds (generative, skeletal and binding (or ligative) hyphae which are aseptate, thick-walled, much branched, either *Bovista*-type with tapering branches or coralloid; they bind the skeletal and generative hyphae together). In *Polyporaceae* and *Lentinaceae*, intercalary skeletal hyphae can give rise to ligative branching, the entire element being termed a skeleto-binding cell (Corner, 1981) or skeleto-ligative hypha (Pegler, 1983). Corner also recognized **sarco-dimitic** (in which the skeletal hyphae are replaced by thick-walled, long, inflating fusiform elements) and **sarco-trimitic** (in which the generative hyphae give both thick-walled inflated elements similar to binding hyphae but septate) types.

Most soft and fleshy basidiomata are monomitic, with hyphae which are generally inflated (most agaricoid and clavarioid fungi). Hard and tough basidiomata may be monomitic with the generative hyphae developing thickened walls, dimitic, with skeletal hyphae (e.g. *Phellinus* spp.) or (esp. when perennial) trimitic (e.g. *Fomes*, *Ganoderma*, *Microporus xanthopus*). Every species has a well-defined and con-

stant construction, which is maintained regardless of changes in the external morphology of the basidioma due to environmental conditions, hence the importance of hyphal analysis in taxonomy.

Lit.: Corner (*Ann. Bot.* 46: 71, 1932, *Phytomorphology* 3: 152, 1953, *Beih. Nova Hedw.* 75: 13, 1983, 78: 13, 1984), Cunningham (*N. Z. Jl Sci. Tech.* 28(A): 238, 1946, *TBMS* 37: 44, 1954), Lentz (*Bot. Rev.* 20: 135, 1954), Talbot (*Bothalia* 6: 1, 1951).

hyphal fusions, see anastomosis. Vegetative hyphae of a mycelium may fuse, forming an interconnected network. Fusion between hyphae of different mycelia is controlled by genetic systems which determine sexual (see sex) or vegetative compatibility (q.v.).

hyphal net ('Hyphenfilz'), organ of attachment in some squamulose (placodioid) lichens (e.g. *Psora decipiens*) where a delicately branched reticulate net penetrates the substrate (see Poelt & Baumgärtner, *Öst. bot. Z.* 111: 1, 1964; rhizino-se strand).

hyphal peg (of basidiomata), a bunch of somewhat interwoven hyphae extending from the trama (where it originates) to the hymenium from which it may project (Singer, 1960: 47); (of hyphae), projection from a hypha for fusion (Buller, 5), peg-hypha.

hyphal rhizoid, a hypha acting as a rhizoid.

Hyphal tip growth, Hyphal elongation is mainly by apex-located synthesis, first confirmed by Gooday (q.v.) and expansion of the hyphal tip (*contra* intercalary growth). Plasma membrane (PM) and cell wall are synthesized in a steep tip-high gradient by fusion of precursor vesicles liberating their contents to be incorporated into the wall as they incorporate their membranes into the PM. Fibrillar wall components (e.g. chitin) are synthesized by tip-located PM-inserted enzymes. The wall is plastic when newly formed but as further wall material is built and the tip extends taking the active growing point away, it gradually becomes inextensible and less plastic. The declining gradient of cell surface extensibility yields

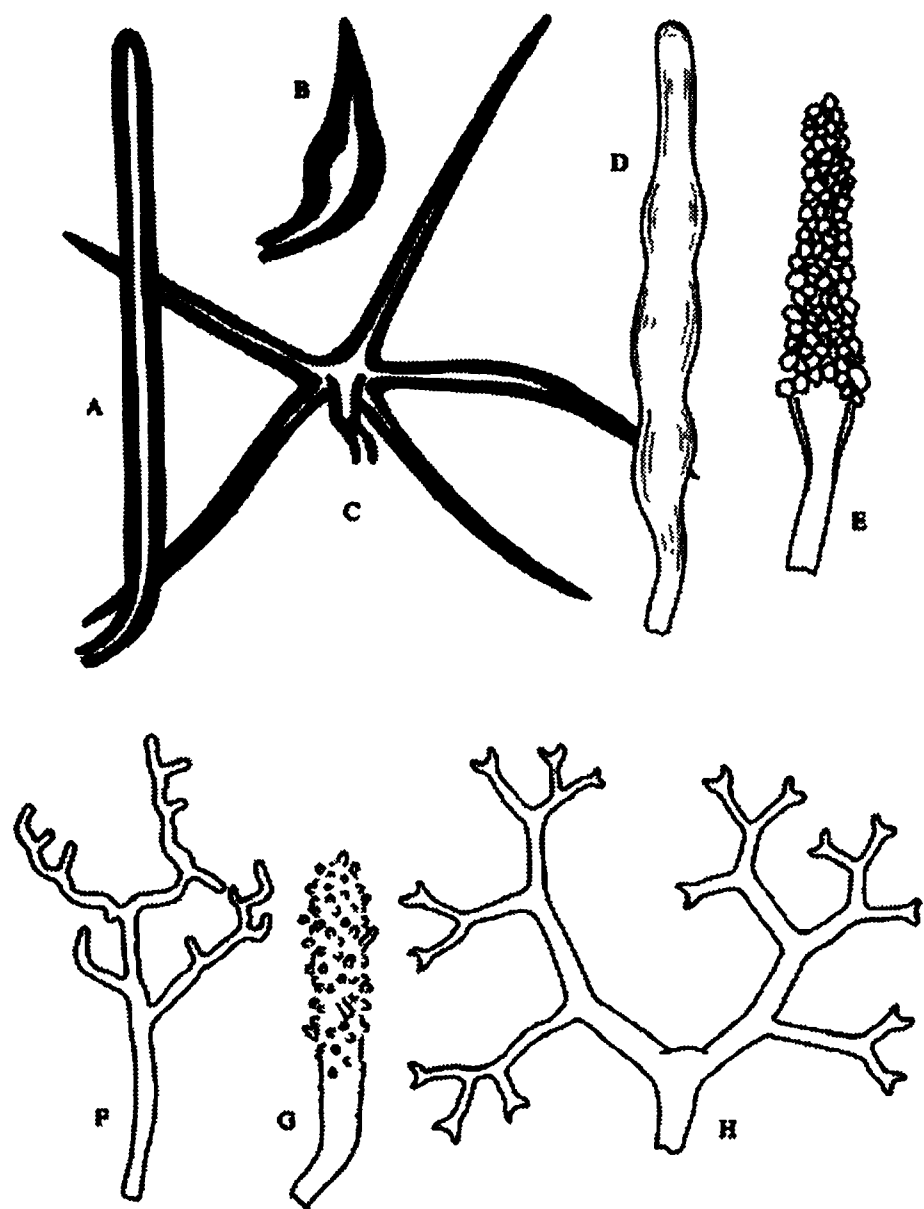


Fig. 18. Hyphidia. A, setal hypha (*Phellinus*); B, seta (*Inonotus*); C, asteroseta (*Asterostroma*); D, gloeohypha (*Gloeocystidiellum*); E, encrusted (*Peniophora*); F, dendrohyphidium (*Cytidia*); G, acanthohyphidium (*Aleurodiscus*); H, dendrohyphidium (*Vararia*). Not to scale

to turgor pressure and is very finely regulated to produce the constant-diameter hypha. Various models have been proposed to help interpret hyphal tip growth. Two models address regulation of extensibility; a) cross-linking of wall polymers, with or without balanced concomitant wall hydrolytic enzyme activity, regulating wall extensibility (Wessels, *in* Heath, *Tip Growth in Plant and Fungal Cells*: 1, 1990) or b) an actin-rich membrane skeleton attached to the inside of the PM regulates extension of the membrane upon which the wall is assembled (Heath, *CJB* 73(Suppl. 1): S131, 1995). In addition, the gradient of vesicle fusions is postulated to be generated by a 'vesicle supply centre' whose location is coincident with the Spitzenkörper, a labile vesicle- and actin-rich structure present in growing tips of most, but not all, fungi, whose behaviour correlates with tip growth rate and direction (Bartnicki-Garcia, *in* Heath, *Tip Growth in Plant and Fungal Cells*: 211, 1990). Another model attempts to explain the role of calcium gradients in the hyphal tip (Regalado, *Microbiology* 144: 2771, 1998), while a further model interpret hyphal tip growth in terms of microtubule-based transport (Sugden *et al.*, *Physical Rev. E*, 2007). Current data do not differentiate the relative contributions of these different components, but cellular regulation, possibly involving cytoplasmic Ca^{2+} (Jackson & Heath, *Microbiol. Rev.* 57: 367, 1993), of each could generate the known diversity of sizes, shapes,

branching patterns and directions of growth characteristic of all hyphal structures (see also wall building). See also spitzenkörper).

Hyphasma Rebent. ex Nocca & Balb. (1821) nom. dub., anamorphic *Fungi*. See Donk (*Taxon* 11: 86, 1962).

Hyphaster Henn. (1903) = *Asterostomella* fide Höhnelt (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt. 1* 119: 21, 1910).

Hyphelia Fr. (1825) = *Trichothecium*. Also used for anamorphs of *Corticium*. fide Hughes (*CJB* 36: 727, 1958), Donk (*Taxon* 11: 86, 1962), Hennebert (*Persoonia* 7: 195, 1973).

hyphidium (pl. -ia), (paraphysis, pseudoparaphysis, paraphysoid, dikaryoparaphysis, and pseudophysis sensu Singer (1962) are syn. or near syn.), a little, or strongly, modified terminal hypha in the hymenium of hymenomycetes (Fig. 18). Donk (*Persoonia* 3: 229, 1964) distinguished; **haplo-** (simple -), unmodified, unbranched or little branched; **dendro-** (dendrophysis), irregularly strongly branched; **dicho-** (dichophysis), repeatedly dichotomously branched; **acantho-** (acanthophysis; bottle-brush paraphysis (Burt, 1918)), having pin-like outgrowths near the apex; in *Corticaceae* may be botryose, clavate, coralloid, or cylindrical. Cf. cystidium.

Hyphobasidiofera K. Matsush. & Matsush. (1996), Agaricomycetes. 1, Malaysia. See Matsushima & Matsushima (*Matsush. Mycol. Mem.* 9: 33, 1996).

Hyphochlaena Cif. (1962), anamorphic *Pezizomycotina*, Hso.???. 1 (sterile mycelium), Dominican Republic. See Ciferri (*Atti Ist. bot. Univ. Lab. crittog. Pavia sér. 5* 19: 110, 1962).

hyphocystidium, see cystidium.

Hyphoderma Fr. (1849) = *Hyphelia* fide Donk (*Taxon* 11: 88, 1962).

Hyphoderma Wallr. (1833), Meruliaceae. c. 95, widespread. s. str. 35 species. See Donk (*Fungus Wageningen* 27: 13, 1957), Donk (*Persoonia* 2: 220, 1962), Eriksson & Ryvarden (*Cortic. N. Europ.* 3: 448, 1975; key 27 Eur. spp.), Wu (*Acta Bot. Fenn.* 142: 64, 1990; key Taiwan spp.), Gilbertson & Hemmes (*Mem. N. Y. bot. Gdn* 89: 81, 2004; Hawaii), Larsson (*MR* 111: 186, 2007; phylogeny).

Hyphodermataceae Jülich (1982) = Meruliaceae.

Hyphodermella J. Erikss. & Ryvarden (1976), Phanerochaetaceae. 3, widespread. See Melo & Hjortstam (*Nova Hedwigia* 77: 351, 2003; Portugal).

Hyphodermopsis Jülich (1982) = *Gyrophanopsis* fide Stalpers & Buchanan (*N.Z. J. Bot.* 29: 333, 1991).

Hyphodictyon Millardet (1866) = *Atichia* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).

Hyphodiscosia Lodha & K.R.C. Reddy (1974), anamorphic *Pezizomycotina*, Hso.1eH.1/10. 4, India; Europe; Japan. See Lodha & Reddy (*TBMS* 62: 419, 1974), Watanabe (*Mycol.* 84: 113, 1992).

Hyphodiscosoides Matsush. (1993), anamorphic *Pezizomycotina*, Hso.0eH.15/19. 1, Peru. See Matsushima (*Matsush. Mycol. Mem.* 7: 54, 1993).

Hyphodiscus Kirschst. (1906), Helotiales. Anamorph *Catenulifera*. 6, north temperate. See Zhuang (*Mycotaxon* 31: 411, 1988), Baral (*Z. Mykol.* 59: 3, 1993), Raitviir & Galán (*SA* 13: 159, 1995), Hosoya (*Mycoscience* 43: 47, 2002; Japan), Raitviir (*Scripta Mycol.* 20, 2004), Untereiner *et al.* (*CJB* 84: 243, 2006; phylogeny).

Hyphodontia J. Erikss. (1958), Schizoporaceae. 64, widespread. See Weresub (*CJB* 39: 1475, 1961),

- Eriksson & Ryvarden (*Cortic. N. Europ.* 4: 583, 1976; key 23 Eur. spp.), Wu (*Acta Bot. Fenn.* 142: 85, 1990; key Taiwan spp.), Langer (*Biblthca Mycol.* 154, 1994; world key), Wu (*Mycol.* 93: 1019, 2001; new spp.).
- Hyphodontiastra** Hjortstam (1999), Meruliaceae. 1, Brazil. See Hjortstam (*Kew Bull.* 54: 755, 1999).
- Hyphodontiella** Å. Strid (1975), Clavariaceae. 2, Nordic. See Strid (*Kongel. Norske Vidensk. Selsk. Skr.* 1975 4: 19, 1975).
- hyphoid** (1) like hyphae; cobwebby; (2) (of aecia of *Dasyscypha*), having aeciospores on hyphal projections from stomata (Arthur).
- Hypholoma** (Fr.) P. Kumm. (1871) = *Psilocybe* (Fr.) P. Kumm. fide Kuyper (*in litt.*).
- Hypholomopsis** Earle (1909) = *Psathyrella* fide Singer (*Agaric. mod. Tax.*, 1951).
- Hyphomucor** Schipper & Lunn (1986), Mucoraceae. 1, paleotropical. See Schipper (*Mycotaxon* 27: 83, 1986), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny).
- Hyphomyces** C.H. Bridges & C.W. Emmons (1961) nom. inval., Fungi.
- Hyphomycetes**, Anamorphic fungi; widespr. in most ecological niches. This artificial class is traditionally separated into three (or four, if agonomycetes are included) orders, based on the presence or absence of conidia and the degree of aggregation of the conidiophores into more complex structures (conidiomata). An alternative system of classification (now obsol.) for the anamorphic fungi as a whole (including the coelomycetes, q.v.) was advanced by Sutton (1980). The traditional separation is:
- (1) **Agonomycetales** (Agonomycetaceae) (*Mycelia sterilia*, q.v.). No conidia generally produced, but in some genera propagules which are liberated by multicellular secession are formed.
 - (2) **Hyphomycetales** (= Moniliaceae + Dematiaceae). This group comprises the main body of the hyphomycetes; conidiophores are separate, not organized on synnematal or sporodochial conidiomata. The full range of conidiogenous events occurs.
 - (3) **Stilbellales** (Coremiales, Synnematomycetes, Stilbellaceae). Conidiophores are aggregated as synnemata, and conidiogenous events are various but the 'basauxic' type is absent. See Morris (*Western Ill. Univ. Ser. biol. Sci.* 3, 1963; key 54 synnem. gen.), Benjamin (*Taxon* 17: 521, 1968; typification), Seifert (*Stud. Mycol.* 27, 1985; *Stilbella* and related genera).
 - (4) **Tuberculariales** (Tuberculariaceae). Conidiophores are aggregated on sporodochial conidiomata and a wide range of conidiogenous events occurs.
- Lit.*: Costantin (*Les mucédinées simples*, 1888; *Rabenh. Krypt.-Fl.* 1 (8-9), 1907-10), Wakefield & Bisby (*TBMS* 25: 49, 427, 1941; Brit. list), Hughes (*CJB* 36: 727, 1958; annotated list 400 gen. names), Delitsch (*Systematik der Schimmelpilze*, 1961), Kendrick & Carmichael (*in Ainsowrth et al., The Fungi* 4: 323, 1973; synoptic keys, illustr., gen., gen. names), Litvinov ([Keys for the Identification of microscopic soil fungi. *Moniliales*], 1967), Barron (*The genera of hyphomycetes from soil*, 1968), Onions *et al.* (*Smith's Introduction to Industrial Mycology* edn 7, 1981), Ellis (*Dematiaceous Hyphomycetes*, 1971; *More Dematiaceous Hyphomyetes*, 1976), Subramanian (*Hyphomycetes. An account of Indian species, except Cercosporae*, 1971), Carmichael *et al.* (*Genera of Hyphomycetes*, 1980), Cole & Kendrick (Eds) (*Biology of conidial fungi*, 2 vols, 1981), Subramanian (*Hyphomycetes: taxonomy and biology*, 1983), Borowska (*Flora Polska, Grzyby (Mycota)*) 16 *Deuterom., Dematiaceae, Phialoconidiae*, 1986; keys to spp. in major genera), Domsch *et al.* (*Compendium of soil fungi*, 2 vols, 1980). See also under Anamorphic fungi.
- Hyphonectria** (Sacc.) Petch (1937) = *Hydropisphaera* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- hyphophore**, erect stalked peltate asexual sporophores in the *Asterothyriaceae* (e.g. *Echinoplaca*, *Gyalidopsis*, *Tricharia*). See Sérusiaux & De Sloover (*Veröff. Geobot. Inst. ETH, Rübel* 91: 260, 1986; types), Vězda (*Čas. slez. Muz. Silesiae A* 22: 67, 1973; *Folia geobot. phytotax., Praha* 14: 43, 1979).
- Hyphopichia** Arx & Van der Walt (1976), Saccharomycetales. Anamorph *Candida*. 1 (insect-associated), widespread. See Kurtzman *in* Hawksworth (Ed.) (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. 269 269: 361, 1994), Kurtzman (*Antonie van Leeuwenhoek* 88: 121, 2005), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- hyphopodium**, a short branch of one or two cells on epiphytic mycelium of *Meliolales*, etc.; in a **capitate** - the end is rounded, = appressorium (fide Mibey & Hawksworth, *SA* 14: 25, 1995); **mucronate** - = conidiogenous cell (fide Hughes, *CJB* 59: 1514, 1981). A **stigmatopodium** (**stigmopodium**) is a hyphopodium in which the end cell or **stigmatocyst** has a haustorium (Arnaud). A stigmatocyst in a hypha is a **node cell**; cf. Doidge (*Bothalia* 4: 273, 1942). See also Walker (*Mycotaxon* 11: 1, 1980).
- Hyphopolynema** Nag Raj (1977), anamorphic *Pezizomycotina*, Hsp.0-1eH.15. 3, Colombia. See Nag Raj (*CJB* 55: 760, 1977), Kohlmeyer & Volkmann-Kohlmeyer (*Mycotaxon* 70: 489, 1999).
- Hyphoradulum** Pouzar (1987), Cyphellaceae. 1, Europe. See Pouzar (*Česká Mykol.* 41: 26, 1987).
- Hyphoscypha** Bres. (1903) = *Lachnum* fide Huhtinen (*SA* 6: 131, 1987).
- Hyphoscypha** Velen. (1934), ? Helotiales. 1, Europe.
- Hyphosoma** Syd. (1924) nom. conf., anamorphic *Pezizomycotina*. See Hughes (*N.Z. Jl Bot.* 8: 153, 1970).
- Hyphospora** A.W. Ramaley (1996), anamorphic *Comminutispora*, Hso.?.?. 1, USA. See Ramaley (*Mycol.* 88: 133, 1996), Hambleton *et al.* (*Mycol.* 95: 959, 2003; phylogeny), Tsuneda *et al.* (*Mycol.* 96: 1128, 2004; morphology).
- Hyphostereum** Pat. (1892), anamorphic *Pezizomycotina*, Hsp/Ccu.0eH.?. 1, S. America.
- Hyphothyrium** B. Sutton & Pascoe (1989), anamorphic *Pezizomycotina*, Hsp.0-1eP.19. 1, Australia. See Sutton & Pascoe (*MR* 92: 219, 1989).
- Hyphozyma** de Hoog & M.T. Sm. (1981), anamorphic *Leotiomyces*, Hso.0eH.3/4. 4 (on other fungi), Europe; N. America. The genus is highly polyphyletic. See also *Eleutheromyces*. See de Hoog & Smith (*Antonie van Leeuwenhoek* 52: 39, 1986; key), Hutchison *et al.* (*MR* 97: 1409, 1993; key), Tsuneda *et al.* (*Mycol.* 89: 867, 1997; on *Lentinula*), Maekawa & Tsuneda (*Mycotaxon* 78: 167, 2001; on *Trametes*), Lopandic *et al.* (*Mycol. Progr.* 4: 205, 2005; phylogeny).
- hypnocyst**, an *Alternaria*-like group of cells (Chippindale, *TBMS* 14: 203, 1929; Griffiths, *Nova Hedw.* 25: 511, 1974).
- hypnospora**, a resting spore.

Hypnotheca Tommerup (1970), ? Helotiales. Anamorph *Monochaetiellopsis*. 1, Australia. See von Arx & Müller (*Stud. Mycol.* 9: 11, 1975).

hypo- (prefix), under.

hypobasidium, see basidium.

Hypoblema Lloyd (1902) = *Calvatia* fide Zeller & Smith (*Lloydia* 27: 167, 1964).

Hypobryon Döbbeler (1983), Dothideomycetes. 6 (on hepatics), Europe. See Döbbeler (*Nova Hedwigia* 37: 3, 1983), Döbbeler (*Mycol. Progr.* 5: 32, 2006).

Hypocapnodium Speg. (1918) = *Aithaloderma* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).

Hypocelis Petr. (1929) = *Vizella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).

Hypocenina Berk. & M.A. Curtis (1874) = *Topospora* fide Groves (*CJB* 43: 1195, 1965).

Hypocenomyce M. Choisy (1951), Ophioparmaceae (L). 14, widespread. See Timdal (*Nordic Jl Bot.* 4: 83, 1984; key), Dirig (*Mycotaxon* 37: 441, 1990; ecology, N America), Timdal (*Mycotaxon* 77: 445, 2001; n. spp.), Wedin *et al.* (*MR* 109: 159, 2005; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Lumbsch *et al.* (*MR* 111: 257, 2007; phylogeny), Lumbsch *et al.* (*MR* 111: 257, 2007; phylogeny).

Hypocharnum Kalchbr. (1876) = *Macowanites*.

Hypochnaceae J. Schröt. (1888) = *Arthoniaceae*.

Hypochnella J. Schröt. (1888), ? *Atheliaceae*. 1, Europe. See Wakefield (*TBMS* 5: 127, 1915), Hagara (*Mykol. Listy* 80: 4, 2002).

Hypochnellaceae Jülich (1982) = *Atheliaceae*.

Hypochniciellum Hjortstam & Ryvarden (1980), *Atheliaceae*. 4, widespread. See Legon (*Mycologist* 17: 41, 2003).

Hypochnicum J. Erikss. (1958), *Meruliaceae*. 20, widespread. See Eriksson (*Symb. bot. upsal.* 16 no. 1: 100, 1958), Legon (*Mycologist* 17: 129, 2003; *Hypochnicum analogum*), Nilsson & Hallenberg (*Mycol.* 95: 54, 2003; phylogeny *Hypochnicum punctulatum* complex).

Hypochnites Mesch. (1898), Fossil Fungi. 1 (Oligocene), Baltic.

hypochnoid, having effused, resupinate, dry, rather loosely intertwined hyphae, as in *Tomentella* (formerly *Hypochnus*).

Hypochnopsis P. Karst. (1889) = *Amaurodon* fide Kõljalg (*Syn. Fung.* 9: 32, 1996).

Hypochnus Fr. (1818) ? = *Tomentella* Pat. fide Donk (*Taxon* 6: 75, 1957).

Hypochnus Fr. ex Ehrenb. (1820) = *Cryptothecia* fide Thor (*Bryologist* 94: 278, 1991).

Hypocline Syd. (1939), anamorphic *Pezizomycotina*, St.0eH.10. 1, Africa.

Hypocopra (Fr.) J. Kickx f. (1867), *Xylariaceae*. 30 (esp. coprophilous), widespread. See Krug & Cain (*CJB* 52: 809, 1974; key).

Hypocrea Fr. (1825), *Hypocreaceae*. Anamorph *Trichoderma*. 171 (on rotten wood, often associated with other fungi), widespread. See Rifai & Webster (*TBMS* 49: 289, 1964), Rifai & Webster (*TBMS* 49: 297, 1964), Doi (*Bull. natn. Sci. Mus. Tokyo*, B 12: 693, 1969), Doi (*Bull. natn. Sci. Mus. Tokyo*, B 15: 649, 1972), Patil & Patil (*Indian Phytopath.* 36: 635, 1983; India), Doi & Yamatoya (*Mem. N. Y. bot. Gdn* 49: 233, 1989; *H. pallida* group), Samuels & Lodge (*Mycol.* 88: 302, 1996), Lieckfeldt *et al.* (*CJB* 76: 1507, 1998), Samuels *et al.* (*Stud. Mycol.* 41, 1998), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999),

Dodd *et al.* (*MR* 104: 23, 2000; anamorph phylogeny), Pöldmaa (*Stud. Mycol.* 45: 83, 2000), Chaverri *et al.* (*Mycol.* 93: 758, 2001), Chaverri *et al.* (*Mycol.* 93: 1113, 2001), Doi (*Memoirs of the National Science Museum Tokyo* 37: 113, 2001; Japan), Dodd *et al.* (*Mycol. Progr.* 1: 409, 2002), Liu *et al.* (*Mycotaxon* 82: 463, 2002; China), Bezerra *et al.* (*Fitopatol. Brasil* 28: 408, 2003), Chaverri & Samuels (*Stud. Mycol.* 48, 2003; spp. with green ascospores), Chaverri *et al.* (*Mol. Phylogen. Evol.* 27: 302, 2003), Chaverri *et al.* (*Mycol.* 95: 1100, 2003), Lu & Samuels (*Sydowia* 55: 255, 2003), Chamberlain *et al.* (*Karstenia* 44: 1, 2004; stipitate spp.), Chaverri *et al.* (*Mycol. Progr.* 3: 29, 2004), Druzhinina *et al.* (*Stud. Mycol.* 50: 401, 2004), Lu *et al.* (*Mycol.* 96: 310, 2004), Pöldmaa & Samuels (*Sydowia* 56: 79, 2004; Thailand), Jaklitsch *et al.* (*Stud. Mycol.* 56: 135, 2006), Jaklitsch *et al.* (*Mycol.* 98: 499, 2006), Overton *et al.* (*Stud. Mycol.* 56: 39, 2006), Overton *et al.* (*Stud. Mycol.* 56: 1, 2006; *H. citrina* group), Samuels *et al.* (*CBS Diversity Ser.* 4, 2006), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).

Hypocreaceae De Not. (1844), *Hypocreales*. 22 gen. (+ 27 syn.), 454 spp.

Lit.: Bissett (*CJB* 69: 2357, 1991), Bissett (*CJB* 69: 2373, 1991), Samuels (*MR* 100: 923, 1996), Grondona *et al.* (*Appl. Environm. Microbiol.* 63: 3189, 1997), Kuhls *et al.* (*Mycol.* 89: 442, 1997), Bulat *et al.* (*MR* 102: 933, 1998), Castle *et al.* (*Appl. Environm. Microbiol.* 64: 133, 1998), Gams & Bissett (*Trichoderma and Gliocladium* Vol. 1. Basic Biology, Taxonomy and Genetics: 3, 1998), Harman *et al.* (*Trichoderma and Gliocladium* Vol. 1. Basic Biology, Taxonomy and Genetics: 243, 1998), Kindermann *et al.* (*Fungal Genetics Biol.* 24: 298, 1998), Lieckfeldt *et al.* (*Trichoderma and Gliocladium* Vol. 1. Basic Biology, Taxonomy and Genetics: 35, 1998), Chen *et al.* (*Appl. Microbiol. Biotechn.* 52: 246, 1999), Lieckfeldt *et al.* (*CJB* 76: 1507, 1998), McKay *et al.* (*Appl. Environm. Microbiol.* 65: 606, 1999), Pöldmaa *et al.* (*CJB* 77: 1765, 1999), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999; cell constituent polyamines). Much less widely circumscribed than in previous editions of this *Dictionary*.

Lit.: Sahr *et al.* (*Mycol.* 91: 935, 1999), Hermosa *et al.* (*Appl. Environm. Microbiol.* 66: 1890, 2000), Lieckfeldt *et al.* (*Microbiol. Res.* 155: 7, 2000), Pöldmaa (*Stud. Mycol.* 45: 83, 2000), Rossman (*Stud. Mycol.* 45: 27, 2000), Douhan & Rizzo (*MR* 107: 1342, 2003), Lu *et al.* (*Mycol.* 96: 310, 2004), Druzhinina *et al.* (*Mycoscience* 47: 55, 2006), Gams (*Stud. Mycol.* 56: 177 pp., 2006).

hypocreaceous, fleshy and brightly coloured, like *Hypocrea*.

Hypocreales Lindau (1897). *Sordariomycetidae*. 7 fam., 237 gen., 2647 spp. Ascomata perithecial, rarely cleistothecial, sometimes either in or on a stroma, ± globose, sometimes ornamented, rarely setose, the ostiole periphysate; peridium and stromatal tissues fleshy, usually brightly coloured; interascal tissue of apical paraphyses, often evanescent; asci ± cylindrical, thin-walled, sometimes with a small apical ring or a conspicuous apical cap, not blueing in iodine; ascospores varied, hyaline or pale brown, usually septate, sometimes muriform, sometimes elongate and fragmenting, without a sheath. Anamorphs prominent, hyphomycetous. Saprobes or parasites of plants, often fungicolous or licheni-

colous, rarely coprophilous, cosmop. Fams:

- (1) **Bionectriaceae**
- (2) **Clavicipitaceae**
- (3) **Cordycipitaceae**
- (4) **Hypocreaceae**
- (5) **Nectriaceae**
- (6) **Niessliaceae**
- (7) **Ophiocordycipitaceae**

Lit.: Boedijn (*Persoonia* 3: 1, 1964), Dingley (*Trans. Proc. R. Soc. N.Z.* 79: 55, 177, 323, 403, 81: 329, 489, 83: 643, 84: 467, 1951-57; NZ), Doi (*Bull. natn Sci. Mus. Tokyo* B 1: 1, 2: 119, 1975-76; S. Am.), Müller & von Arx (1962, 1973), Petch (*TBMS* 21: 243, 1938; UK), Rogerson (*Mycol.* 62: 865, 1970; gen. names, key gen.), Rossman (*Mycol. Pap.* 150, 1983; key 52 phragmosporous spp.; *Stud. Mycol.* 45: 27, 2000; gen. concepts), Rossman *et al.* (*Mycol.* 85: 685, 1993; key 8 gen. simple spores; *Stud. Mycol.* 42, 1999; monogr.), Samuels & Rossman (*Whole fungus* 1: 167, 1979; anamorphs, gen. concepts), Samuels & Seifert (*in* Sugiyama (Ed.), *Pleomorphic fungi*: 29, 1987; anamorphs), Samuels & Seifert (*Sydowia* 43: 249, 1991; key 20 synnematus spp.), Samuels *et al.* (*Mem. N.Y. bot. Gdn* 59: 6, 1990; 75 spp., Indonesia), Schoch *et al.* (*MR* 111: 154, 2007; phylogeny). See also under *Nectria* and anamorph gen. names.

Hypocrella Sacc. (1878), Clavicipitaceae. Anamorph *Aschersonia*. 37 (on *Insecta*), widespread (tropical). See Hywel-Jones & Evans (*MR* 97: 871, 1993), Hywel-Jones & Samuels (*Mycol.* 90: 36, 1998), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Liu *et al.* (*Mycotaxon* 78: 67, 2001; China), Chaverri *et al.* (*MR* 109: 1268, 2005), Liu & Hodge (*MR* 109: 818, 2005), Liu *et al.* (*MR* 110: 537, 2006; anamorph), Sung *et al.* (*Stud. Mycol.* 57, 2007), Torres *et al.* (*MR* 111: 317, 2007; Panama), Chaverri *et al.* (*Stud. Mycol.* 60, 2008; phylogeny, neotropics).

Hypocreodendron Henn. (1897), anamorphic *Discoxy-laria*, Hsy.0eH.19. 1, S. America. See Rogers *et al.* (*Mycol.* 87: 41, 1995).

Hypocreomycetidae O.E. Erikss. & Winka (1997), Sordariomycetes. Ords:

- (1) **Coronophorales**
- (2) **Hypocreales**
- (3) **Melanosporales**
- (4) **Microascales**

Lit.: see under fams, also Schoch *et al.* (*MR* 111: 154, 2007; marine lineages).

Hypocreophis Speg. (1919) = *Hypocrella* fide Clements & Shear (*Gen. Fung.*, 1931).

Hypocreopsis G. Winter (1875) ≡ *Selinia* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).

Hypocreopsis P. Karst. (1873), Hypocreaceae. Anamorph *Stromatocrea*. 5 (decaying wood, often associated with resupinate basidiomycetes), widespread (north temperate). See Niemelä & Nordin (*Karstenia* 25: 75, 1985; Eur.), Candy & Webster (*Mycologist* 2: 18, 1988), Candoussau (*Mycologist* 4: 170, 1990), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Ainsworth (*English Nature Research Reports* 600, 2004; conservation).

hypocystidium, see *cystidium*.

Hypodendrum Paulet ex Earle (1909) = *Pholiota* fide Singer (*Agaric. mod. Tax.*, 1951).

Hypoderma DC. (1805) nom. rej. = *Lophodermium* See Cannon & Minter (*Taxon* 32: 572, 1983; gen. nomencl.).

Hypoderma De Not. (1847) nom. cons., Rhytismata-

ceae. 54, widespread (esp. temperate). See Cannon & Minter (*Taxon* 32: 572, 1983; gen. nomencl.), Johnston (*N.Z. Jl Bot.* 28: 159, 1990; 12 spp. NZ, gen. concept), Johnston (*Mycotaxon* 52: 221, 1994; ascospores), Johnston (*Mycol. Pap.* 176: 239 pp., 2001; on grasses), Hou & Piepenbring (*Nova Hedwigia* 82: 91, 2006; China).

Hypodermataceae Rehm (1887) = Rhytismataceae.

hypodermataceous (of asci), ones which are essentially unitunicate, lack any apical thickening, and which discharge the spores through a narrow pore; see ascus.

Hypodermella Tubeuf (1895), Rhytismataceae. 3, widespread. See Cannon & Minter (*Mycol. Pap.* 155: 123 pp., 1986; Indian subcontinent), Hansen & Lewis (*Compendium of Conifer Diseases*, 1997), Johnston (*Biodiversity of Tropical Microfungi*: 241, 1997).

Hypodermellina Höhn. (1917), Rhytismatales. 1, Europe.

Hypodermina Höhn. (1916), anamorphic *Diaporthales*, St.0eH.?. 1, Europe. See Castlebury *et al.* (*Mycol.* 94: 1017, 2002; as *Mazzantiella*).

Hypodermium Link (1816) ≡ *Caecoma* fide Laundon (*Mycol. Pap.* 102, 1965).

Hypodermium Link (1825) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).

Hypodermopsis Earle (1902) = *Hysterium* Pers. fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).

Hypodermopsis Kuntze (1898) ≡ *Hypoderma* De Not.

Hypodiscus Lloyd (1923) [non *Hypodiscus* Nees 1836, *Restionaceae*] ≡ *Neohypodiscus*.

Hypodrys Pers. (1825) ≡ *Fistulina*.

Hypoflavia Marbach (2000), Caliciaceae (L.). 2, S. America. See Marbach (*Bibliotheca Lichenol.* 74: 291, 2000).

Hypogaea E. Horak (1964), Agaricaceae. 1, Argentina. Basidioma gasteroid. See Horak (*Sydowia* 17: 299, 1964).

Hypogaeaceae E. Horak (1964) = Agaricaceae.

Hypogaeum Pers. (1797) = *Elaphomyces* fide Fries (*Syst. mycol.* 3: 57, 1829).

hypogean (**hypogeal**, **hypogeic**, **hypogeous**), in the earth; (of fungi) see Hypogeous fungi.

hypogenous, produced lower down.

Hypogeous fungi. Fungi having subterranean sporocarps comprise many taxonomically unrelated species showing remarkable features of convergent evolution as a result of adaptation to this specialized habitat. They include the truffles (q.v.; esp. *Elaphomycetales*, *Pezizales*), false truffles (*Rhizopogon*, *Hymenogaster*, *Gautieria*), various 'gasteromycetes' (*Radiigera*, *Pyrenogaster*) and a few *Zygomycetes* (e.g. *Endogone*). Most are mycorrhizal; many mutualistic relationships have also evolved between hypogeous fungi animals, particularly insects and some mammals; many show considerable variability within a single fruitbody in numbers of spores produced per ascus or basidium, and their fruitbodies are often involuted or convoluted with a strongly reduced hymenium and thought to be derived from epigeous forms; their importance of some species in the food chain of endangered mammals has meant more is known about their conservation needs than for most fungi (e.g. Loeb *et al.*, *Am. Midl. Nat.* 144: 286, 2000), see Animal mycophagists; some, particularly species of *Elaphomyces* accumulate radionuclides in exceptional quantities (see Air pollution). Their unusual nature has stimulated much folk lore and many

- legends about hypogeous fungi including, particularly, a belief that some are aphrodisiacs. See Tulasne (*Fungi hypogaei*, 1851 [reprint 1970]), Hawker (*Biol. Rev.* 30: 127, 1955), Trappe (*Mycotaxon* 9: 297, 1979). **Australasia** Trappe *et al.* (*Aust. Syst. Bot.* 5: 597 & 617, 1992; 9: 773 & 803, 1996); **British Isles** Hawker (*Phil. Trans.* B237: 429, 1954; *TBMS* 63: 67, 1974, list), Pegler *et al.* (*British truffles. A revision of British hypogeous fungi*, 1993); **Europe** Montecchi & Sarasini (*Funghi Ipogei d'Europa*, 2000); **Germany** Hess (*Die Hypogaeen Deutschland*, 1891-4 [reprint 1971]); **Hungary** (Carpathian Basin), Szemere (*Die unteririschen Pilze des Karpatenbeckens*, 1965); **Malaysia** Corner & Hawker (*TBMS* 36: 125, 1953); **Mexico** Trappe & Guzmán (*Mycol.* 63: 317, 1971); **Spain** Calonge *et al.* (*An. Inst. Bot. Cavanilles* 34: 15, 1977), Moreno Arroyo *et al.* (*Tesoros de nuestros montes. Trufas de Andalucía*, 2005); **USA** Trappe (1979), Castellano *et al.* (*Key to spores of the genera of hypogeous fungi of north temperate forests with special reference to animal mycophagy*, 1989). See Truffle. See also: www.mykoweb.com/biblio/hypo_bib.pdf (bibliography of hypogeous and secdioid basidiomycetes).
- Hypogloeum** Petr. (1923), anamorphic *Pezizomycotina*, Cac.0eH.?. 1, Europe.
- Hypogymnia** (Nyl.) Nyl. (1896), Parmeliaceae (L). c. 65, widespread. See Bitter (*Hedwigia* 40: 171, 1901), Krog (*Skr. norsk. Polarinst.* 144, 1968), Krog (*Lichenologist* 6: 135, 1974), Beltman (*Biblthca Lichenol.* 11, 1978), Elix (*Brunonia* 2: 175, 1980; Australasia), Awasthi (*Kavaka* 12: 87, 1986; key 11 spp. India), Luo (*Bull. bot. Res. Harbin* 6: 155, 1986; China), Wei (*Acta Mycol. Sin. Suppl.* 1: 379, 1987; isidiate spp. China), Elix & Jenkins (*Mycotaxon* 35: 489, 1989; key 18 Australian spp.), Hyvärinen (*Lichenologist* 24: 267, 1992; thallus structure), Goward & McCune (*Bryologist* 96: 450, 1993; N America), Zeybek *et al.* (*Cryptog. bot.* 3: 260, 1993; chemistry), Crespo & Cubero (*Lichenologist* 30: 369, 1998; phylogeny), Wedin *et al.* (*MR* 103: 1152, 1999; phylogeny), McCune & Obermayer (*Mycotaxon* 79: 23, 2001; typification), McCune & Tcha-banenko (*Bryologist* 104: 146, 2001; E Asia), Yoshida & Kashiwadani (*Bull. natn. Sci. Mus. Tokyo*, B 27: 35, 2001; typification, E Asia), McCune *et al.* (*Bryologist* 106: 226, 2003; Himalayas), Thell *et al.* (*Symb. bot. upsal.* 34 no. 1: 429, 2004; Scandinavia), McCune (*Bull. Calif. Lichen Soc.* 13: 42, 2006; conservation), McCune *et al.* (*Bryologist* 109: 80, 2006; N America), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Wei & Wei (*Mycotaxon* 94: 155, 2005; China).
- Hypogymniaceae** Poelt ex Elix (1980) = Parmeliaceae.
- hypogyny** (adj. **hypogynous**), the condition of having the antheridium under the oogonium and on the same hypha.
- Hypohelion** P.R. Johnst. (1990), Rhytismataceae. 2, Europe; N. America. See Johnston (*Mycotaxon* 39: 219, 1990), Johnston (*Mycol. Pap.* 176: 239 pp., 2001).
- Hypolepia** Raf. (1808) nom. nud., Fungi. See Merrill (*Index Rafinesq.*, 1949).
- hypolithic**, see endolithic.
- Hypolyssus** Pers. (1825) nom. conf., Agaricomycetes. sensu Berk. = *Caripia* (Podoscyph.).
- Hypomnema** Britzelm. (1883) nom. dub., Agaricales.
- Hypomyces** (Fr.) Tul. (1860), Hypocreaceae. Anamorphs *Cladobotryum*, *Sibirina*, *Verticillium*. 53 (mostly on larger fungi), widespread. See Arnold (*Nova Hedwigia* 21: 529, 1972; classif.), Tubaki (*Rep. Tottori mycol. Inst.* 12: 161, 1975; Japanese spp.), Arnold (*Bibliogr. Mitteil. Univ.-bibl. Jena* 25, 1976; bibliogr.), Samuels (*Mem. N. Y. bot. Gdn* 26, 1976), Rogerson & Samuels (*Mycol.* 77: 763, 1985; spp. on discomycetes), Rogerson & Samuels (*Mycol.* 81: 413, 1989; key 10 spp. on *Boletales*), Rogerson & Samuels (*Mycol.* 85: 231, 1993; spp. on polypores), Rogerson & Samuels (*Mycol.* 86: 839, 1994; key 13 spp. on agarics), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Pöldmaa (*Stud. Mycol.* 45: 83, 2000), Douhan & Rizzo (*MR* 107: 1342, 2003; host-parasite rels), Pöldmaa (*Mycol.* 95: 921, 2003; on *Stereaceae*), Pöldmaa & Samuels (*Sydowia* 56: 79, 2004; Thailand), Tokiwa & Okuda (*Mycoscience* 46: 294, 2005; Japan).
- Hypomycetaceae** Earle (1901) = Hypocreaceae.
- Hypomycetales** = Hypocreales.
- Hypomycopsis** Henn. (1904) = *Mycosphaerella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- hyponecral**, see necral layer.
- Hyponectria** Sacc. (1878), Hyponectriaceae. 16 (on dead leaves etc.), widespread. See Barr (*Mycol.* 69: 952, 1977; key), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Wang & Hyde (*Fungal Diversity* 3: 159, 1999), Winka & Eriksson (*Mycoscience* 41: 97, 2000; DNA), Sivanesan & Shivas (*Fungal Diversity* 9: 169, 2002).
- Hyponectriaceae** Petr. (1923), Xylariales. 22 gen. (+ 15 syn.), 128 spp.
Lit.: Samuels *et al.* (*Mycotaxon* 28: 473, 1987), Barr (*Indian Journal of Mycology and Plant Pathology*, 1994). The affinities are still uncertain pending further molecular analysis, see also Hyde *et al.* (*Sydowia* 50: 21, 1998), Mahuku *et al.* (*MR* 102: 559, 1998), Wang & Hyde (*Fungal Diversity* 3: 159, 1999), Winka & Eriksson (*Mycoscience* 41: 97, 2000), Jeewon *et al.* (*MR* 107: 1392, 2003).
- Hyponevris** Earle (1909) = *Schizophyllum*.
- Hyponevris** Paulet (1808) = *Merulius* Haller ex Boehm. fide Donk (*Taxon* 12: 167, 1963).
- hyponym**, a name only; one having no description or reference to a specimen.
- hypoparasite**, a hidden parasite; a pathogen dispersed along with another pathogen, such as a mycovirus in an *Ophiostoma ulmi* population.
- Hypophloeda** K.D. Hyde & E.B.G. Jones (1989), Diaporthales. 1 (mangrove roots), Brunei; Seychelles. See Hyde & Jones (*TMSJ* 30: 61, 1989).
- hypophloeodal**, under the periderm or bark; endophloeodal; subcutical; within the bark.
- hypophyllous**, on the under surface of a leaf.
- Hypophyllum** Earle (1909) = *Lactarius* fide Singer (*Agaric. mod. Tax.*, 1951).
- Hypophyllum** Paulet (1808) = *Agaricus* L.
- hypoplasia**, the state of having growth less than normal, cf. hyperplasia.
- Hypoplasta** Preuss (1855) = *Cytospora* fide Saccardo (*Syll. fung.* 3: 1, 1884).
- Hypoplegma** Theiss. & Syd. (1917) = *Perisporiopsis* Henn. fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Hypopteris** Berk. (1854) = *Apiospora* fide Theissen & Sydow (*Annl. mycol.* 13: 419, 1915).
- Hyporrhodius** (Fr.) Staude (1857) = *Pluteus* fide Kuyper (*in litt.*).

- Hypospila** Fr. (1825) nom. dub., Pezizomycotina. See von Arx (*Antonie van Leeuwenhoek* 17: 257, 1951).
- Hypospilina** (Sacc.) Traverso (1913), Diaporthales. Anamorph *Asteroma*. 2, Europe. See Barr (*Mycol. Mem.* 7, 1978), Monod (*Beih. Sydowia* 9: 1, 1983).
- Hypostegium** Theiss. (1916) = *Glomerella* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Hypostigme** Syd. (1925) = *Parastigmataea* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Hypostomum** Vuill. (1896) nom. dub., Fungi.
- hypostroma**, see stroma.
- Hypotarsetta** Donadini (1985), Pyronemataceae. 1, Europe. See Donadini (*Docums Mycol.* 15 no. 60: 47, 1985), Fouchier & Neville (*Bulletin Semestriel de la Fédération des Associations Mycologiques Méditerranéennes* 13: 32, 1998).
- hypothallus** (1) (of lichens), the first hyphae of the thallus to grow, usually used of a crustaceous lichen which has no photobiont cells or cortex; = prothallus (protothallus), fide Maas Geesteranus (*Blumea* 6: 47, 1947) who restricts hypothallus to the spongy tissue on the underside of the thallus in *Anzia*, *Pannaria* and *Pannoparmelia*, but see spongiostratum; (2) (of *Mycetozoa*), the thin layer on the surface of the substratum not used up in sporangial development; Ross (*Mycol.* 65: 477, 1973) distinguished epi- and subhypothallic development.
- hypothecium**, medullary excipulum; the hyphal layer under the subhymenium in an apothecium; sometimes used indiscriminately for all tissues below the hymenium (including the subhymenium).
- Hypothele** Paulet (1812) nom. inval. = *Hydnum*.
- hypotonic** (of culture media), having an osmotic pressure lower than that of the organism cultured, cf. hypertonic.
- Hypotrachyna** (Vain.) Hale (1974), Parmeliaceae (L.). c. 198, widespread (esp. subtropics and montane tropics). See Hale (*Smithson. Contr. bot.* 25, 1975), Krog & Swinscow (*Norw. Jl Bot.* 26: 11, 1979; E. Afr.), Eliasaro *et al.* (*Mycotaxon* 69: 255, 1998; Brazil), Kurokawa & Lai (*Mycotaxon* 77: 225, 2001; Taiwan), Divakar & Upreti (*Mycotaxon* 86: 67, 2003), Thell *et al.* (*Mycol. Progr.* 3: 297, 2004; phylogeny), Elix *et al.* (*Lichenologist* 37: 101, 2005; saxicolous spp.), Masson (*Cryptog. Mycol.* 26: 205, 2005; France), Blanco *et al.* (*Mol. Phylogen. Evol.* 39: 52, 2006; phylogeny), Divakar *et al.* (*Mol. Phylogen. Evol.* 40: 448, 2006; phylogeny, polyphyly), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Hypotrachynicola** Etayo (2002), Sordariomycetes. 1 (on lichens), Colombia. See Etayo (*Bibliotheca Lichenol.* 84: 50, 2002).
- Hypoxylaceae** DC. (1805) = *Xylariaceae*.
- Hypoxylina** Starbäck (1905) = *Hypoxylon* Bull. fide Læssøe (*SA* 8: 25, 1989), Læssøe (*SA* 13: 43, 1994; ? synonym of *Xylaria*).
- Hypoxylites** Kirschst. (1925), Fossil Fungi. 2 (Neolithic), Germany.
- Hypoxylon** Adans. (1763) nom. rej. = *Xylaria* Hill ex Schrank See Læssøe (*SA* 13: 43, 1994; ? synonym of *Xylaria*), Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Hypoxylon** Bull. (1791) nom. cons., *Xylariaceae*. Anamorphs *Nodulisporium*, *Virgariella*. 130, widespread. See also *Annulohypoxylon*, *Biscogniauxia*, *Entonaema*, *Nemania*. See Miller (*Monogr. World spec. Hypoxylon*, 1961; keys *Hypoxylon* s.l.), Dennis (*Bull. Jard. bot. Brux.* 33: 317, 1963; Congo), French *et al.* (*CJB* 47: 223, 1969), Jong & Rogers (*Tech. Bull. Wash. agric. Exp. Stn* 71, 1972; anamorphs), Abe (*TMSJ* 25: 399, 1985; tissue types), Ju & Tzean (*Trans. Mycol. Soc. Rep. China* 1: 13, 1985; key 13 spp. Taiwan), Petrini & Müller (*Mycol. Helv.* 1: 501, 1986; key 25 spp. C. Eur.), Cherepanov (*Nov. Sist. niz. Rast.* 25: 109, 1988; key 34 spp. former USSR), Granmo *et al.* (*Op. Bot.* 100: 59, 1989; Nordic spp.), van der Gucht & van der Veken (*Mycotaxon* 44: 275, 1992; key 18 Papua New Guinea spp.), Læssøe (*SA* 13: 43, 1994; gen. concept, nomencl.), Ju & Rogers (*Mycol. Mem.* 20, 1996; monogr.), Granmo (*Sommerfeltia* 26, 1999; Norway, key), Sánchez-Ballesteros *et al.* (*Mycol.* 92: 964, 2000; molecular phylogeny), Mazzaglia *et al.* (*MR* 105: 670, 2001; phylogeny), Mühlbauer *et al.* (*Mycol. Progr.* 1: 235, 2002; chemistry), Quang *et al.* (*Phytochem.* 65: 469, 2004; chemistry), Hsieh *et al.* (*Mycol.* 97: 844, 2005; phylogeny), Quang *et al.* (*Phytochem.* 66: 797, 2005; chemistry), Triebel *et al.* (*Nova Hedwigia* 80: 25, 2005; phylogeny, anamorphs), Stadler & Fournier (*Revta Iberoamer. Micol.* 23: 160, 2006; chemistry, phylogeny), Suwannasai *et al.* (*Mycotaxon* 94: 303, 2005; Thailand).
- Hypoxylonites** Elsik (1990), Fossil Fungi. c. 20 (Eocene – Oligocene), USA.
- Hypoxylonopsis** Henn. (1904) = *Valsaria* fide Saccardo (*Syll. fung.* 24: 538, 1926).
- Hypoxylonsporites** P. Kumar (1990), Fossil Fungi. 2, India.
- Hypoxylum** Juss. (1789) nom. dub. = *Cordyceps* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Hypsilophora** Berk. (1879) nom. dub., ? Fungi.
- Hypsizygus** Singer (1947), Lyophyllaceae. 3, widespread (north temperate). See Ponzi (*Rivista di Micologia* 36: 245, 1993), Dielen (*AMK Mededelingen*: 44, 1999).
- Hypsolophora**, see *Hypsilophora*.
- Hypsostroma** Huhndorf (1992), Hypsostromataceae. Anamorph *Pleurophomopsis*-like. 2, C. & S. America. See Huhndorf (*Mycol.* 84: 750, 1992), Huhndorf (*Mycol.* 86: 266, 1994; posn).
- Hypsostromataceae** Huhndorf (1994), ? Dothideomycetes (inc. sed.). 2 gen., 4 spp.
Lit.: Huhndorf (*Mycol.* 84: 750, 1992), Huhndorf (*Mycol.* 86: 266, 1994).
- Hypsotheca** Ellis & Everh. (1885) = *Caliciopsis* fide Fitzpatrick (*Mycol.* 34: 464, 1942).
- Hysterangiaceae** E. Fisch. (1899), Hysterangiales. 4 gen. (+ 1 syn.), 54 spp.
Lit.: Curry & Kimbrough (*Mycol.* 75: 781, 1983), Beaton *et al.* (*Kew Bull.* 40: 435, 1985), Castellano & Beever (*N.Z. Jl Bot.* 32: 305, 1994; NZ spp.), Castellano & Muchovej (*Mycotaxon* 57: 339, 1996), Calonge (*Fl. Mycol. Iberica* 3: 271 pp., 1998), Castellano (*Ectomycorrhizal Fungi*: 311, 1999), Lebel & Castellano (*Aust. Syst. Bot.* 12: 803, 1999), Humpert *et al.* (*Mycol.* 93: 465, 2001), Binder & Bresinsky (*Mycol.* 94: 85, 2002).
- Hysterangiales** K. Hosaka & Castellano (2007). Phal-lomycetidae. 5 fam., 18 gen., 114 spp. Fams:
- (1) **Gallaceaceae**
 - (2) **Hysterangiaceae**
 - (3) **Mesophelliaceae**
 - (4) **Phallogastraceae**

(5) **Trappeaceae**

For *Lit.* see under fam.

Hysterangium Vittad. (1831), Hysterangiaceae. c. 50, widespread (esp. temperate). See Zeller & Dodge (*Ann. Mo. bot. Gdn* 16: 83, 1929; key N. Am. spp.), Soehner (*Sydowia* 6: 246, 1952; Bayern), Schwarzel (*Schweiz. Z. Pilzk.* 10: 154, 1979; key 18 spp.), Beaton *et al.* (*Kew Bull.* 40: 435, 1985; key Austral. spp.), Castellano (*Hysterangium – Ectomycorrhizal fungi, key genera in profile*, 1999; ecology), Castellano *et al.* (*Karstenia* 40: 12, 2000; as *Hysterangium*), Verbeken & Walley (Boll. Gruppo Micol. 'G. Bresadola' 46: 87, 2003; African sp. (as *Hysterangium*)).

Hysteriaceae Chevall. (1826), Hysteriales. 14 gen. (+ 7 syn.), 69 spp.

Lit.: Zogg (*Beitr. Kryptfl. Schweiz* 11 no. 3, 1962; Eur.), Bellemère (*Annls Sci. Nat. Bot.*, sér. 12 12: 429, 1971), Amano (*TMSJ* 24: 283, 1983; Japan), Larios & Honrubia (*Revta Ibér. Micol.* 5: 111, 1988), Sivanesan *et al.* (*TBMS* 90: 665, 1988), Renobales & Aguirre (*SA Reprint of Volumes 1-4 (1982-1985)* 8: 87, 1990), van der Linde (*S. Afr. J. Bot.* 58: 491, 1992; key 5 gen., 12 spp., S. Afr.), Checa (*Mycotaxon* 62: 349, 1997; Iberian spp.), Goh *et al.* (*MR* 102: 1309, 1998), Lorenzo & Messuti (*MR* 102: 1101, 1998; S Am. spp.), Tretiach & Modenesi (*Nova Hedwigia* 68: 527, 1999), Vasil'eva (*Mikol. Fitopatol.* 33: 297, 1999), Diederich & Wedin (*Nordic J Bot.* 20: 203, 2000), Liew *et al.* (*Mol. Phylogen. Evol.* 16: 392, 2000; DNA), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).

hysteriaceous (**hysterioid**, **hysteriiform**), long and cleft, like the **hysterothecium** (ascoma) of the *Hysteriaceae*; lirellate.

Hysteriales Lindau (1896). Dothideomycetes. 1 fam., 14 gen., 69 spp. Ascomata erumpent or superficial, often aggregated, elongated, sometimes branched, opening by a longitudinal split or radial slits; peridium black, very thick-walled, carbonaceous, composed of small pseudoparenchymatous cells or intertwined hyphal tissue. Interascal tissue of narrow cellular or trabeculate pseudoparaphyses. Asci cylindrical, fissitunicate, with a distinct ocular chamber. Ascospores hyaline to brown, variously septate, sometimes with a mucous sheath. Anamorphs varied. Mostly saprobic, cosmop. Fam.:

Hysteriaceae

Lit.: Liew *et al.* (*Mol. Phylog. Evol.* 16: 392, 2000), Schoch *et al.* (*Mycol* 98: 1041, 2006).

Hysteridium P. Karst. (1905), anamorphic *Pezizomycotina*, St.0eH.?. 1, Europe. See Sutton (*Mycol. Pap.* 141, 1977).

Hysterina (Ach.) Gray (1821) = *Opegrapha* Ach. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Hysteriopsis Geyl. (1887), Fossil Fungi. 1 (Tertiary), Indonesia. = *Hysterites* (Fossil fungi) fide Meschinelli (1892).

Hysteriopsis Speg. (1906) ? = *Hysterographium* fide Zogg (*Beitr. Kryptfl. Schweiz* 11 no. 3, 1962).

Hysterites Göpp. (1836), Fossil Fungi. 15 (Tertiary), Europe.

Hysterites Unger (1841), Fossil Fungi. 1 (Tertiary), former Yugoslavia.

Hysterium Pers. (1797), Hysteriaceae. Anamorphs *Coniosporium*, *Hysteropycnis*. 10, widespread (esp. temperate). See Zogg (*Beitr. Kryptfl. Schweiz* 11 no.

3, 1962), Vasil'eva (*Mikol. Fitopatol.* 33: 225, 1999; Russian Far East), Liew *et al.* (*Mol. Phylogen. Evol.* 16: 392, 2000; phylogeny), Lee & Crous (*S. Afr. J. Bot.* 69: 480, 2003; S Africa), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny), Checa *et al.* (*Mycol.* 99: 285, 2007; Costa Rica).

Hysterium Tode (1791) = *Colpoma* See Cannon & Minter (*Taxon* 32: 572, 1983; gen. nomencl.).

Hysterocarina H. Zogg (1949), Hysteriaceae. 1, Brazil.

hysterochroic, see colour.

Hysterodiscula Petr. (1942), anamorphic *Rhytismataceae*, St.0eH.1. 2, widespread (north temperate). Reports suggesting genetic links with *Duplicaria* need confirmation. See Darker (*CJB* 45: 1427, 1967), Eriksson (*Symb. Bot. Upsal.* 19 no. 4: 19, 1970).

Hysterodothis Höhn. (1909) = *Sphaerodothis* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).

Hysterogaster Zeller & C.W. Dodge (1928) = *Hymenogaster* fide Cunningham (*Gast. Austr. N.Z.*: 47, 1944).

Hysterglonium Rehm ex Lindau (1896), ? Hysteriaceae. 2 or 3, N. America; Europe.

Hysterographium Corda (1842), Hysteriaceae. Anamorph *Hysteropycnis*. 6, widespread. See Zogg (*Phytopath. Z.* 14: 310, 1944), Zogg (*Beitr. Kryptfl. Schweiz* 11 no. 3, 1962), Larios & Honrubia (*Revta Ibér. Micol.* 5: 111, 1988; Spain), Vasil'eva (*Mikol. Fitopatol.* 33: 297, 1999; E Russia), Messuti & Lorenzo (*Nova Hedwigia* 76: 451, 2003; S America), Checa *et al.* (*Mycol.* 99: 285, 2007; Costa Rica).

Hysteromyces Vittad. (1844) = *Rhizopogon* fide Fischer (*Nat. Pflanzenfam.* 5b: viii, 1938).

Hysteromyxa Sacc. & Ellis (1882) nom. dub., Fungi. See Petrak (*Sydowia* 5: 196, 1951).

Hysteronaevia Nannf. (1984), Helotiales. 11, widespread (north temperate). See Scheuer (*Biblhca Mycol.* 123: 274, 1988), Nauta & Spooner (*Mycologist* 14: 65, 2000; UK), Raitviir (*Folia cryptog. Estonica* 40: 43, 2003; Estonia), Suková (*Czech Mycol.* 56: 63, 2004; Czech Republic).

Hysteropatella Rehm (1890), Hysteriaceae. 3, Europe; N. America. See Sherwood-Pike (*Sydowia* 38: 267, 1986), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).

Hysteropeltella Petr. (1923), Dothideomycetes. 1, Europe.

Hysteropeziza Rabenh. (1874) = *Pyrenopeziza* fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).

Hysteropezizella Höhn. (1917), Helotiales. Anamorph *Neottiospora*. c. 19, widespread. See Défago (*Sydowia* 21: 1, 1967), Hein (*Nova Hedwigia* 34: 449, 1981; paraphyses ornamentation), Scheuer (*Biblhca Mycol.* 123: 274, 1988).

hysterophyte, a saprophyte (obsol.).

Hysteropsis Rehm (1887), Dothideomycetes. 1, Europe.

Hysteropycnis Hilitzer (1929), anamorphic *Pezizomycotina*, St.0eH.?. 5, Europe; N. America.

Hysterostegiella Höhn. (1917), Helotiales. 10, widespread. See Hein (*Nova Hedwigia* 38: 669, 1983; key), Scheuer (*Biblhca Mycol.* 123: 274, 1988).

Hysterostoma Theiss. (1913) = *Dothidasteromella* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).

Hysterostomella Speg. (1885), Parmulariaceae. 17, widespread (tropical). See Hansford (*Mycol. Pap.* 15,

- 1946), Farr (*Sydowia* 38: 65, 1986), Inácio & Cannon (*Fungal Diversity* 9: 71, 2002).
- Hysterostomina** Theiss. & Syd. (1915) = *Hysterostomella* fide Hansford (*Mycol. Pap.* 15, 1946), Batista & Vital (*Atas do IMUR* 1: 53, 1960), von Arx & Müller (*Stud. Mycol.* 9, 1975).
- hysterothecium**, an elongated ascoma like that of the *Hysteriaceae* with a slit-like line of dehiscence.
- Hystriospheraeridium** Deflandre (1937), Fossil Fungi, Ascomycota. 1, Europe. See Deflandre (*Annales de Paléontologie* 26: 68, 1937).
- Hystricula** Cooke (1884) ? = *Winterella* (Sacc.) Kuntze fide Saccardo (*Syll. fung.* 1: 471, 1882).
- Hystrix** Alstrup & Olech (1993) [non *Hystrix* Moench 1794, *Poaceae*] = *Acanthonitschkea* fide Eriksson & Santesson (*SA* 14: 54, 1995).
- I**, see iodine.
- IAL**, see Societies and organizations.
- Ialomitzia** Gruia (1964), anamorphic *Pezizomycotina*, Hso.0eP.?. 1, Rumania. Alternatively a cyanobacterium.
- IAP**, see Index of Atmospheric Purity.
- ibotenic acid**, a metabolite of *Amanita muscaria*, etc., toxic to humans and flies (*Musca* spp.); amanita factor C.
- ICBN**, International Code of Botanical Nomenclature; see Nomenclature.
- Iceland moss**. *Cetraria islandica*, habitually eaten by reindeer and caribou, and used as a substitute for flour during hard times in Scandinavia and Iceland, is rich in digestible carbohydrates; used in soups and pastilles. After the Chernobyl nuclear accident in April 1986, this species accumulated radioactive Caesium in levels harmful for reindeer populations. See Dahl (*Bot. Rev.* 20: 463, 1954); Machart *et al.* (*J. Environmental Radioactivity* 97: 70, 2007); Richardson & Young (in Seaward (Ed.), *Lichen Ecology*: 121, 1977); Animal mycophagists; Medical uses of fungi.
- Icerymyces** Brain (1923) nom. conf., anamorphic *Pezizomycotina*, St.0eH.?. 1 (in insects). See Batra in Subramanian (Ed.) (*Taxonomy of fungi* 1: 187, 1978).
- Ichthyochytrium** Plehn (1920), Chytridiales. 1 (in *Cyprinus*), Germany.
- Ichthyosporidium** Caullery & Mesnil (1905), Microsporidia. 2, Europe; N. America. *I. giganteum*, causal agent of fish disease. See Canning in Margulis & *al.* (Eds) (*Handbook of Protoctista*: 53, 1990; systematic position).
- Icmadophila** Trevis. (1853) nom. cons., Icmadophilaceae (L). 6, widespread (northern hemisphere). See Frey (*Rabenh. Krypt.-Fl.* 9 4.1: 819, 1933), Honegger (*Lichenologist* 15: 57, 1983; asci), Rambold *et al.* (*Biblthca Lichenol.* 53, 1993), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998), Platt & Spatafora (*Lichenologist* 31: 409, 1999), Galloway (*Lichenologist* 32: 294, 2000; synonym of *Knightiella*), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Icmadophilaceae** Triebel (1993), Pertusariales (L). 6 gen. (+ 11 syn.), 58 spp.
Lit.: Rambold *et al.* (*Biblthca Lichenol.* 53, 1993), Kantvilas (*Herzogia* 12: 7, 1996), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998), Platt & Spatafora (*Lichenologist* 31: 409, 1999), Galloway (*Lichenologist* 32: 294, 2000), Platt & Spatafora (*Mycol.* 92: 475, 2000), Lumbsch *et al.* (*Mol. Phylogen. Evol.* 31: 822, 2004), Reeb *et al.* (*Mol. Phylogen. Evol.* 32: 1036, 2004), Wedin *et al.* (*MR* 109: 159, 2005), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny).
- Icmadophilomyces** E.A. Thomas ex Cif. & Tomas. (1953) nom. illegit. = *Icmadophila*.
- icones** (Latin), pictures; Figures; plates.
- ICSU**, see Societies and organizations.
- ICTF**, see Societies and organizations.
- ICZN**, International Code of Zoological Nomenclature.
- Idiocercus** B. Sutton (1967), anamorphic *Pezizomycotina*, Cpd.0eH.19. 3, widespread. See Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993).
- Idiomyces** Thaxt. (1893), Laboulbeniaceae. 1, Europe; Japan. See Benjamin (*Aliso* 10: 345, 1983), Tavares (*Mycol. Mem.* 9: 627 pp., 1985), Hafellner (*Linzer biol. Beitr.* 31: 507, 1999; Iberian peninsula).
- id-reaction**, see dermatophytid.
- Idriella** P.E. Nelson & S. Wilh. (1956), anamorphic *Hymenoscyphus*, Hso.0eP.10. c. 30, widespread. See von Arx (*Sydowia* 34: 30, 1981; key), Castañeda Ruiz & Kendrick (*Univ. Waterloo Biol. Ser.* 35: 1, 1991; 4 n.spp.), Rodrigues & Samuels (*Mycotaxon* 43: 271, 1992; endophytic spp. on palms), Lascaris & Deacon (*MR* 98: 1200, 1994; growth, sporulation).
- IFO**, Institute for Fermentation (Osaka, Japan); founded 1944 as Kōkū-Hakkō Kenyūsho and supported by the Japanese government and Takeda Chemical Industries Ltd, with a separate board of trustees; see Anon. (*Res. Comm. IFO* 17: 1, 1995; 50th anniv. issue).
- Igneocumulus** A.W. Ramaley (2003), ? Hypocreales. Anamorph *Lecythophora*-like. 1, USA. See Ramaley (*Mycotaxon* 88: 158, 2003).
- Ijuhya** Starbäck (1899), Bionectriaceae. Anamorph *Acremonium*-like. 7 (on wood and herbaceous debris), widespread. See Samuels (*Mem. N. Y. bot. Gdn* 48, 1988), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- ikatake** ('ika-take'), the basidiome of *Aseroë arachnoidea*.
- IKI**, see iodine.
- Iledon** Samuels & J.D. Rogers (1986), anamorphic *Botryohypoxylon*, St. = eP.15. 1, Venezuela. See Samuels & Rogers (*Mycotaxon* 25: 633, 1986).
- Ileodictyon** Tul. ex M. Raoul (1844), Phallaceae. 2, widespread (esp. southern hemisphere). See Ka *et al.* (*Mycobiology* 32: 54, 2004; Korea).
- illegitimate**, see Nomenclature. Cf. legitimate.
- Illosporiosis** D. Hawksw. (2001), anamorphic *Hypocreales*. 1 (lichenicolous), Italy. See Sikaroodi *et al.* (*MR* 105: 457, 2001).
- Illosporium** Mart. (1817), anamorphic *Hypocreales*, Cpd.0eH.?. 1 (on lichens, *Peltigera*), widespread (north temperate). See also *Marchandiomyces*. See Hawksworth (*Bull. Br. Mus. nat. hist. Bot.* 6: 181, 1979), Sikaroodi *et al.* (*MR* 105: 453, 2001; phylogenetic posn.).
- Ilyomyces** F. Picard (1917), Laboulbeniaceae. 2, Europe. See Weir (*MR* 99: 789, 1995), Santamaría (*Fl. Mycol. Iberica* 5, 2003; Iberian peninsula).
- Ilytheomyces** Thaxt. (1917), Laboulbeniaceae. 15, widespread. See Rossi (*Mycol.* 90: 1047, 1998; Bolivia).
- IMA**, see Societies and organizations.
- IMA Committee for Asia**. Founded in 1977; recognized as the Committee for Asia within the Interna-

- tional Mycological Association (q.v.); structure comprises an executive, with national representatives from Asian countries. Publications: *IMA Committee for Asia Newsletter*. Website: <http://web.hku.hk/%7Ekdhhyde/imaca>.
- Imazekia** Tak. Kobay. & Y. Kawabe (1992), ? Phyllachoraceae. 1 (from living leaves), Japan. See Kobayashi & Kawabe (*Jap. Jour. Trop. Agr.* 36: 195, 1992).
- Imbricaria** (Schreb.) Michx. (1803) [non *Imbricaria* Juss. 1789, *Sapotaceae*] = *Anaptychia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Imbricariaceae** Chevall. (1826) = *Physciaceae*.
- imbricate** (of pilei, scales, squamules, etc.), partly covering one another like the tiles on a roof.
- IMC**, see International Mycological Congresses.
- IMI** (Imperial Bureau of Mycology, 1920-29; Imperial Mycological Institute, 1930-47; Commonwealth Mycological Institute, 1948-85; CAB International Mycological Institute, 1986-90; International Mycological Institute, 1990-98). A former Institute of CABI (q.v.), originally based in Kew, then relocated to Egham, Surrey, UK in 1992; see Aitchison & Hawksworth (*IMI: retrospect and prospect*, 1993). The acronym remains in use for the dried reference collection.
- Imicles** Shoemaker & Hambl. (2001), anamorphic *Pezizomycotina*. 6, widespread. See Shoemaker & Hambleton (*CJB* 79: 598, 2001).
- Imimyces** A. Hern. Gut. & B. Sutton (1997) = *Polydesmus* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- immaculate**, not spotted.
- immarginate**, having no well-defined edge.
- Immersaria** Rambold & Pietschm. (1989), *Porpidiaceae* (L). 1, widespread. See Calatayud & Rambold (*Lichenologist* 30: 231, 1998), Buschbom & Mueller (*Mol. Phylogen. Evol.* 32: 66, 2004; phylogeny).
- immersed**, embedded in the substratum.
- Immersiella** A.N. Mill. & Huhndorf (2004), *Lasiosphaeriaceae*. 2. See Miller & Huhndorf (*MR* 108: 31, 2004), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Immersisphaeria** Jaklitsch (2007), *Sordariomycetes*. 1 (fungicolous), Poland. See Jaklitsch (*Mycotaxon* 101: 17, 2007).
- immobilisation**, the controlled, intentional, attachment of fungal cells in fermentation technology (Webb, *Mycologist* 3: 163, 1989). Cf. biomass support particles.
- Immotthia** M.E. Barr (1987), *Pleosporales*. Anamorph *Coniothyrium*-like. 1, Europe; N. America. See Barr (*Mycotaxon* 29: 501, 1987), Jaklitsch *et al.* (*Öst. Z. Pilzk.* 11: 93, 2002).
- immune**, the condition of having qualities which do not allow, or not having qualities which allow, the development of a disease to take place; **natural immunity** is based on qualities natural to the organism, **acquired immunity**, on the development of such qualities in the course of its life-time, generally as a result of taking the disease naturally or experimentally (not certainly present in plants).
- immune (from)**, exempt from infection (*TBMS* 33: 155, 1950); having immunity.
- immunization**, the process of increasing the resistance of, or of giving resistance to, a living organism.
- immunosuppressant**, a substance such as the fungal metabolite cyclosporin (produced by *Tolypocladium inflatum*), which partly or completely suppresses the immune system; used to prevent rejection of transplanted organs.
- imperfect state**, see States of fungi; Anamorphic fungi.
- imperforate**, having no opening.
- Imprimospora** G. Norris (1986), *Fossil Fungi*. 1 (Eocene), Canada.
- impriorable**, illegitimate (obsol.).
- Impudentia** Vujanović (2003), anamorphic *Pezizomycotina*, H??.?. 2 (on insects), Canada. See Vujanovic *et al.* (*Mycotaxon* 88: 234, 2003).
- Imshaugia** S.L.F. Mey. (1985), *Parmeliaceae* (L). 3, widespread (northern hemisphere). See Hinds (*Mycotaxon* 72: 271, 1999; N. Am.), Elix (*Mycotaxon* 90: 337, 2004; S America), Thell *et al.* (*Symb. bot. upsal.* 34 no. 1: 429, 2004; biogeography), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- in situ** (Lat.), **in-situ** (Engl.) (of an organism), one living in its natural habitat; cf. *ex situ*.
- inaequi-hymeniiferous** (of hymenial development in agarics), having basidia which mature and shed their spores in zones; the coprinus type (Buller, *Researches* 2: 19, 1922). cf. *aequi-hymeniiferous*.
- Inapertisporites** Hammen ex Rouse (1959), *Fossil Fungi*. 28 (Jurassic, Cretaceous, Eocene, Tertiary), widespread.
- incertae sedis (inc. sed.)**, of uncertain taxonomic position.
- Incertisporites** Hammen (1954), *Fossil Fungi*. 1 (Cretaceous, Tertiary), Colombia.
- Inciliaria** Fr. (1825) nom. dub., *Fungi* (L).
- incised**, as if cut into; esp. of a pileus margin or lobes of a foliose lichen thallus.
- Incolaria** Herzer (1893), *Fossil Fungi ? Fungi*. 1 (Carboniferous), N. America.
- incompatible** (1) (of sex), unable to be cross-mated due to mating type or fertility barriers; (2) (of vegetative mycelia), unable to form a stable heterokaryon due to genetic differences at one or more vegetative compatibility (vc, het) loci. See vegetative compatibility.
- incrassate**, made thick.
- Incrucipulum** Baral (1985), *Hyaloscyphaceae*. c. 4, widespread (temperate). See Baral (*Z. Mykol.* 53: 119, 1987).
- Incrupila** Raitv. (1970), *Hyaloscyphaceae*. c. 10, Europe; N. America. See Raitviir & Galán (*MR* 98: 1137, 1994), Raitviir (*Micologia* 2000: 457, 2000), Raitviir (*Scripta Mycol.* 20, 2004).
- Incrupilella** Svrček (1986) = *Hyphodiscus* fide Baral (*SA* 13: 113, 1994).
- incrusted** (of hyphae), having matter excreted on the walls (Corner, 1950).
- Incrustocalyptella** Agerer (1983), *Cyphellaceae*. 3, Colombia; Papua New Guinea; Hawaiian Is.; Thailand. See Agerer (*Z. Mykol.* 49: 160, 1983), Desjardin *et al.* (*Fungal Diversity* 4: 75, 2000; Thailand).
- Incrustoporia** Domański (1963) = *Skeletocutis* fide David (*Naturaliste can.* 109: 235, 1982).
- Incrustoporiaceae** Jülich (1982) = *Polyporaceae*.
- incubation period**, the time between inoculation and the development of visible symptoms.
- indefinite**, not sharply limited.
- indehiscent** (of sporocarps, sporangia, etc.), not opening, or with no special method of opening.
- indeterminate** (1) having the edge not well-defined, esp. of fruit-bodies and leaf-spots; (2) (of conidiophores), continuing growth indefinitely.

Index of Atmospheric Purity (IAP). A numerical estimate of the purity of the air on the basis of the lichens present on trees (LeBlanc & DeSloover, *CJB* 48: 1485, 1970). See Air pollution, Bioindication.

Index of Ecological Continuity, see RIEC.

Index of Fungi. Produced by CABI, and appearing twice annually since 1940, this lists new and recently published nomenclatural novelties for fungi s.l. This publication provides a present-day continuation of the great mycological catalogues produced by Petrak, Saccardo, and Zahlbruckner. See Literature.

IndexFungorum

(www.indexfungorum.org/Names/IndexFungorumPartnership.htm). The *de facto* world mycological nomenclator. Freely available on-line, this resource provides information about scientific names of fungi at species level and below, including, where available, authors and place of publication, with hyperlinks to a scanned image of the main catalogue entry for each name and, where available, the protologue page.

Indian bread, see tuckahoe.

Indian paint fungus, *Echinodontium tinctorium* (q.v.).

Indiella Brumpt (1906) = *Madurella* fide Ciferri & Redaelli (*Mycopathologia* 3: 182, 1941).

indigenous, natural to a country or region; native.

indigenous property, see Bioprospecting, Patent protection.

indirect (of fruit-body development), see direct.

individualism in fungi, mechanisms may exist in nature to 'define' individuals involving co-operative (hyphal fusions, heterokaryosis) and individualistic methods. See Todd & Rayner (*Sci. Progr.* 66: 331, 1980), incompatible.

indumentum, a covering, such as hairs, etc.

indurated, made hard.

Induratia Samuels, E. Müll. & Petrini (1987), Xylariaceae. Anamorph *Nodulisporium*. 1, New Zealand. See Samuels & Rossman (*Mycol.* 84: 26, 1992).

indusium (1) cover; (2) (of phalloids), a net-like structure hanging from the top of the stipe under the pileus.

Industrial mycology. Fungi are used in many industrial processes. Because of the ease with which many can be grown in pure culture, and the convenience of their single-cell growth, use of yeasts has dominated, but increasing numbers of other fungi are now being used for new processes.

Some of the more important substances produced, frequently from different forms of carbohydrates and starch, are: alcohol (by *Saccharomyces cerevisiae* from sugar or, after hydrolysis, starch, e.g. cereals, potatoes, or cellulose, e.g. wood, waste sulphite liquor); citric acid (*Aspergillus*, *Penicillium*, *Mucor*); enzyme mixtures such as takadiastase (*Aspergillus*); fats (*Penicillium*); fumaric (*Rhizopus*) and gluconic (*Aspergillus*) acids; glycerol (*S. cerevisiae* var. *ellipsoideus* by the sulphite process); riboflavin (various lactose-fermenting yeasts); itaconic acid (*A. terreus*, etc.; used as a copolymer with acrylic resins); kojic acid (*A. flavus* group); lactic acid (*Rhizopus*); lipoids ('fat') (*Endomycopsis vernalis*; also *Geotrichum candidum*); mycoprotein (*Fusarium venenatum*); rennin (*Rhizomucor pusillus*, *Rhizopus oligosporus*, etc.; O'Leary & Fox, *J. Dairy Res.* 41: 381, 1974); riboflavin (*Eremothecium*).

Steroid transformations are effected by hyphomycetes and other fungi (Peterson, in Rainbow & Rose

(Eds), *Biochemistry of industrial micro-organisms*: 537, 1963). Ensilage is another fermentation process and the retting of flax, hemp, and other fibres is dependent on pectin-attacking bacteria and fungi, see Thaysen & Bunker (1927). Fungi play a major role in production of many pharmaceutical commodities, including antibiotics, immunosuppressives, statins and vitamins (). More recent developments include 'mycelial paper' (the addition of mycelium of *Phytophthora cinnamomi* and other phycomycetes to wood pulp); see Johnson & Carlson (*Biotechnol. Bioeng.* 20: 1063, 1978), fuels from biomass (Jefferies *et al.*, in Smith *et al.*, 1980), and use of fungal chitin in applications to heal wounds (Hamlyn & Schmidt, *Mycologist* 8: 147, 1994).

Lit.: An Zhiquiang [ed.] (*Fungal biotechnology: a handbook of industrial mycology*, 2004), Arora (*Handbook of fungal biotechnology*, 2003), Beuchat (*Food and beverage mycology*, 1978), Bracken (*The chemistry of micro-organisms*, 1955), Brian (*TBMS* 58: 359, 1972; economic value of fungi), Emmons *et al.* (*Henrici's molds, yeasts and actinomycetes*, edn 2, 1947), Foster (*Chemical activities of fungi*, 1949), Fulmer & Werkman (*An index to the chemical action of micro-organisms on the non-nitrogenous compounds*, 1930), Galloway (*Applied mycology and bacteriology*, edn 3, 1950), Gray (*The relation of fungi to human affairs*, 1959), Hansen (*Jørgensen's Micro-organisms and fermentation*, 1948), Lafar (*Technische Mycologie*, 2 vols, 1896-1907 [English transl. 1889-1910], *Handbuch der technischen Mykologie*, 5 vols, 1904-14), Lemke (*J. industrial microbiol. and biotechnol.* 14: 355, 1995; industrial mycology and genetics), Leong & Berka (*Molecular industrial mycology: systems and applications for filamentous fungi*, 1991), Onions *et al.* (*Smith's Introduction to industrial mycology*, edn 7, 1981), Prescott & Dunn (*Industrial microbiology*, 1940; edn 4, 1982), Ramsbottom (*Rep. Br. Ass.* 1936: 189; uses of fungi), Smith & Berry (Eds) (*The filamentous fungi*, 1, *Industrial mycology*, 1975), Smith *et al.* (Eds) (*Fungal biotechnology*, 1980), Thaysen & Bunker (*The microbiology of cellulose, hemicellulose, pectins and gums*, 1927).

See also Antibiotics, Biodegradation, Biodeterioration, Biotechnology, Brewing, Cheese, Edible fungi, Fermented food and drinks, Genetic engineering, Lichens (Economics), Metabolic products, Mushroom cultivation, Nutrition, Pigments, Starters, Wine making.

Inermisia Rifai (1968) = *Byssonectria* fide Pfister (*Mycol.* 85: 952, 1994).

inermous, having no spines or prickles.

Inesiosporium R.F. Castañeda & W. Gams (1997), anamorphic *Pezizomycotina*, Hso.???. 2, Cuba; Hawaii. See Castañeda Ruiz & Gams (*Nova Hedwigia* 64: 485, 1997).

infarctate, solid; turgid.

infect (of a pathogen), to enter and establish a pathogenic relationship with an organism; to enter and persist in a carrier (*TBMS* 33: 155, 1950); to make an attack on an organism; (of an agent), to make infection of an organism take place; **-ed** (of an organism), attacked by a pathogen, cf. contaminated; **-ion**, the act of infecting; **-ious** (of diseases), resulting from infection; sometimes used in the sense of able to be handed on by touch (contagious) or by inoculum; **-ive** (of a pathogen), able to make an attack on a living

- organism; (of a vector, medium, etc.), having the power of effecting the transmission of a pathogen.
- inferior** (of an annulus), low down on the stipe.
- infested**, attacked by animals, esp. insects; sometimes used of fungi in soil or other substrata in the sense of 'contaminated'.
- infissitunicate** (Dughi, *C. r. hebd. Séanc. Acad. Sci., Paris* 243: 750, 1956), see ascus.
- inflated hypha**, see hypha.
- Inflatostereum** D.A. Reid (1965), Phanerochaetaceae. 2, S. America; Asia. See Reid (*Nova Hedwigia* Beih. 18: 143, 1965), Welden (*Revta Biol. trop.* 44 Suppl. 4: 91, 1996).
- inflexed** (of pileus margin), turned down (Fig. 19F).
- infra-** (prefix), below; **-generic** (of ranks), all those below that of genus; **-specific** (of ranks), all those below that of species; used in a parallel way for other ranks.
- Infrafungus** Cif. (1951), anamorphic *Pezizomycotina*, Hso.1≡ eH.?. 1 (on *Cladosporium*), Philippines. See Ciferri (*Mycopath. Mycol. appl.* 6: 26, 1951).
- Infundibulicybe** Harmaja (2003), Tricholomataceae. 13, widespread. See Harmaja (*Ann. bot. fenn.* 40: 215, 2003).
- infundibuliform**, funnel-like in form.
- Infundibulomyces** Plaingam, Somrith. & E.B.G. Jones (2003), anamorphic *Pezizomycotina*. 1, Thailand. See Plaingam *et al.* (*CJB* 81: 732, 2003).
- Infundibulum** Velen. (1934) = *Peziza* Fr. fide Eckblad (*Nytt Mag. Bot.* 15: 1, 1968), Svrček (*Acta Mus. Nat. Prag.* 32B: 115, 1976).
- Infundibura** Nag Raj & W.B. Kendr. (1981), anamorphic *Saccoblastiaceae*. 1, New Zealand; British Isles. See Nag Raj & Kendrick (*CJB* 59: 544, 1981).
- Ingaderia** Darb. (1897), Roccellaceae (L). 4, widespread. See Tehler (*CJB* 68: 2458, 1990; cladistics), Feige & Lumbsch (*Mycotaxon* 48: 381, 1993), Myllys *et al.* (*Bryologist* 101: 70, 1998), Follmann (*J. Hattori bot. Lab.* 90: 251, 2001; S America), Tehler & Irestedt (*Cladistics* 23: 432, 2007).
- ingest**, to obtain food by engulfing it; see phagotrophic. Cf. absorb.
- Ingoldia** R.H. Petersen (1962) = *Gyoerffyyella* fide Marvanová *et al.* (*Persoonia* 5: 29, 1967), Marvanová & Descals (*TBMS* 89: 499, 1987).
- Ingoldiella** D.E. Shaw (1972), anamorphic *Sistotrema*. 3 (with clamp connexions), Australia. See Nawawi & Webster (*TBMS* 78: 287, 1982).
- Ingoldiomyces** Vánky (1996), Tilletiaceae. 1 (in seeds of *Poaceae*), N. & S. America. See Castlebury *et al.* (*Mycol.* 97: 888, 2005; phylog.).
- Ingvariella** Guderley & Lumbsch (1997), Thelotremaaceae (L). 1, widespread (esp. mediterranean). See Guderley *et al.* (*Nova Hedwigia* 64: 152, 1997).
- inhabitant**, see symbiosis.
- inhibitory substances**, see staling substances.
- Inifatiella** R.F. Castañeda (1985), anamorphic *Pezizomycotina*, Hsy.≡ eP.1. 1, Cuba. See Castañeda (*Deuteromycotina de Cuba* Hyphomycetes III: 20, 1985).
- ink-caps**, basidiomata of *Coprinus*.
- innate**, bedded in; immersed.
- Innatospora** J.F.H. Beyma (1929) = *Arthrimum* fide Ellis (*Mycol. Pap.* 103, 1965).
- Inocephalus** (Noordel.) P.D. Orton (1991) = *Entoloma* fide Kuyper (*in litt.*).
- Inocibium** Earle (1909) = *Inocybe* fide Kauffman (*N. Amer. Fl.* 10, 1924).
- inoculate**, to put a microorganism, or a substance containing one, into an organism or a substratum.
- inoculation**, the act of inoculating [of (an organism or substratum)] *with* (the inoculum); *of* (the inoculum) *into* (an organism or substratum); by (an agent or method).
- inoculum**, the substance, generally a pathogen, used for inoculating.
- inoculum potential** (of a fungus or other microorganism), the energy of growth available for colonization of a substratum at the surface of the substratum to be colonized (Garrett, 1956).
- Inocutis** Fiasson & Niemelä (1984), Hymenochaetaceae. 8. See Wagner & Fischer (*Mycol.* 94: 998, 2002).
- Inocybaceae** Jülich (1982), Agaricales. 13 gen. (+ 22 syn.), 821 spp.
Lit.: Kuyper (*Persoonia* Suppl. 3: 1, 1986), Singer (*Agaric. mod. Tax.* 4th ed, 1986), Nordstein (*Syn. Fung.* 2: 115 pp., 1990), Senn-Irlet (*Persoonia* 16: 1, 1995), Kropp & Matheny (*Mycol.* 96: 295, 2004), Aime *et al.* (*Am. J. Bot.* 92: 74, 2005), Binder *et al.* (*Systematics and Biodiversity* 3: 113, 2005), Matheny (*Mol. Phylogen. Evol.* 35: 1, 2005), Matheny & Bougher (*Mycol. Progr.* 5: 2, 2006).
- Inocybe** (Fr.) Fr. (1863), Inocybaceae. c. 500, widespread (esp. temperate). See Pegler & Young (*Kew Bull.* 26: 499, 1972; basidiospores, key Br. spp.), Horak (*N.Z. Jl Bot.* 15: 713, 1977; key 24 NZ spp.), Alessio (*Bres. Icon. Mycol.* 29 Suppl. 3: 1, 1980; col. illustr. & key Eur. spp.), Stangl & Veselský (*Česká Mykol.* 34: 45, 1980; rough-spored spp.), Kuyper (*Persoonia* Suppl. 3: 1, 1986).
- Inocybella** Zerova (1974) = *Inocybe* fide Kuyper (*in litt.*).
- Inocyclus** Theiss. & Syd. (1915), Parmulariaceae. 7 (esp. on *Pteridophyta*), widespread (tropical).
- Inoderma** (Ach.) Gray (1821) = *Thrombium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Inoderma** Berk. (1881) = *Mesophellia*.
- Inoderma** P. Karst. (1879) = *Inodermus*.
- Inodermus** Qué. (1886) = *Inonotus* fide Donk (*Persoonia* 1: 173, 1960).
- Inodosporus** Overstreet & Weidner (1974), Microsporidia. 2. See Overstreet & Weidner (*Z. ParasitKde* 44: 169, 1974).
- Inoloma** (Fr.) Wünsche (1877) = *Cortinarius*.
- Inonotaceae** Fiasson & Niemelä (1984) = Hymenochaetaceae.
- Inonopsis** Parmasto (1973), Hymenochaetaceae. 1, widespread (north temperate). See Wagner & Fischer (*Mycol.* 94: 998, 2002).
- Inonotus** P. Karst. (1879), Hymenochaetaceae. c. 80, widespread. s. str. 30 species. See Pegler (*TBMS* 47: 175, 1964; key), Gilbertson (*Mem. N. Y. bot. Gdn* 28: 67, 1976), Wagner & Fischer (*MR* 105: 773, 2001), Ryvarden (*Syn. Fung.* 15: 70, 2002; neotropical species), Ryvarden (*Syn. Fung.* 21: 149 pp., 2005; 101 species).
- inoperculate** (of an ascus or sporangium), opening by an irregular apical split to discharge the spores, see ascus; cf. operculate.
- Inopilus** (Romagn.) Pegler (1983) = *Entoloma* fide Kuyper (*in litt.*).
- inordinate**, in no order.
- inquinant**, stained; blackened; dirty (obsol.).
- Insecticola** Mains (1950) = *Akanthomyces* fide Samson & Evans (*Acta Bot. Neerl.* 23: 28, 1974).

Insects (and other invertebrates) and fungi. The relationships between insects and fungi are many and complex: for reviews, see Vega & Blackwell (*Insect-fungal associations*, 2005; ecology, evolution) and Wilding *et al.* (Eds) (*Insect-fungus interactions*, 1989).

Termites, ants (Uphof, *Bot. Rev.* 8: 563, 1942; Lüscher, *Nature* 167: 34, 1951; Weber, *Ecology* 38: 480, 1957; *Lepiota* cultured by *Cyphomyrma*) and ambrosia beetles make 'cultures' of fungi (Bakshi, *TBMS* 33: 111, 1950). This 'insect agriculture' is highly evolved, often complex and may also involve further species, for example bacteria. The insect may then feed on the resulting cultures directly, or on the fungal substratum after the fungus has made it more digestible (see Termites and fungi). Ambrosia beetles have evolved special structures called *mycangia* which are adaptations for the collection and transport of fungal hyphae or spores (similar structures are also seen in some other beetles and certain mites); each species of ambrosia beetle may have its own specific fungus. 'Ambrosia galls' on plants caused by a mutualistic association between *Cecidomyiidae* flies and anamorphs of *Botryosphaeria* (see galls). Other insects use fungus spores as food (e.g. herbarium beetles, q.v.), and the transmission of fungus spores (esp. slime spores), in addition to pycniospores and other 'diploidizing agents', is frequently effected by insects (see Smell). See Leach (*Insect transmission of plant diseases*, 1940), Carter (*Insects in relation to plant diseases*, 1962; edn 2, 1973); Evans (*Ann. Appl. Biol.* 75: 331, 1973); also stigmatomycosis. Molluscs such as slugs have also been observed feeding on fungal spores (Buller, *TBMS* 7: 270, 1922), and some fungi may have evolved mechanisms for deterring this feeding (Wood *et al.*, *Biochemical systematics and ecology* 29: 531, 2001; Wood & Lefevre, *Biochemical systematics and ecology* 35: 634, 2007).

Many invertebrates, particularly mites and molluscs, graze on lichens. Mites and ants may be important in the dispersal of soredia and ascospores ingested by rotifers may be viable after excretion. Some lichens have been reported from shells of land snails and some from marine limpets. Some foliose species have been found on *Coleoptera* (see Gressit, *Entom. News* 80: 1, 1969). Many moths and other insects mimic lichens in larval or adult stages as well as using them for food. Lichen acids do little to deter grazing molluscs and may pass through the gut unchanged (Zopf, *Biol. Zbl.* 16: 593, 1896). See Lawrey (*Biology of lichenized fungi*, 1984), Richardson (*The vanishing lichens*, 1975), Seaward & Gerson (in Seaward (Ed.), *Lichen ecology*: 69, 1977; detailed review), Smith (*Lichens*, 1921 [reprint 1975]); Lichens, soredia.

Certain beetles are frequently associated with myxomycetes, in at least some cases involved with spore dispersal, and there is a growing literature on these associations (e.g. Kotelenets, [*Mikologiya i Fitopatologiya*] 37: 50, 2003) [in Russian]. Insects, other arthropods, and other invertebrates, including molluscs have been observed to feed on myxomycetes. See reviews by Ing (*Proc. S. Lond. Ent. Nat. Hist. Soc.* 1967: 18, 1967) and the reports of Keller & Snell (*Mycol.* 94: 757, 2002) and Waggoner & Poinar (*J. eucaryotic microbiology* 39: 639, 1992; fossil records of myxomycetes and associated beetles).

See Biological control, Co-evolution, Entomoge-

nous fungi, Symbiosis.

Insiticia Earle (1909) = *Mycena* fide Singer (*Agaric. mod. Tax.*, 1951).

insititious, of inserted nature, introduced from without.

Insolibasidium Oberw. & Bandoni (1984), *Platyglloeaceae*. 1, N. America; Australia. See Cunnington & Pascoe (*Australas. Pl. Path.* 32: 433, 2003; Australia).

inspissate, made thick.

Institale Fr. (1829) = *Hypoxylon* Bull. fide Læssøe (*SA* 13: 43, 1994).

integrated (of conidiogenous cells), incorporated in the main axis or branches of the conidiophore; cf. discrete.

intellectual property, see Bioprospecting, Patent protection.

inter- (prefix), between; among.

interascal tissue, see hamathecium.

interascicular parenchyma, the paraphysis-like hyphae or paraphysoidal interthecial fibres (Stevens) (obsol.).

interbiotic, living as a parasite on or near one or more living organisms, as certain rhizoidal chytrids.

Intercalarispora J.L. Crane & Schokn. (1983), anamorphic *Pezizomycotina*, Hso.#eP.1. 1 (aquatic), USA. See Crane & Schoknecht (*CJB* 61: 2243, 1983), Mercado-Sierra *et al.* (*Mycotaxon* 67: 417, 1998).

intercalary (1) (of growth), between the apex and the base; (2) (of cells, spores, etc.), between two cells.

intercellular, between cells.

International Mycological Association. Founded in 1971; recognized as the Section for General Mycology within the International Union of Biological Societies; objective is to encourage all aspects of mycology; structure comprises individual and corporate members, an elected executive, with regional committees for Africa (see African Mycological Association), Asia (see IMA Committee for Asia), Australasia (see Australasian Mycological Association), Europe (see European Mycological Association), Latin America (see Asociación Latino-americana de Micología) and North America (see Mycological Society of America); organizes International Mycological Congresses (q.v.). Website: www.ima-mycology.org.

International Mycological Congresses (arranged by the International Mycological Association, see Societies and organizations). (1) Exeter, UK (1971; *TBMS* 58(2), Suppl.: 1-40, 1972); (2) Tampa, USA (1977; *Mycol.* 70: 253-265, 1978); (3) Tokyo, Japan (1983); (4) Regensburg, Germany (1990); (5) Vancouver, Canada (1994); (6), Jerusalem, Israel (1998); (7), Oslo, Norway (2002); (8), Cairns, Australia (2006). The next congress is scheduled for Edinburgh, UK in 2010.

Internet. Since the previous edn of this *Dictionary*, the internet has become a huge resource for mycological information. Resources available on the internet are developing very rapidly, but individual websites are notoriously ephemeral. As a result, search engines such as Baidu (www.baidu.com), Google (www.google.com), Guruji (www.guruji.com), Naver (www.naver.com) and Yahoo (www.yahoo.com) are essential tools, and collaborative projects such as Hoodong (www.hoodong.com) and Wikipedia (www.wikipedia.org) provide ingress to a vast amount of information, some truly authoritative.

Most (but far from all) mycological information on the internet is in the English language. There is a strong movement among mycologists and other life scientists to make information about scientific names of fungi, distributional (biodiversity) information about living organisms, and taxonomic publications freely and openly available on-line. A selection of non-commercial English language websites which provide free and open information specifically about fungi, are listed below (those also functioning in other languages are marked with an asterisk).

General

Cybertruffle* (www.cybertruffle.org.uk)
 IndexFungorum Partnership
 (www.indexfungorum.org/Names/IndexFungorumPartnership.htm)
 Landcare
 (<http://nzfungi.landcareresearch.co.nz/html/mycology.asp>) [mainly New Zealand]
 Mycobank (www.mycobank.org)
 Mycology.net (www.mycology.net)
 WWW Virtual Library: Mycology
 (<http://mycology.cornell.edu>)
 USDA Systematic Mycology and Microbiology Laboratory* (<http://nt.ars-grin.gov/fungalatabases/>)

Authors of fungal names and other mycologists

Authors of Fungal Names
 (www.indexfungorum.org/Names/AuthorsOfFungalNames.asp)
 Cybertruffle's Fungal Valhalla
 (www.cybertruffle.org.uk/valhalla)
 Lichenologist directory
 (www.botany.hawaii.edu/lichen)
 Mycologists on-line (www.fungi.sav.sk/myco)

Biodiversity information (when, where and with what fungi occur)

Cybertruffle's Robigalia*
 (www.cybertruffle.org.uk/robigalia)
 IMI on-line
 (<http://194.203.77.76/herbIMI/IMINumber.asp>)
 Index of checklists of lichens and lichenicolous fungi
 (www.biologie.uni-hamburg.de/checklists/lichens/portals/index_index.htm)
 Landcare
 (<http://nzfungi.landcareresearch.co.nz/html/mycology.asp>) [mainly New Zealand]
 Mycotaxon regional checklists in downloadable format (www.mycotaxon.com/resources/weblists.html)
 USDA Systematic Mycology and Microbiology Laboratory* (<http://nt.ars-grin.gov/fungalatabases/>)

Conservation

Ascomycete conservation
 (www.cybertruffle.org.uk/ascos)
 IUCN Species Survival Commission Fungi Specialist Group
 (www.rbv.vic.gov.au/iucnsscfungi/welcome_to_iucn)
 Mildew, mould and myxomycete conservation
 (www.cybertruffle.org.uk/moulds)
 Rust and smut conservation
 (www.cybertruffle.org.uk/rustsmut)

Distribution maps

Cybertruffle's Robigalia*
 (www.cybertruffle.org.uk/robigalia)
 Landcare
 (<http://nzfungi.landcareresearch.co.nz/html/mycology.asp>) [New Zealand]

Mycological literature (including catalogues and thesauri)

Bibliography of Systematic Mycology
 (www.indexfungorum.org/BSM/bsm.asp)
 Cyberliber (www.cybertruffle.org.uk/cyberliber)
 LibriFungorum
 (<http://194.203.77.76/LibriFungorum/Index.htm>)
 Mycobank (www.mycobank.org/MycoBiblio.aspx)
 USDA Systematic Mycology and Microbiology Laboratory* (<http://nt.ars-grin.gov/fungalatabases/literature/literature.cfm>)

Mycological societies

African Mycological Association
 (<http://194.203.77.69/AfricanMycologicalAssociation>)
 Australasian Mycological Association
 (<http://bugs.bio.usyd.edu.au/AustMycolSoc/Home/ams.html>)
 European Mycological Association
 (www.euromould.org)
 International Association for Lichenology
 (www.lichenology.org)
 International Mycological Association (www.ima-mycology.org)
 International Mycorrhiza Society
 (www.mycorrhizas.org)
 International Society for Human and Animal Mycology (www.isham.org)
 International Society for Plant Pathology
 (www.isppweb.org)
 Latin-American Mycological Association*
 (www.almic.org) [Caribbean, Central America, Mexico and South America]
 Mycological Society of America
 (www.msafungi.org) [North America]
 The International Mycological Directory
 (www.cybertruffle.org.uk/imd) maintains an extensive and updated list of these and other mycological societies.

Fungal reference collections

International Mycological Directory
 (www.cybertruffle.org.uk/imd)

Photographs of fungi

Lichen-forming fungi
 (www.nhm.uio.no/botanisk/lavherb.htm)

Scientific names of fungi and their associated organisms [none of these lists are exhaustive]

Cybernome* (www.cybertruffle.org.uk/cybernome)
 Dictionary of the Fungi Hierarchy
 (www.indexfungorum.org/Names/fundic.asp)
 Fungus Family Names Database
 (www.indexfungorum.org/Names/Families.asp)
 IndexFungorum
 (www.indexfungorum.org/Names/Names.asp) [the *de facto* world standard for fungal names]
 Mycobank (www.mycobank.org/MycoTaxo.aspx)
 Nomen.eumycetozoa.com (www.eumycetozoa.com) ['myxomycete' nomenclator]
 USDA Systematic Mycology and Microbiology Laboratory* (<http://nt.ars-grin.gov/fungalatabases/nomen/Nomenclature.cfm>)
 Scientific names of other organisms associated with fungi [none of these lists are exhaustive]
 Cybernome* (www.cybertruffle.org.uk/cybernome)
 International Plant Names Index (www.ipni.org) [names of seed-producing plants]
 Species2000 (www.sp2000.org) [names of all groups of organisms]

More general English language websites providing information of value to mycologists include:
 Biodiversity Heritage Library
 (www.biodiversitylibrary.org)
 Global Biodiversity Information Facility
 (www.gbif.org)
 Genbank
 (www.ncbi.nlm.nih.gov/sites/entrez?db=taxonomy)
 Index Herbariorum
 (http://sciweb.nybg.org/science2/IndexHerbariorum.asp)
 Text of international code governing nomenclature of fungi (http://ibot.sav.sk/icbn/main.htm).

interspace (of a pileus), the space between the lamellae.

interthecial, between asci.

intervenose (of a pileus), veined in the interspaces.

Intexta J.I.R. Larsson, Steiner & Bjørnson (1997), Microsporidia. 1. See Larsson *et al.* (*Acta Protozool.* 36: 295, 1997).

Intextomyces J. Erikss. & Ryvarden (1976), Agaricomycetes. 4, widespread. See Eriksson & Ryvarden (*Cortic. N. Europ.* 4: 735, 1976).

intra- (prefix), within; inside.

intracellular, within the cell.

intrahyphal, see hypha.

Intralichen D. Hawksw. & M.S. Cole (2002), Pezizomycotina. 3, widespread. See Hawksworth & Cole (*Fungal Diversity* 11: 88, 2002).

intramatrical, living in the matrix or substratum.

intramatrical spores, an alternative name for vesicles produced in host roots by most endomycorrhizal fungi.

intraparietal, within a wall or walls (e.g. of crystals amongst the tissues of an exciple).

Intrapes J.F. Hennen & Figueiredo (1979), anamorphic *Pucciniales*. 1 (on *Couepia* (*Chrysobalanaceae*)), Brazil. Anamorph name for (II). See Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983).

Intrapredatorus W.J. Chen, T.L. Kuo, S.T. Wu (1998), Microsporidia. 1. See Chen *et al.* (*Parasitol. Internat.* 47: 183, 1998).

Intraspora Oehl & Sieverd. (2006) = *Archaeospora* fide Schüssler & Walker (*in litt.*) but see, Oehl & Sieverding (*J. Appl. Bot. Food Quality Angew. Botan.* 80: 77, 2006).

Intrasporangium Kalakout., Kirillova & Krassiln. (1967), Actinobacteria. q.v.

intricate cortex (of lichen thalli), made up of hyphae twisted together; cf. *textura intricata*.

introrse, in the direction of the central axis; inwards.

intumescence, a swelling.

invaginated, covered by a sheath.

Inventories. Assessments of Biodiversity (q.v.) within specific areas, with the aim of cataloguing what is there and valuing its presence. The most prominent inventorying activity to date is the proposed All-Taxa Biodiversity Inventory (ATBI) of the Guanacaste Conservation Area, Costa Rica (Janzen & Hallwachs, *Draft report of an NSF Workshop, Philadelphia*, 1993). Inventories of fungi have been made for various small areas on the initiative of various largely unsupported individuals, classic examples being Esher Common and Slapton Ley, both in the UK, and both with thousands of fungi recorded from a few square km. After many years study of those sites, there is no evidence that the numbers of species new to each site are tailing off. To make an inventory of

fungi, even in a small area, thus clearly requires long-term financial investment at a level few if any governments are as yet prepared to contemplate. See Hawksworth *et al.* (*in* Janardhanan *et al.* (Eds), *Tropical mycology*, 1998), Mueller *et al.* (*Biodiversity of fungi - inventory and monitoring methods*, 2004), Rossman (*in* Peng & Chou (Eds), *Biodiversity and terrestrial ecosystems*: 169, 1994), Rossman *et al.* (*Protocols for an All Taxa Biodiversity Inventory of Fungi.*, 1998). See also: Biodiversity, Collection.

involucrellum, tissue forming the upper part of a perithecioid ascoma surrounding the true exciple, not involving host or substrate materials (cf. clypeus) and generally dimidiate (e.g. *Verrucaria*).

Involucrocarpon Servit (1953) = *Catapyrenium* fide Santesson (*Lichens and lichenicolous fungi of Sweden and Norway*, 1993).

Involucropyrenium Breuss (1996), Verrucariaceae (L). 4, widespread (temperate). See Breuss (*Annl. naturh. Mus. Wien Ser. B, Bot. Zool.* 98: 37, 1996).

Involucroscypha Raitv. (2002), Helotiales. 1. See Raitviir (*Mycotaxon* 81: 46, 2002).

Involucrothele Servit (1953) = *Thelidium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

involute, rolled in (Fig. 19I).

Involutisporonites R.T. Clarke (1965), Fossil Fungi. 4 (Cretaceous, Paleocene, Tertiary), China; USA.

Inzengaea Borzi (1885) = *Emericella* fide von Arx (*Gen. Fungi Sporul. Cult.* Edn 3, 1981).

iodine (I, J), used as Lugol's solution (I 0.5g, KI 1.5 g, water 100 ml), in potassium iodide (IKI; I 1%, KI 3%), and formerly often Melzer's reagent (see Stains) giving blue, red, lavender or violet colours seen best after pre-treatment with potassium hydroxide in spores, asci, hymenial tissues, etc. Reactions can vary according to the kind of iodine solution used, its concentration, the age of the material, and the nature of any pretreatment; all need to be reported when referring to such tests. Extensively used in the systematics of lichenized and non-lichenized fungi since Nylander (*Flora, Jena* 48: 465, 1865). See Baral (*Mycotaxon* 29: 399, 1987; caution in use), Common (*Mycotaxon* 41: 67, 1991; review I+ materials), Kohn & Korf (*Mycotaxon* 3: 165, 1975; pre-treatment), Nannfeldt (*TBMS* 67: 283, 1976; ascus plugs), amylomycan, amyloid, dextrinoid.

Iodophanaceae Prokhorov (1993) = Pezizaceae.

Iodophanus Korf (1967), Pezizaceae. Anamorph *Oedocephalum*. 16 (coprophilous), widespread. See Kimbrough *et al.* (*Am. J. Bot.* 56: 1187, 1969), Thind & Kaushal (*Indian Phytopath.* 31: 343, 1979), Valadon *et al.* (*TBMS* 74: 187, 1980; carotenoids, taxonomy), Kimbrough & Curry (*Mycol.* 77: 219, 1985; posn), de Cachi & Ranalli (*Nova Hedwigia* 49: 59, 1989; ontogeny), Kimbrough *et al.* *in* Hawksworth (Ed.) (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. 269 269: 398, 1994), Landvik *et al.* (*Nordic J. Bot.* 17: 403, 1997; DNA), Prokhorov (*Mikol. Fitopatol.* 31: 27, 1997; key), Hansen *et al.* (*Mycol.* 93: 958, 2001; phylogeny), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny).

Iodosphaeria Samuels, E. Müll. & Petrini (1987), Iodosphaeriaceae. Anamorphs *Ceratosporium*, *Seledosporella*-like. 2 (from leaves), widespread. See Samuels *et al.* (*Mycotaxon* 28: 473, 1987), Barr (*Mycotaxon* 39: 43, 1990; posn), Kang *et al.* (*Fungal Diversity* 2: 135, 1999; posn), Taylor & Hyde (*Sydowia*

- 51: 127, 1999; on palms), Hilber & Hilber (*The genus Lasiosphaeria and Allied Taxa*, 2002), Huhndorf *et al.* (*Mycol.* 96: 368, 2004).
- Iodosphaeriaceae** O. Hilber (2002), Xylariales. 1 gen., 2 spp.
Lit.: Hilber & Hilber (*Genus Lasiosphaeria and Allied Taxa*, 2002).
- Iodowynnea** Medel, Guzmán & S. Chacón (1996), Pezizaceae. 1, widespread (tropical). See Medel *et al.* (*Mycotaxon* 59: 127, 1996), Hansen *et al.* (*Mol. Phylogen. Evol.* 36: 1, 2005; phylogeny), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Van Vooren & Moyne (*BSMF* 122: 137, 2006; France).
- Iola**, see *Jola*.
- Ionaspis** Th. Fr. (1871), Hymeneliaceae (L). 7, widespread. See Magnusson (*Acta horti gotoburg.* 8: 1, 1933), Jørgensen (*Graphis Scripta* 2: 118, 1989; key 11 spp. Scandinavia), Lutzoni & Brodo (*Syst. Bot.* 20: 224, 1995).
- ionomidotic reaction**, release of a dark pigment into aqueous potassium hydroxide (KOH) mounts; an important taxonomic criterion in some dark coloured *Leotiales* apothecia (e.g. *Claussenomyces*; Oullette & Korf, *Mycotaxon* 10: 255, 1979).
- Ionomidotis** E.J. Durand ex Thaxt. (1923) ? = *Ameghiniella* fide Zhuang (*Mycotaxon* 31: 261, 1988; key), Gamundí (*MR* 95: 1131, 1991), Gamundí & Romero (*Fl. criptog. Tierra del Fuego* 10, 1998).
- Ionophragmium** Peres (1961), anamorphic *Pezizomycotina*, Cpt.≡ eP.?. 1, Brazil. See Peres (*Publicações Inst. Micol. Recife* 317: 11, 1961).
- Ioplaca** Poelt (1977), Teloschistaceae (L). 2, Nepal. See Poelt & Hinteregger (*Biblthca Lichenol.* 50, 1993; Himalaya).
- Iotideia** Clem. (1909) = *Peziza* Fr. fide Eckblad (*Nytt Mag. Bot.* 15: 1, 1968).
- ipomoearone**, a phytoalexin (q.v.) from sweet potato (*Ipomoea batatas*).
- Iraniella** Petr. (1949), *Pezizomycotina*. 1, Iran.
- Irene** Theiss. & P. Syd. (1917) = *Asteridiella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Irenina** F. Stevens (1927) = *Appendiculella* fide Hansford (*Beih. Sydowia* 2, 1961).
- Irenopsis** F. Stevens (1927), *Meliolaceae*. 70, widespread (tropical). See Hosagoudar (*Meliolales of India*: 363 pp., 1996; India), Mibey & Hawksworth (*Mycol. Pap.* 174: 108 pp., 1997; Kenya).
- Iridinea** Velen. (1934), ? *Helotiales*. 2, former Czechoslovakia.
- Iridionia** Sacc. (1902) ≡ *Irydyonia*.
- Irpex** Fr. (1828), *Meruliaceae*. 6, Europe; N. America. See Maas Geesteranus (*Persoonia* 7: 443, 1974), Buzina *et al.* (*J. Clin. Microbiol.* 43: 2009, 2005; clinical).
- Irpicaceae** Spirin & Zmitr. (2003) = *Steccherinaceae*.
- Irpiciochaete**, see *Irpicochaete*.
- Irpiciporus** Murrill (1905) = *Spongipellis* fide Pegler (*The polypores [Bull. BMS Suppl.]*, 1973).
- Irpicium** Bref. (1912) nom. dub. = *Abortiporus* fide Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974).
- Irpicochaete** Rick (1940) nom. dub., ? *Polyporales*.
- Irpicodon** Pouzar (1966), *Amylocorticaceae*. 1, Europe. See Wojewoda (*Acta Mycologica Warszawa* 38: 3, 2003; Poland).
- irpicoid**, having teeth, or becoming toothed, as in *Irpex*.
- Irpicomycetes** Deighton (1969), anamorphic *Pezizomycotina*, Hso.≡ eP.1. 2 (on *Schiffnerula*), Malaysia; Japan. See Deighton (*Mycol. Pap.* 118: 24, 1969), Watanabe & Narita (*Mycoscience* 35: 105, 1994).
- Irydyonia** Racib. (1900), ? *Rhytismatales*. 1, Java.
- Isaria** Pers. (1794), anamorphic *Cordycipitaceae*, Hsy.0eH.10. 7 (entomogenous), widespread. See Petch (*TBMS* 19: 34, 1934; spp. on insects), de Hoog (*Stud. Mycol.* 1, 1972; descr. spp., nomencl.), Luangsa-ard *et al.* (*Mycol.* 96: 773, 2004; phylogeny), Gams *et al.* (*Taxon* 54: 537, 2005; nomencl.), Hodge *et al.* (*Taxon* 54: 485, 2005; typification), Luangsa-ard *et al.* (*MR* 109: 581, 2005; phylogeny), Sung *et al.* (*Stud. Mycol.* 57, 2007).
- Isariaceae** Link (1826) = *Cordycipitaceae*.
- Isariella** Henn. (1908), anamorphic *Pezizomycotina*, Hsp.0eH.?. 2, C. & S. America. See Seifert (*Mem. N. Y. bot. Gdn* 49: 202, 1989).
- Isariopsisella** Höhn. (1929) = *Ramularia* Unger fide Braun (*Monogr. Cercosporaella, Ramularia Allied Genera (Phytopath. Hyphom.)* 2: 316, 1998).
- Isariopsis** Fresen. (1863) ≡ *Phacellium* fide Braun (*Nova Hedwigia* 47: 335, 1989; reassessment of spp.).
- Ischnochaeta** Sawada (1959) = *Erysiphe* fide Zheng (*Mycotaxon* 22: 209, 1985).
- Ischnoderma** P. Karst. (1879), *Fomitopsidaceae*. 10, widespread (temperate). See Pouzar (*Česká Mykol.* 25: 15, 1971), Jahn (*Westf. Pilzber.* 9: 99, 1973), Corner (*Beih. Nova Hedwigia* 97: 77, 1989), Roberts & Ryvarden (*Kew Bull.* 61: 55, 2006; Cameroon).
- Ischnodermataceae** Jülich (1982) = *Hapalopilaceae*.
- Ischnostroma** Syd. & P. Syd. (1914), anamorphic *Pezizomycotina*, Cpt.0fH.?. 1, Philippines.
- ISHAM**, see Societies and organizations.
- Ishwaramyces** Hosag. (2004), *Asterinaceae*. 1, India. See Hosagoudar *et al.* (*J. Econ. Taxon. Bot.* 28, 2004).
- Isia** D. Hawksw. & Manohar. (1978), *Sordariomycetes*. 2, India; Nepal; New Caledonia. See Hawksworth & Manoharachary (*TBMS* 71: 332, 1978).
- Isidiaceae** Rchb. (1841) = *Pertusariaceae*.
- isidiate**, having isidia.
- isidiiferous**, of a lichen thallus bearing isidia.
- Isidium** (Ach.) Ach. (1803) nom. rej. = *Pertusaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- isidium** (pl. **isidia**), a photobiont-containing protuberance of the cortex in lichens which may be warty, cylindrical, clavate, scale-like, coralloid, simple, or branched (Fig. 22D); occurring directly on the thallus (e.g. *Peltigera praetextata*, *Pseudevernia furfuracea*); may become soresiate (e.g. *Lobaria pulmonaria*). See Bailey (*in* Brown *et al.* *Lichenology: progress and problems*: 214, 1976; review), Du Rietz (*Svensk bot. Tidskr.* 18: 141, 1924; classification), Kershaw & Millbank (*Lichenologist* 4: 214, 1970; rôle), Puymaly (*Botaniste* 48: 237, 1965).
- Isipinga** Doidge (1921) = *Symphaster* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- islandicin**, toxins of *Penicillium islandicum*; a cause of hepatitis (yellow rice disease) in humans. See also luteoskyrin.
- islanditoxin**, see islandicin.
- iso-** (prefix), equal.
- isoenzyme**, see isozyme.
- isogamete**, one of two sex cells like in form.
- isogamy**, the conjugation of isogametes.

isohaplont, a haplont of cells having genotypically like nuclei (Kniep, 1928), cf. miktohaplont.

isokont (isokontous) (of cilia and flagella), of equal length. Cf. heterokont.

isolate (v.), (1) to make an isolation; (n), (2) the culture itself, esp. the first 1-spore or pure isolation of a fungus from any place; Lotsy's 'species' (Brierley, *Ann. appl. Biol.* 18: 420, 1931).

isolation (1) the process of getting a fungus or other organism into pure culture; (2) the culture itself.

Isolation methods. *Aquatic and marine fungi*: Couch (*J. Elisha Mitch. Scientific. Soc.* 55: 208, 1939; chytrids), Fuller *et al.* (*Mycol.* 56: 745, 1964; marine 'phycomycetes'), Fuller & Jaworski (*Zoosporic fungi in teaching and research*, 1987), Jones (Ed.) (*Recent advances in aquatic mycology*, 1976), Sparrow (*Aquatic phycomycetes*, edn 2, 1960). *Single spore isolation*: See Hildebrand (*Bot. Rev.* 4: 627, 1938; 16: 181, 1950), Badry (*Micromanipulators and micromanipulation*, 1963).

Soil fungi: Gams (*in* Winterhoff (Ed.), *Fungi in vegetation science*: 183, 1992; review); see also Soil fungi.

Spore trapping: See spora.

Use of antibiotics: Georg *et al.* (*Science* 114: 387, 1951) advocate penicillin 20 units/ml + streptomycin 40 units/ml to suppress unwanted bacteria when isolating fungi (see also cycloheximide); use of rose bengal in isolation media (Ottow, *Mycol.* 64: 304, 1972).

Isolation media: When isolating fungi, use of translucent media enables developing colonies to be clearly visible. On standard nutrient-rich media e.g. Malt Agar or Potato Dextrose Agar, fungal growth can be rapid. To facilitate separation of colonies, growth rate can be reduced by preparing standard media at quarter or half-strength. Tap Water Agar is an effective isolation medium since it restricts development of fast-growing fungi and discourages bacterial growth. Antibiotics added to media to eliminate bacterial contamination include penicillin G, streptomycin and chloramphenicol (see Media). Bacteria can also be eliminated by lowering the pH of the medium. Selective media are used to obtain particular fungi and exclude others. Many recipes for selective media have been published. See Singleton *et al.* (Eds) (*Methods for research on soilborne phytopathogenic fungi*, 1992), Davet & Rouxel (*Detection and isolation of soil fungi*, 2000), Tuite (*Plant pathological methods. Fungi & bacteria*, 1969). Selective methods often involve the addition of chemical inhibitors to isolation media. See Vaartja (*Phytopathology* 50: 870, 1960), Edgington (*Phytopathology* 61: 42, 1971). Broad spectrum growth inhibitors include Cyclosporin A, Cycloheximide, Dichloran and Rose Bengal. See Hocking & Pitt (*Applied and Environmental Microbiology* 39: 488, 1980), Bills & Polishook (*CJB* 69: 1477, 1991). Pentachloronitrobenzene (PCNB) can be used to select for basidiomycetes and *Fusarium* (Singleton *et al.*, 1992). Antibiotics of the polyene group, nystatin and pimarinic are also used in selective media for isolating *Pythium* and *Phytophthora*. See Eckert. & Tsao (*Phytopathology* 52: 771, 1962). Methylbezimidazole carbamate (Benomyl) is selective for some *Oomycota* and *Zygomycota*. At low concentrations, it is also used to select for basidiomycetes. See Hunt & Cobb (*CJB* 49: 2064, 1971). Selective media for conidial fungi is discussed

by Jong (*in* Cole & Kendrick (Eds), *Biology of conidial fungi* 2, 1981). For selective media used in food-borne fungi, see Samson *et al.* (*Introduction to food-borne fungiedn* 5, 1996).

See also entries on particular habitats, and Culture, and Preservation.

isolichenin, see lichenin.

isomorphic, like in form but unlike in structure.

Isomunkia Theiss. & Syd. (1915), Fungi. 1, Ecuador. See Petrak (*Sydowia* 5: 337, 1951).

Isomyces Clem. (1931) $\equiv$ Debaryomyces Lodder & Kreger ex Kreger.

isonym, a homotypic synonym; see basionym.

isoplanogamete, one of two motile sex cells like in form.

Isosoma Svrček (1989) = Cudoniella fide Baral (*SA* 13: 113, 1994).

isospory, see homosporous.

Isotexis Syd. (1931) = Elsinoë fide von Arx & Müller (*Stud. Mycol.* 9, 1975).

Isothea Fr. (1849), Phyllachoraceae. 4 (from living leaves), widespread (arctic-alpine). See Cannon (*MR* 100: 1409, 1996), Chlebicki & Suková (*Mycotaxon* 90: 153, 2004; Carpathians).

isotomic dichotomous branching, branching in which both dichotomies are about the same thickness and length so that the dichotomic pattern is visible even in older parts of the thallus, as in *Cladonia evansii*, cf. anisotomic dichotomic branching.

isotype, see type.

isozyme (isoenzyme), one of a family of enzymes with different molecular weights and electron charges and so separating in electrophoresis (q.v.).

Issatchenkia Kudrjanzev (1960) = Pichia fide Kurtzman *et al.* (*Int. J. Syst. Bacteriol.* 30: 503, 1980), Peterson & Kurtzman (*Antonie van Leeuwenhoek* 58: 235, 1990; molec. phylogeny), Yamada *et al.* (*Biosc., Biotechn., Biochem.* 61: 577, 1996; phylogeny), Kurtzman *et al.* *in* Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 221, 1998), Thanh *et al.* (*FEMS Yeast Res.* 4: 113, 2003; Vietnam), Sugiyama *et al.* (*Mycol.* 98: 996, 2006).

Issia J. Weiser (1977), Microsporidia. 3.

Isthmiella Darker (1967), Rhytismataceae. 4 (on conifers), N. America; Asia. See Darker (*CJB* 45: 1419, 1967), Hou *et al.* (*CJB* 83: 37, 2005; China).

Isthmolongispora Matsush. (1971), anamorphic *Pezizomycotina*, Hso. $\equiv$ eH.10. 5, Papua New Guinea. See de Hoog & Hennebert (*Proc. K. ned. Akad. Wet. Ser. C, Biol. Med. Sci.* 86: 343, 1983).

Isthmophragmospora Kuthub. & Nawawi (1992), anamorphic *Pezizomycotina*, Hso. $\equiv$ eP.10. 1 (aquatic), Malaysia. See Kuthubutheen & Nawawi (*CJB* 70: 101, 1992).

Isthmospora F. Stevens (1918), anamorphic *Trichothyrium*, Hso.0bP.1. 1, widespread (tropical).

isthmospore, a spore comprising two or more cells interconnected by a much narrower region, as in the ascospores of *Vialaea* (Cannon, *MR* 99: 367, 1995); a conidium composed of four more thick-walled cells separated by thin-walled cells as in *Isthmospora* (Hughes, *Mycol. Pap.* 50, 1953).

Isthmosporella Shearer & J.L. Crane (1999), Phaeosphaeriaceae. 1 (freshwater), USA. See Shearer & Crane (*Mycol.* 91: 141, 1999).

Isthmotricladia Matsush. (1971), anamorphic *Pezizomycotina*, Hso.1bH.10. 1, Papua New Guinea. See Matsushima (*Bull. natn. Sci. Mus. Tokyo*, B 14: 478,

- 1971), Roldan (*Mycotaxon* 42: 297, 1991; culture).
- isthmus** (1) the narrower or thinner-walled portion of an isthmospore (q.v.); (2) the thickened medial perforated septum of a polarilocular ascospore.
- isthmus disarticulation**, protoplasmic retraction during spore formation, with the secretion of an endosporic wall membrane.
- Isuasphaera** H.D. Pflug (1978), Fossil Fungi, anamorphic *Pezizomycotina*. 1 (c. 3800 million yr old Isua quartzite), Greenland.
- Itajahya** Möller (1895), Phallaceae. 1, widespread (tropical; subtropical). See Ahmad (*Lloydia* 8: 238, 1945), Malençon (*BSMF* 100: Atlas pl. 238, 1984).
- italicization** (of scientific names), see Classification.
- Itersonia** Rippel & Flehmig [not traced] nom. dub., ? Myxobacteria.
- Itersonilia** Derx (1948), anamorphic *Cystofilobasidiaceae*. 2, widespread (temperate). See Sowell & Korf (*Mycol.* 52: 934, 1960), Channon (*Ann. appl. Biol.* 51: 1, 1963; leaf spot and canker of parsnip by *I. pastinacae*), Webster *et al.* (*TBMS* 82: 13, 1984; ballistospore discharge), Yamada & Konda (*J. gen. appl. Microbiol.* Tokyo 30: 313, 1984; significance of coenzyme Q system in classification), Webster *et al.* (*TBMS* 91: 193, 1988; ballistospore discharge), Boekhout (*MR* 95: 135, 1991; phenetic systematics), Boekhout & Jille (*Syst. Appl. Microbiol.* 14: 117, 1991; mitosis and DNA content in *I. perplexans*), Boekhout *et al.* (*Can. J. Microbiol.* 37: 188, 1991; genomic characterization), Ingold (*Mycologist* 5: 35, 1991; development), Horita & Yasuoka (*Journal of General Plant Pathology* 68: 277, 2002; *Itersonilia perplexans* in Japan).
- Ithyphallus** Gray (1821) nom. rej. $\equiv$ Mutinus.
- ITS**, see Molecular biology.
- Ityorhoptrum** P.M. Kirk (1986), anamorphic *Pezizomycotina*, Hso.#eP.19. 1, British Isles. See Kirk (*TBMS* 86: 417, 1986).
- IUBS**, see Societies and organizations.
- IUCN**, International Union for the Conservation of Nature and Natural Resources; the World Conservation Union. See Conservation.
- IUMS**, see Societies and organizations.
- iwatake**, see rock tripe.
- Iwilsoniella** E.B.G. Jones (1991), Halosphaeriaceae. 1 (cooling tower water), British Isles. See Jones (*SA* 10: 7, 1991).
- Ixechinaceae** Guzmán (1974) = Boletaceae.
- Ixechinus** R. Heim (1968) = *Fistulinella* fide Guzmán (*Boln. Soc. mex. Micol.* 8: 53, 1974).
- ixo-** (prefix), sticky.
- Ixocomus** Qué. (1888) $\equiv$ Suillus Gray.
- ixocutis** (of a pileus), a slimy cuticle.
- Ixodopsis** P. Karst. (1870) $\equiv$ Sordaria.
- ixotrichoderm** (**ixotrichodermium**) (of a pileus), a trichodermium composed of gelatinized hyphae (Snell, 1939; for a discussion, see Shaffer, *Mycol.* 58: 486, 1966).
- Iyengarina** Subram. (1958), anamorphic *Pezizomycotina*, Hso.0bP.1. 1, India. See Subramanian (*J. Indian bot. Soc.* 37: 406, 1958).
- J**, see iodine.
- Jaapia** Bres. (1911), Boletales. 2, widespread. See Nannfeldt & Eriksson (*Svensk bot. Tidskr.* 47: 177, 1953).
- Jaapia** Kirschst. (1938) $\equiv$ Keisslerina.
- Jack o'lantern**, the basidioma of the luminous *Clitocybe illudens*.
- jack-in-the-box discharge**, see ascus.
- Jacksonia** J.C. Lindq. (1970) [non *Jacksonia* R. Br. ex Aiton 1811, *Papilionaceae*] $\equiv$ *Dietelia* fide Lindquist (*Rev. Fac. Agron., Univ. Nac. La Plata* 47: 303, 1972).
- Jacksoniella** J.C. Lindq. (1972) = *Dietelia* fide Sathe (*Indian Phytopath.* 27: 617, 1974), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983) See.
- Jacksoniella** Kamat & Sathe (1972) = *Dietelia* fide Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983).
- Jacksonomyces** Jülich (1979), Meruliaceae. 10, widespread. See Wu & Chen (*Bull. natn. Sci. Mus. Tokyo*, B 3: 260, 1977).
- Jackya** Bubák (1902) [non *Jackia* Wall. 1823, *Rubiaceae*] = *Puccinia* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- Jacobaschella** Kuntze (1891) $\equiv$ *Diplosporium*.
- Jacobia** Arnaud (1952) nom. inval., anamorphic *Agaricomycetes*, Hso.0eH.?. 1 (with clamp connexions), Europe.
- Jacobia** Contu (1998) $\equiv$ *Contumyces* fide Kuyper (*in litt.*).
- Jacobsonia** Boedijn (1935), Helotiaceae. 1, Sumatra.
- Jaculispora** H.J. Huds. & Ingold (1960), anamorphic *Classiculaceae*, Hso.0eH.1. 1 (aquatic), Jamaica. See Hudson & Ingold (*TBMS* 43: 475, 1960).
- Jaczewski** (Arthur Louis Arthurovič de; 1863-1932; Russia). Studied under Fischer (q.v.), Berne (1889-1894); founded the laboratory of mycology and plant pathology (1896) then the Central Laboratory for Plant Pathology (1901) then the Bureau for Mycology and Phytopathology (1907), St Petersburg Botanic Garden; first Director, Bureau of Mycology and Phytopathology [later renamed the Jaczewski Institute], St Petersburg (1907-1932). A pioneer of mycology in Russia and, perhaps, the greatest Russian mycologist, with a prolific scientific output; his outstanding managerial skills enabled him to realize remarkable results during very difficult years of revolution and war. *Publs.* [*Key to the Fungi*] (1913-1917), [*Fundamentals of mycology*] (1933) [in Russian]; also numerous other works on mycology and plant pathology. *Biogs, obits etc.* Grummann (1974: 548); Jones (*Phytopathology* 23: 111, 1933) [portrait]; Stafleu & Cowan (*TL-2* 2: 413, 1979).
- Jaczewska** Mattir. (1912) = *Phallus* fide Vasil'kov (*Bot. Zh. SSSR* 40: 596, 1955).
- Jaczewskiella** Murashk. (1926) = *Stigmina* fide Sutton (*Mycol. Pap.* 141, 1977).
- Jaffuela** Speg. (1921), ? *Dothioraceae*. 1 (on *Puya*), Chile.
- Jafnea** Korf (1960), Pyronemataceae. 2, widespread. See Berthet & Korf (*Nat. can.* 96: 247, 1969), Schumacher (*Mycotaxon* 33: 149, 1988), Benkert & Klofac (*Öst. Z. Pilzk.* 13: 55, 2004; Europe), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Jafneadelphus** Rifai (1968) = *Aleurina* Massee fide Zhuang & Korf (*Mycotaxon* 26: 361, 1986).
- Jahniella** Petr. (1921), anamorphic *Pezizomycotina*, Cpd.0fH.1. 3, former Czechoslovakia.
- Jahnoporus** Nuss (1980), Albatrellaceae. 2, widespread (north temperate). See Nuss (*Hoppea* 39: 176, 1980).
- Jahnula** Kirschst. (1936), Aliquandostipitaceae. 10 (on submerged wood), widespread. See Hawksworth (*Sydowia* 37: 43, 1984), Hyde & Wong (*Nova Hedwigia* 68: 489, 1999; Australia), Pang *et al.* (*MR* 106:

- 1031, 2002), Raja & Shearer (*Mycol.* **98**: 319, 2006), Campbell *et al.* (*CJB* **85**: 873, 2007; phylogeny).
- Jahnulales** K.L. Pang, Abdel-Wahab, El-Shar., E.B.G. Jones & Sivichai (2002). Dothideomycetes. 1 fam., 6 gen., 25 spp. Fam.:
- Aliquandostipitaceae**
For *Lit.* see under fam.
- Jainesia** Gonz. Frag. & Cif. (1925), anamorphic *Pezizomycotina*, Hso.≡ eP.?. 1, West Indies.
- Jamesdicksonia** Thirum., Pavgi & Payak (1961), Georgerfischeriaceae. 23 (on *Cyperaceae*, *Poaceae*), S. Asia; N.; C. & S. America; Australia. See Bauer *et al.* (*MR* **105**: 416, 2001), Vánky & McKenzie (*Fungal Diversity Res. Ser.* **8**: 259 pp., 2002; New Zealand).
- Jamesiella** Lücking, Sérus. & Vězda (2005), Gomphillaceae (L.). 1, widespread. See Lücking *et al.* (*Lichenologist* **37**: 165, 2005), Lücking *et al.* (*Lichenologist* **38**: 131, 2006; Costa Rica).
- Janacekia** J.I.R. Larsson (1983), Microsporidia. 3.
- Janannfeldtia** Subram. & Sekar (1993), Nitschkiaceae. 2, India. See Subramanian & Sekar (*Kavaka* **18**: 19, 1993), Huhndorf *et al.* (*MR* **108**: 1384, 2004).
- Janauaria** Singer (1986), Agaricaceae. 1, Brazil. See Singer (*Agaric. mod. Tax.* 4th ed: 495, 1986).
- Janetia** M.B. Ellis (1976), anamorphic *Pezizomycotina*, Hso.≡ eP.10. 17, widespread. See Sutton & Pascoe (*Aust. Syst. Bot.* **1**: 127, 1988), Sivanesan (*MR* **94**: 566, 1990; synnematus spp.), Caldach *et al.* (*Mycol.* **94**: 355, 2002; Spain), Xu & Guo (*Nova Hedwigia* **75**: 201, 2002; China).
- Janospora** (Starbäck) Höhn. (1923) = *Stilbospora* fide Sutton (*Mycol. Pap.* **141**, 1977).
- Janseella** Henn. (1899) = *Phaeotrema* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Jansia** Penz. (1899) = *Mutinus* fide Dring in Ainsworth *et al.* (Eds) (*The Fungi* **4B**: 458, 1973).
- Jansoniisporites** Kalgutkar (1997), Fossil Fungi. 1, Canada. See Kalgutkar (*Review of Palaeobotany and Palynology* **97**: 216, 1997).
- Japanese mushroom**, see matsu-take.
- Japewia** Tønsberg (1990), Ramalinaceae (L.). 3, widespread (north temperate). See Tønsberg (*Lichenologist* **22**: 205, 1990), Printzen (*Bryologist* **102**: 714, 1999).
- Japewiella** Printzen (1999), Ramalinaceae (L.). 4, Mexico. See Printzen (*Bryologist* **102**: 714, 1999).
- Japonia** Höhn. (1909), anamorphic *Yoshinagaia*, Cpd.1eH.1. 1, Japan.
- Japonogaster** Kobayasi (1989), Agaricaceae. 1, Japan. ? A monstrosity of *Lycoperdon*.
- Jarmania** Kantvilas (1996), Ramalinaceae (L.). 1, Australia. See Kantvilas (*Lichenologist* **28**: 230, 1996).
- Jarxia** D. Hawksw. (1989), Naetrocymbaceae. 1, C. America; Florida. See Hawksworth (*Stud. Mycol.* **31**: 93, 1989), Harris (*More Florida Lichens*, 1995).
- Jattaea** Berl. (1900), Calosphaeriaceae. Anamorphs *Stachybotrys*-like, *Phialophora*-like. 8, widespread. See Barr (*Mycol.* **77**: 549, 1985), Romero & Samuels (*Beih. Sydowia* **43**: 228, 1991), Mostert *et al.* (*Stud. Mycol.* **54**: 115 pp., 2006), Damm *et al.* (*Persoonia* **20**: 39, 2008; asci, relns).
- Jattaelichen** Tomas. & Cif. (1952) = *Arthopyrenia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Jattaemyces** Cif. & Tomas. (1953) = *Jattaelichen*.
- Javaria** Boise (1986), ? Melanommataceae. 2 (on *Palmae*), N. & S. America. See Boise (*Acta Amazon. Supl.* **14**: 49, 1986), Hyde & Fröhlich (*Sydowia* **50**: 81, 1998; synonym of *Astrosphaeriella*).
- Javonarxia** Subram. (1995), anamorphic *Pezizomycotina*, Hso.≡ eP.19. 2, Malaysia. See Subramanian (*Kavaka* **20/21**: 57, 1995).
- Jeaneliomyces** Lepasme (1945) = *Dimeromyces* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- jelly fungi**, a term sometimes applied to the *Tremelales* s.l.
- Jenmania** W. Wächt. (1897), Lichinaceae (L.). 2, S. America. See Henssen (*Lichenologist* **5**: 444, 1973; key), Schultz & Büdel (*Lichenologist* **35**: 151, 2003; phylogeny).
- Jenmaniomyces** Cif. & Tomas. (1953) = *Jenmania*.
- Jerainum** Nawawi & Kuthub. (1992), anamorphic *Pezizomycotina*, Hso.#eP.1. 1 (aquatic), Malaysia. See Nawawi & Kuthubutheen (*Mycotaxon* **45**: 409, 1992).
- Jew's ear**, the basidioma of *Auricularia auricula-judae*.
- Jirovecia** J. Weiser (1977), Microsporidia. 3.
- Jiroveciana** J.I.R. Larsson (1981), Microsporidia. 1.
- Jobellisia** M.E. Barr (1993), ? Diaporthales. 2 (from wood), widespread. See Barr (*Mycotaxon* **46**: 45, 1993), Huhndorf *et al.* (*Sydowia* **51**: 183, 1999; DNA, posn), Kang *et al.* (*Mycoscience* **40**: 151, 1999; posn), Réblová *et al.* (*Stud. Mycol.* **50**: 533, 2004), Mostert *et al.* (*Stud. Mycol.* **54**: 115 pp., 2006).
- Joerstadia** Gjaerum & Cummins (1982), Phragmidiaceae. 4 (on *Alchemilla* (*Rosaceae*)), Africa; Madagascar. See Gjaerum & Cummins (*Mycotaxon* **15**: 420, 1982).
- Johansonia** Sacc. (1889), Saccardiaceae. c. 11, widespread (tropical).
- Johansoniella** Bat., J.L. Bezerra & Cavalc. (1966) = *Johansonia* fide von Arx & Müller (*Stud. Mycol.* **9**, 1975).
- Johenrea** C.E. Langeb, J.J. Becnel, E. Razafindratiana, J. Przybyszewski & H. Razafindrafara (1996), Microsporidia. 1. See Langeb *et al.* (*J. Invert. Path.* **68**: 28, 1996).
- Johncouchia** S. Hughes & Cavalc. (1983), anamorphic *Septobasidium*, Hso.0bP.1. 1, widespread. See Hughes & Cavalcanti (*CJB* **61**: 2226, 1983).
- Johnkarlingia** Pavgi & S.L. Singh (1979), Synchytriaceae. 1 (on *Brassica* roots), India. See Pavgi & Singh (*Mycopathologia* **69**: 53, 1979).
- Johnstonia** M.B. Ellis (1971) [non *Johnstonia* Walkom 1925, fossil] = *Nejohnstonia*.
- Jola** Möller (1895), Eocronartiaceae. 1 (on *Musci*), widespread (tropical). See Martin (*Mycol.* **31**: 239, 1939), Frieders & McLaughlin (*MR* **105**: 734, 2001; cytol., ultrastr., anam.).
- Jonaspis**, see *Ionaspis*.
- Jongiella** M. Morelet (1971) = *Camillea* fide Læssøe *et al.* (*MR* **93**: 121, 1989), Læssøe (*SA* **13**: 43, 1994; ? synonym of *Xylaria*).
- Jopex**, see *Irpex*.
- jordanon**, Brierley's (*Ann. app. Biol.* **18**: 420, 1931) application of Lotsy's term for a group of isolates constituting a race or strain, with similar cultural characters and behaviour (obsol.).
- Josefpoeltia** S.Y. Kondr. & Kärnefelt (1997), Teloschistaceae (L.). 3, S. America. See Kondratyuk & Kärnefelt (*Progr. Probl. Lichenol. Nineties. Proc.*

- Third Symp. Intern. Assoc. Lichenol.* [Biblthca Lichenol. 68]: 22, 1997), Frödén & Lindblom (*Bryologist* 106: 447, 2003).
- Jove's beard**, the basidioma of *Odontia barba-jovis*.
- Jrpex**, see *Irpex*.
- Jubispora** B. Sutton & H.J. Swart (1986), anamorphic *Pezizomycotina*, St.≡ eP.19. 1, Africa. See Sutton & Swart (*TBMS* 87: 97, 1986).
- Jugglerandia** Lloyd (1923) ≡ Holwaya.
- Jugulospora** N. Lundq. (1972), Lasiosphaeriaceae. 1 (on burnt soil), Europe; N. America. See Lundqvist (*Symb. bot. upsal.* 20 no. 1, 1972), Barr (*Mycotaxon* 39: 43, 1990; posn), Huhndorf *et al.* (*Mycol.* 96: 368, 2004; phylogeny), Miller & Huhndorf (*Mol. Phylogen. Evol.* 35: 60, 2005; phylogeny).
- Julella** Fabre (1879), Thelenellaceae (±L). 3 or 18, widespread. See Barr (*Sydowia* 38: 11, 1986), Aptroot & van den Boom (*Mycotaxon* 56: 1, 1995), Kohlmeyer *et al.* (*Bot. Mar.* 40: 291, 1997), Tam *et al.* (*Bot. Mar.* 46: 487, 2003; phylogeny), Aptroot *et al.* (*Biblthca Lichenol.* 97, 2008; Costa Rica).
- Juliohirschhornia** Hirschh. (1986), Ustilaginaceae. 1 (on *Paspalum*), S. America. See Vánky (*in litt.*; ? syn. of *Ustilago*), Hirschhorn (*Las Ustilaginales de la Flora Argentina*, 1986).
- Jumillera** J.D. Rogers, Y.M. Ju & F. San Martín (1997), Xylariaceae. Anamorphs *Geniculosporium*-like, *Libertella*-like. 7, widespread. See Rogers *et al.* (*Mycotaxon* 64: 39, 1997), Rogers & Ju (*CJB* 80: 478, 2002; Hawaii).
- Juncigena** Kohlm., Volkm.-Kohlm. & O.E. Erikss. (1997), Hypocreomycetidae. Anamorph *Cirrenalia*. 1 (stems of *Juncus*), N. America. See Kohlmeyer *et al.* (*Bot. Mar.* 40: 291, 1997), Schoch *et al.* (*MR* 111: 154, 2007; phylogeny).
- Junctospora** Minter & Hol.-Jech. (1981), anamorphic *Pezizomycotina*, Hso.0eH.4. 1, former Czechoslovakia. See Minter & Holubová-Jechová (*Folia geobot. phytotax.* 16: 202, 1981).
- Junewangia** W.A. Baker & Morgan-Jones (2002), anamorphic *Pezizomycotina*, H??.?. 1, widespread. See Baker *et al.* (*Mycotaxon* 81: 307, 2002).
- Junghuhnia** Corda (1842), Meruliaceae. c. 20, widespread. See Ryvarden (*Persoonia* 7: 17, 1972), Pouzar (*Czech Mycol.* 55: 1, 2003; Cuba), Ipulet & Ryvarden (*Syn. Fung.* 20: 87, 2005; Uganda).
- Jungkultur**, see Normkultur.
- Junia** Dumort. (1822) [non *Junia* Adans. 1763, *Clethraceae*] = *Phallus* fide Stalpers (*in litt.*).
- juvenescence**, the process of maturing at a stage of development normally immature.
- K** (1) see Metabolic products; (2) Royal Botanic Gardens (Kew, Surrey, UK); founded 1841; managed by a Board of Trustees and mainly funded by the UK Ministry of Agriculture, Fisheries and Food (MAFF); most lichen material transferred to **BM** (q.v.); see Blunt (*In for a penny*, 1978), Hepper (Ed.) (*Royal Botanic Gardens, Kew: gardens for science and pleasure*, 1982); (3) see Sørensen coefficient.
- Kabataia** J. Lom, I. Dyková & K. Tonguthai (1999), Microsporidia. 1. See Lom *et al.* (*Dis. Aq. Organ.* 38: 39, 1999).
- Kabatana** J. Lom, I. Dyková & K. Tonguthai (2000), Microsporidia. 3. See Lom *et al.* (*J. Parasit.* 93: 655, 2000).
- Kabathia** Nieuwl. (1916) = *Sphaerellopsis* Cooke fide Sutton (*Mycol. Pap.* 141, 1977).
- Kabatia** Bubák (1904), anamorphic *Discosphaerina*, St.0-1eH.1. 9, widespread. See Sutton (*The Coelomycetes*, 1980).
- Kabatiella** Bubák (1907), anamorphic *Discosphaerina*, Cpd.0eH.?. 17, widespread (esp. north temperate). *K. caulivora* (clover (*Trifolium*) scorch). See Sampson (*TBMS* 13: 103, 1928), von Arx (*Revision of fungi classified as Gloeosporium*, 1970), Hoog *et al.* (*Stud. Mycol.* 43: 31, 1999), Yurlova *et al.* (*Stud. Mycol.* 43: 63, 1999; teleom.), Crous *et al.* (*Australas. Pl. Path.* 29: 267, 2000; Australia).
- Kabatina** R. Schneid. & Arx (1966), anamorphic *Dothioraceae*, Cac.0eH.15. 5, Europe; N. America. See Ramaley (*Mycotaxon* 43: 437, 1992; on *Mahonia*), Butin & Pehl (*MR* 97: 1340, 1993), Hsiang *et al.* (*Can. J. Pl. Path.* 22: 79, 2000; Canada).
- Kacosphaeria** Speg. (1887), ? Calosphaeriaceae. 1, Tierra del Fuego. See Petrak (*Sydowia* 5: 328, 1951).
- Kaernefeltia** A. Thell & Goward (1996), Parmeliaceae (L). 2, N. America. See Thell & Goward (*Bryologist* 99: 125, 1996), Thell *et al.* (*Mycol. Progr.* 1: 335, 2002; phylogeny), Mattsson & Articus (*Symb. bot. upsal.* 34 no. 1: 237, 2004).
- Kafiaddinia** Mekht. (1978) = *Dactylellina* fide Scholler *et al.* (*Sydowia* 51: 89, 1999).
- Kainomyces** Thaxt. (1901), Laboulbeniaceae. 3, W. Africa; Asia. See Terada (*TMSJ* 19: 55, 1978), Tavares (*Mycol. Mem.* 9: 627 pp., 1985).
- Kakabekia** Bargh. (1965), Fossil Fungi. 2, Europe; N. America.
- Kalaallia** Alstrup & D. Hawksw. (1990), Dacampiaceae. 1 (on lichens), Greenland. See Alstrup & Hawksworth (*Meddr Grønland Biosc.* 31, 1990), Orange (*Mycotaxon* 81: 265, 2002).
- Kalaharituber** Trappe & Kagan-Zur (2005), Pezizaceae. 1, Namibia. See Ferdman *et al.* (*MR* 109: 242, 2005), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Kalbiana** Henssen (1988), ? Verrucariaceae (L). 1, Brazil. See Henssen (*Lichenes Neotropici Fascicle X* (nos 401-450): 9, 1988).
- Kalbographa** Lücking (2007), Graphidaceae (L). 1, Caribbean. See Lücking (*Biblthca Lichenol.* 96: 185, 2007).
- Kalchbrennera** Berk. (1876) = *Lysurus* fide Dring (*Kew Bull.* 35: 68, 1980).
- Kalchbrenneriella** Diederich & M.S. Christ. (2002), anamorphic *Pezizomycotina*, H??.?. 1 (on lichens). See Diederich (*Bryologist* 105: 411, 2002).
- Kaleidosporium** Van Warmelo & B. Sutton (1981), anamorphic *Pezizomycotina*, Cac.#eP.15. 1, N. America. See van Warmelo & Sutton (*Mycol. Pap.* 145: 23, 1981).
- Kallichroma** Kohlm. & Volkm.-Kohlm. (1993), Bionectriaceae. 2 (submerged wood, marine), widespread. See Kohlmeyer & Volkmann-Kohlmeyer (*MR* 97: 753, 1993), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Rossman *et al.* (*Mycol.* 93: 100, 2001).
- Kalmusia** Niessl (1872), ? Montagnulaceae. c. 12, widespread. See Barr (*Prodr. Cl. Loculoasc.*: 168 pp., 1987), Tanaka *et al.* (*Mycoscience* 46: 110, 2005; Japan), Eriksson (*Mycotaxon* 95: 67, 2006; on *Bambusa*).
- Kamatella** Anahosur (1969), anamorphic *Pezizomycotina*, Cpd.1eP.1. 1, S. Africa; India. See Anahosur (*Bull. Torrey bot. Club* 96: 207, 1969).
- Kamatia** V.G. Rao & Subhedar (1976) = *Pseudodictyosporium* fide Kendrick *in* Carmichael *et al.* (*Gen-*

- era of *Hyphomycetes*, 1980), Tsui *et al.* (*Fungal Diversity* 21: 157, 2006).
- Kamatomyces** Sathe (1966) = *Masseella* fide Berndt (*in litt.*).
- kamé**, truffle (Arabic); **black -**, **brown -**, the edible *Terfezia boudieri* and *T. clavayi*, respectively, of the Middle East (Awameh & Alsheikh, *Mycol.* 72: 50, 494, 1980).
- kames**, see *terfas*.
- Kameshwaromyces** Kamal, R.K. Verma & Morgan-Jones (1986), anamorphic *Pezizomycotina*, Hso.#eP.1. 1, India. See Kamal *et al.* (*Mycotaxon* 25: 247, 1986).
- Kananascus** Nag Raj (1984), *Sordariomycetes*. Anamorph *Koorchaloma*. 2, widespread. See Nag Raj (*Mycotaxon* 19: 167, 1984), Treigiene (*Mycotaxon* 96: 173, 2006; Lithuania).
- Kanousea** Bat. & Cif. (1962) = *Microcallis* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Kantvilasia** P.M. McCarthy, Elix & Sérus. (2000), *Ectolechiaceae*. 1, Tasmania; S. America. See McCarthy *et al.* (*Lichenologist* 32: 317, 2000), Lücking (*Cryptog. Mycol.* 27: 121, 2006; French Guiana).
- Kapooria** J. Reid & C. Booth (1989), *Diaporthales*. 1, India. See Reid & Booth (*CJB* 67: 879, 1989).
- Kappamyces** Letcher & M.J. Powell (2005), *Kappamycetaceae*. 1, USA. See Letcher & Powell (*Nova Hedwigia* 80: 115, 2005).
- Kappamycetaceae** Letcher (2006), *Rhizophydiales*. 1 gen., 1 spp.
- Karakulinia** N.P. Golovina (1964) = *Fusicladium* fide Deighton (*Mycol. Pap.* 112, 1967), Schubert *et al.* (*Schlechtendalia* 9, 2003).
- Karlingia** A.E. Johanson (1944) nom. illegit. ≡ *Rhizophlyctis* fide Blackwell & Powell (*Mycotaxon* 70: 213, 1999; nomencl.).
- Karlingiomyces** Sparrow (1960), *Chytridiaceae*. 5, widespread. See Karling (*Sydowia Beih.* 6: 58, 1966), Dogma (*Nova Hedwigia* 24: 393, 1973), Blackwell *et al.* (*Mycotaxon* 89: 259, 2004; monogr., key) = *Karlingia* (*Chytrid.*) fide.
- Karoowia** Hale (1989), *Parmeliaceae* (L.). 18, widespread. See Elix (*Flora of Australia* 55: 62, 1994), Elix (*Australasian Lichenology* 46: 18, 2000; Australia), Blanco *et al.* (*Taxon* 53: 959, 2004; phylogeny), Thell *et al.* (*Mycol. Progr.* 3: 297, 2004; phylogeny), Blanco *et al.* (*Mol. Phylogen. Evol.* 39: 52, 2006; phylogeny).
- Karschia** Körb. (1865), *Dothideomycetes*. 4 (on lichens), Europe. See Hafellner (*Beih. Nova Hedwigia* 62, 1979; key, disp. excl. spp.).
- Karsten** (Petter Adolf; 1834-1917; Finland). PhD, Helsinki (1859); schoolteacher, Wasa Gymnasium (1862-1864); Lecturer in botany (1864-1900) then Professor (1900-1908), Agricultural and Dairy Institute, Mustiala. Pioneer in Finnish mycology, describing many new species. Collections mostly in Helsinki (H). *Publs. Mycologia Fennica* (1871-1878) [reprint 1967]; *Symbolae ad Mycologiam Fennicam* 33 parts (1870-1895) [reprint 1967]; *Rysslands, Finlands och den Skandinaviska Halföns Hattsvampar* (1879-82); *Kritisch Öfversigt af Finlands Basidsvampar* (*Basidiomycetes; Gastero- et Hymenomycetes*) (1889); also collected mycological papers (1859-1909) [reprint 4 vols, 1973]. *Biogs, obits etc.* Grumann (1974: 609); Hintikka (*Karstenia* 1: 5, 1950, portrait) [in Finnish]; Lowe (*Mycol.* 48: 99, 1956) [polypore types]; Stafleu & Cowan (*TL-2* 2: 505, 1979).
- Karstenella** Harmaja (1969), *Karstenellaceae*. 1, Finland. See Harmaja (*Karstenia* 9: 20, 1969), Harmaja (*Karstenia* 14: 109, 1974).
- Karstenellaceae** Harmaja (1974), *Pezizales*. 1 gen., 1 spp.
Lit.: Harmaja (*Karstenia* 9: 20, 1969), Harmaja (*Karstenia* 14: 109, 1974), Kimbrough (*Mem. N. Y. bot. Gdn* 49: 326, 1989).
- Karstenia** Britzelm. (1897) [non *Karstenia* Göpp. 1836, fossil *Polypodiaceae*] ≡ *Prillieuxia*.
- Karstenia** Fr. (1885) nom. cons., ? *Rhytismatales*. 9, Europe; America. See Sherwood (*Mycotaxon* 5: 1, 1977), Sherwood (*Occ. Pap. Farlow Herb. Crypt. Bot.* 15, 1980), Wilberforce (*Mycologist* 13: 149, 1999).
- Karsteniomyces** D. Hawksw. (1980), anamorphic *Pezizomycotina*, Cpd.1eH.1. 1 (on lichens, esp. *Peltigera*), Europe. See Hawksworth (*Bull. Br. Mus. nat. hist. Bot.* 9: 22, 1981), Boqueras & Diederich (*Mycotaxon* 47: 425, 1993).
- Karstenula** Speg. (1879), *Melanommataceae*. Anamorph *Microdiplodia*. 16, widespread (temperate). See Munk (*Dansk bot. Ark.* 17, 1957), Eriksson & Hawksworth (*SA* 10: 140, 1991), Constantinescu (*MR* 97: 377, 1993; anamorph), Yuan & Mohammed (*Mycotaxon* 63: 9, 1997).
- karyochorisis**, somatic nuclear division resulting from a constriction of the nuclear membrane (Moore, *Z. Zellforsch.* 63: 921, 1964).
- karyogamy**, the fusion of two sex nuclei after cell fusion, i.e. after plasmogamy.
- karyotype**, the size and number of chromosomes in an organism. Generally determined by deduction from mating studies, microscopically or from specialized electrophoresis methods. See McCluskey & Mills (*Mol. Pl.-Microbe Interactions* 3: 366, 1990), pulsed field gel-electrophoresis.
- Kaskaskia** Born & J.L. Crane (1972) = *Gyrostroma* fide Bedker & Wingfield (*TBMS* 81: 179, 1983).
- Kathistaceae** Malloch & M. Blackw. (1990), *Sordariomycetes* (inc. sed.). 4 gen. (+ 1 syn.), 8 spp.
Lit.: Malloch & Blackwell (*CJB* 68: 1712, 1990), Blackwell & Jones (*Biodiv. Cons.* 6: 689, 1997), Blackwell *et al.* (*Mycol.* 95: 987, 2003).
- Kathistes** Malloch & M. Blackw. (1990), *Kathistaceae*. 3 (coprophilous), widespread (north temperate). See Malloch & Blackwell (*CJB* 68: 1712, 1990), Blackwell *et al.* (*Mycol.* 95: 987, 2003; phylogeny).
- katothecium**, see *catathecium*.
- katsuobushi**, a Japanese food obtained by fermenting cooked bonito fish (*Sarda sarda*) with *Aspergillus* spp.
- Katumotoa** Kaz. Tanaka & Y. Harada (2005), *Phaeosphaeriaceae*. 1, Japan. See Tanaka & Harada (*Mycoscience* 46: 313, 2005).
- Kauffman** (Calvin Henry; 1869-1931; USA). School teacher (1895-1901). Student, University of Wisconsin (1901-1902); Assistant, Cornell University, New York (1902-1904); Instructor (1904-1912) then Assistant Professor (1912-1920) then Associate Professor (1920-1923) then Professor (1923-1931) and Director of Herbarium (1921-1931), Michigan University. Contributed to the knowledge of the *Agaricaceae* particularly in Michigan, the Rocky Mountains and the Pacific Northwest. *Publs. Agaricaceae of Michigan* (1918); also other books and papers on the *Agaricaceae* (q.v.). *Biogs, obits etc.* Mains (*Phytopa-*

- thology* 22: 271, 1932); Mains (*Mycol.* 24: 265, 1932) [portrait]; Stafleu & Cowan (*TL-2* 2: 507, 1979).
- Kaufmannwolfia** Galgoczy & E.K. Novák (1962) = *Trichophyton* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Kavinia** Pilát (1938), *Lentariaceae*. 5, Europe. See Eriksson & Ryvarden (*Cortic. N. Europ.* 4: 752, 1976), Legon (*Mycologist* 17: 42, 2003; UK).
- Kawasakia** Y. Yamada & Nogawa (1995) = *Lipomyces* fide Yamada & Nogawa (*Bull. Fac. Agric. Shizuoka Univ.* 45: 31, 1995), Kurtzman *et al.* (*FEMS Yeast Res.* 7: 1027, 2007; phylogeny).
- Kazachstania** Zubcova (1971), *Saccharomycetaceae*. 28, widespread. See von Arx *et al.* (*Stud. Mycol.* 14: 1, 1977), Kurtzman in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 134, 1998; as *Arxiozyma*), Kurtzman & Robnett (*FEMS Yeast Res.* 3: 417, 2003), Lu *et al.* (*Int. J. Syst. Evol. Microbiol.* 54: 2431, 2004), Wu & Bai (*Int. J. Syst. Evol. Microbiol.* 55: 2219, 2005), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny), Imanishi *et al.* (*FEMS Yeast Res.* 7: 330, 2007).
- Kazulia** Nag Raj (1977), anamorphic *Chaetothyriaceae*, Hsp.1bH.10. 1, Brazil. See Nag Raj (*CJB* 55: 1621, 1977).
- kb** (kilobases), an abbreviation for 1000 base pairs of DNA.
- KC**, see Metabolic products.
- kefir**, a water soluble polysaccharide from kefir grains (Kooiman, *Carboh. Res.* 7: 200, 1968).
- Keinstirschia** J. Reid & C. Booth (1989), *Diaporthales*. 1, Germany. See Reid & Booth (*CJB* 67: 897, 1989).
- Keisslerellum** Werner (1944) nom. inval. = *Mycoporellum* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Keissleria** Höhn. (1918) = *Broomella* fide Höhnelt (*Annls mycol.* 18: 71, 1920).
- Keissleriella** Höhn. (1919), ? *Massarinaceae*. Anamorph *Dendrophoma*-like. c. 25, widespread. See Bose (*Phytopath. Z.* 41: 179, 1961; key 11 spp.), Sivanesan (*Bitunicate Ascomycetes and their Anamorphs*, 1984), Kohlmeyer *et al.* (*MR* 100: 393, 1996).
- Keisslerina** Petr. (1920) = *Dothiora* Fr. (1849) fide Froidevaux (*Nova Hedwigia* 23: 679, 1973).
- Keissleriomyces** D. Hawksw. (1981), anamorphic *Pezizomycotina*, Cpd.≡ eH.15. 1 (on *Cladonia*), Europe. See Hawksworth (*Bull. Br. Mus. nat. Hist. Bot.* 9: 25, 1981).
- Keithia** Sacc. (1892) [non *Keithia* Spreng. 1822, ? *Capparaceae*] = *Didymascella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Kelleria** Tomin (1926) [non *Kelleria* Endl. 1848, *Thymelaeaceae*] ? = *Thelocarpon* fide Salisbury (*Lichenologist* 3: 175, 1966).
- Kellermania** Ellis & Everh. (1885), anamorphic *Planistromella*, Cpd.0eH/≡ eH.1. 13, USA. See Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993), Ramaley (*Mycotaxon* 47: 259, 1993; teleomorphs), Ramaley (*Mycotaxon* 55: 255, 1995; key to 7 spp.), Ramaley (*Mycotaxon* 66: 509, 1998).
- Kellermaniites** Babajan & Tasl. (1977), Fossil Fungi. 1 (Tertiary), former USSR.
- Kellermanniopsis** Edward, Kr.P. Singh, S.C. Tripathi, M.K. Sinha & Ranade (1974) ? = *Bleptosporium* fide Sutton (*Mycol. Pap.* 88, 1963).
- Kemmleria** Körb. (1861) ? = *Buellia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Kendrickiella** K. Jacobs & M.J. Wingf. (2001), anamorphic *Eurotiales*. 1. See Jacobs *et al.* (*CJB* 79: 113, 2001), Grünig *et al.* (*CJB* 80: 1239, 2002; phylogeny).
- Kendrickomyces** B. Sutton, V.G. Rao & Mhaskar (1976), anamorphic *Pezizomycotina*, St.0eH.15. 1, India; Australia. See Sutton *et al.* (*TBMS* 67: 243, 1976).
- Kensinjia** J. Reid & C. Booth (1989), *Diaporthales*. 1, USA. See Barr (*Mycotaxon* 41: 287, 1991).
- Kentingia** Sivan. & W.H. Hsieh (1989), *Dothideomycetes*. Anamorph ? *Excipulariopsis*. 1, Taiwan; India. See Sivanesan & Hsieh (*MR* 93: 83, 1989).
- Kentrosporium** Wallr. (1844) = *Claviceps*.
- kephir**, see Fermented food and drinks.
- keratin**, protein which is the main component of skin, hair, nails, feathers and horns.
- Keratinomyces** Vanbreus. (1952) = *Trichophyton* fide Ajello (*Sabouraudia* 6: 153, 1968), Guillamón *et al.* (*Antonie van Leeuwenhoek* 69: 223, 1996), Gräser *et al.* (*Medical Mycology* 37: 105, 1999).
- keratinophylic** (1) capable of decomposing keratin; (2) of many fungi causing superficial mycoses in humans; see dermatophyte, ringworm.
- Keratinophyton** H.S. Randhawa & R.S. Sandhu (1964) = *Aphanoascus* fide Cano & Guarro (*MR* 94, 1990).
- keratomycosis**, a fungus infection of the cornea of the eye.
- Keratosphaera** H.B.P. Upadhyay (1964) ? = *Koordersiella* fide Eriksson & Hawksworth (*SA* 6: 133, 1987).
- kerion**, an inflammatory form of ringworm of the scalp; tinea kerion.
- Kermincola** Šulc (1907) nom. dub., anamorphic *Pezizomycotina*.
- Kernella** Thirum. (1949), *Pucciniaceae*. 1 (on *Litsea* (*Lauraceae*)), India; Nepal; China. May belong to *Puccinia*.
- Kernia** Nieuwl. (1916), *Microascaceae*. Anamorphs *Graphium*, *Scopulariopsis*. 5 (coprophilous), widespread. See Malloch & Cain (*CJB* 49: 855, 1971; key), Locquin-Linard (*Revue Mycol. Paris* 41: 509, 1977), Lee & Hanlin (*Mycol.* 91: 434, 1999; DNA), Issakainen *et al.* (*Medical Mycology* 41: 31, 2003; phylogeny).
- Kernia** Thirum. (1947) = *Kernella*.
- Kerniomyces** Toro (1939), *Schizothyriaceae*. 1, S. America.
- Kernkampella** Rajendren (1970), *Raveneliaceae*. 10 (on *Euphorbiaceae*), widespread (esp. tropical). See Rajendren (*Mycol.* 62: 1112, 1970; morphology), Laundon (*Mycotaxon* 3: 142, 1975), Bagyanarayana *et al.* (*Journal of Mycology and Plant Pathology* 33: 76, 2003; India).
- kerosene fungus (creosote fungus)**, *Amorphotheca resinae* (anamorph *Hormoconis resinae*); grows on creosoted wood and petrochemical fuels, also isolated from soil; utilizes n-alkanes with chain lengths between C₉ and C₁₉, grows esp. well at fuel/water interfaces forming hyphal mats that can break loose and cause blockages in aircraft wing and other fuel storage tanks, often associated also with accelerated corrosion; a particular problem during development of the airliner Concorde where fuel tanks were used as a heat-sink during supersonic flight, resulting in a

- warmer than usual environment which promoted growth of the fungus. See David & Kelley (*Mycopath.* 129: 159, 1995 [*IMI Descr.* 1230]), Hendley (*TBMS* 47: 467, 1964), Hill (*Aircraft engineering and aerospace technology* 75: 497, 2003), Parbery (*Austr. J. Bot.* 17: 331, 1969; natural occurrence), Ratledge (in Wilkinson (Ed.), *Developments in biodegradation of hydrocarbons*: 1, 1987; hydrocarbon uptake), Shennon (in Houghton *et al.* (Eds), *Biodeterioration* 7, 248, 1988; biocides).
- ketjap**, shoyu sauce (q.v.) as made in Indonesia.
- Ketubakia** Kamat, Varghese & V.G. Rao (1987), anamorphic *Pezizomycotina*, Hsp.≡ eP.1. 1, India. See Kamat *et al.* (*Nova Hedwigia* 44: 519, 1987).
- Keys, construction of.** See Farr (*Taxon* 55: 589, 2006; discussion of on-line keys), Hawksworth (*Mycologist's handbook*, 1974), Pankhurst (*Biological identification*, 1978), Parker-Rhodes (*Bull. BMS* 8: 68, 1974), Rayner (*Bull. BMS* 10: 31, 1976), Tilling (*J. Biol. Educ.* 18: 293, 1984), Korf (*Mycol.* 64: 937, 1972); also Numerical taxonomy.
- Kheikia** Petr. (1921) = *Herpotrichia* fide von Arx & Müller (*Sydowia* 37: 6, 1984).
- Khuskia** H.J. Huds. (1963), *Trichosphaeriales*. Anamorph *Nigrospora*. 1, widespread. See Sivanesan & Holliday (*IMI Descr. Fungi Bact.* 311, 1971).
- Kickxella** Coem. (1862), *Kickxellaceae*. 1, Europe; N. America. See Linder (*Farlowia* 1: 49, 1943), Benjamin (*Aliso* 4: 149, 1958), Young (*Ann. Bot.* 38: 873, 1974; spore ultrastr.).
- Kickxellaceae** Linder (1943), *Kickxellales*. 12 gen. (+ 2 syn.), 32 spp.
Lit.: Benjamin (*Aliso* 4: 321, 1959), Benjamin (*Aliso* 5: 11, 1961), Benjamin (*Aliso* 5: 273, 1963), Moss & Young (*Mycol.* 70: 944, 1978), Saikawa (*CJB* 67: 2484, 1989), Tanabe *et al.* (*Mol. Phylogen. Evol.* 30: 438, 2004).
- Kickxellales** Kreisel ex R.K. Benj. (1979). *Kickxellomycotina*. 1 fam., 12 gen., 32 spp. Fam.:
Kickxellaceae
Lit.: Benjamin (*Aliso* 4: 149, 321; 5: 11, 273, 1958-1963; *The whole fungus* 2: 573, 1979), Young (*New Phytol.* 67: 823, 1968; spore ultrastr.), Moss & Young (*Mycol.* 70: 944, 1978; phylogeny), White *et al.* (*Mycol.* 98: 860, 2006; molecular phylogeny), Hibbett *et al.* (*MR* 111: 109, 2007), and see under Family.
- Kickxellomycotina** Benny (2007). 5 fam., 59 gen., 264 spp. Fams:
 (1) **Asellariaceae**
 (2) **Dimargaritaceae**
 (3) **Harpellaceae**
 (4) **Kickxellaceae**
 (5) **Legeriomycetaceae**
Lit.: Benjamin (*Aliso* 4: 149, 321; 5: 11, 273, 1958-1963; *The whole fungus* 2: 573, 1979), Young (*New Phytol.* 67: 823, 1968; spore ultrastr.), Moss & Young (*Mycol.* 70: 944, 1978; phylogeny), White *et al.* (*Mycol.* 98: 860, 2006; molecular phylogeny), Hibbett *et al.* (*MR* 111: 109, 2007), and see under Family.
- Kiehli** Viégas (1944), *Parmulariaceae*. 1 or 2, Brazil; Panama. See Farr (*Mycol.* 60: 924, 1968), Inácio *et al.* (*Mycol. Progr.* 4: 133, 2005).
- kievitone**, an isoflavonoid phytoalexin produced by the French bean (*Phaseolus vulgaris*).
- Kiliasia** Hafellner (1984) = *Toninia* fide Timdal (*Op. Bot.* 110, 1991).
- Kilikiostroma** Bat. & J.L. Bezerra (1961) = *Strigula* fide Lücking *et al.* (*Lichenologist* 30: 121, 1998).
- Kiliophora** Kuthub. & Nawawi (1993), anamorphic *Pezizomycotina*, Hso.0eP.16. 2, Malaysia; Ivory Coast. See Kuthubutheen & Nawawi (*Mycotaxon* 48: 239, 1993).
- Kimbropesia** Korf & W.Y. Zhuang (1991), *Pezizaceae*. 1, Canary Islands. See Korf & Zhuang (*Mycotaxon* 40: 269, 1991), van Brummelen (*Cryptog. Bryol.-Lichénol.* 19: 257, 1998; ultrastr.), Norman & Egger (*Mycol.* 91: 820, 1999; phylogeny), Hansen *et al.* (*Mycol.* 93: 958, 2001; phylogeny).
- Kimuromyces** Dianese, L.T.P. Santos, R.B. Medeiros & Furlan. (1995), ? *Uropyxidaceae*. 1 (on *Astronium* (*Anacardiaceae*)), Brazil. See Dianese *et al.* (*Fitopatol. Brasil* 20: 251, 1995).
- Kineosporia** Pagani & Parenti (1978), *Actinobacteria*. q.v.
- kinetid**, flagellar apparatus including kinetosomes and their associated tubules and fibres.
- kinetosome**, intracellular, non-membrane bound organelles; microtubular cylinders (0.2 µm diam.) organized in the 9 (A, B C- microtubules) + 0 pattern and with axoneme extensions in the 9 (A, B- microtubules) + 2 pattern.
- KINGDOMS OF FUNGI**, In the seventh edition of this *Dictionary*, the fungi were accepted as a single kingdom along with bacteria (*Monera*), plants (*Plantae*), animals (*Animalia*) and protists (*Protista*) according to the five-kingdom scheme of Whittaker (*Science* 163: 160, 1969). However, with advances in ultrastructural, biochemical, and especially molecular biology, the treatment of the fungi as one of the five kingdoms of life has become increasingly untenable (see Phylogeny). The organisms studied by mycologists are now established as polyphyletic (i.e. with different phylogenies) and have to be referred to at least three different kingdoms as previously adopted in the 8th and 9th editions of this *Dictionary*.
- This situation has arisen because of similarities in biology and structure. Essentially, 'fungi', pragmatically defined as organisms studied by mycologists, are eukaryotic, heterotrophic, develop branching filaments (or are more rarely single-celled), and reproduce by spores. Where it is useful to speak of fungi in this polyphyletic sense, the name can be used non-italicized and not capitalized to differentiate this from the kingdom *Fungi*; it is also possible to use other informal names for 'fungi', e.g. eumycotan or protoctistan fungi if considered desirable (Kendrick, 1992), but their replacement by scientific names that could imply either a common ancestry (cf. *Panomyces*) or more formal rank (e.g. union; Barr, 1992) is not advocated here. Retention of the fungal phylum termination **-mycota** regardless of the kingdom to which the 'fungal' phyla are referred fulfills the same purpose. However, for this edition of the *Dictionary* zoological orthography is adopted for most of the suprafamilial ranks of the 'protozoan fungi'.
- The three kingdoms of 'fungi' accepted in this edition of the *Dictionary* are:
 (1) **Chromista**
 (2) **Fungi**
 (3) **Protozoa**
- Their distinguishing features and names are discussed under the entries for each of the kingdoms. In recognition of their distinct evolutionary origins, organisms from these three kingdoms which are tradi-

tionally studied by mycologists, are now listed separately in this *Dictionary*. Some authors unite the *Chromista* and *Protozoa* into a single highly polyphyletic kingdom *Protocista* (syn. *Protista*), but that conclusion is not supported by molecular, biochemical, and other evidence (see under kingdom entries). Cavalier-Smith (1993) and Corliss (1994) both retain *Chromista* and *Protozoa* as separate kingdoms. Dick (2001) segregates the *Straminipila* as a kingdom separate from the *Chromista* and including the fungal phyla of that kingdom.

Lit.: Ainsworth *et al.* (Eds) (*The Fungi* 4A-4B, 1973), von Arx (*The genera of fungi sporulating in pure culture*, edn 3, 1981), Barr (*Mycol.* 84: 1, 1992), Bessey (*Morphology and taxonomy of fungi*, 1950), Cavalier-Smith (in Osawa & Honjo (Eds), *Evolution of life*: 271, 1991; *Microbiol. Rev.* 37: 953, 1993), Corliss (*Acta Protozool.* 33: 1, 1994), Hawksworth (*MR* 95: 641, 1991), Kendrick (*The fifth kingdom*, edn 2, 1992), Kriesel (*Grundzüge eines natürlichen Systems der Pilze*, 1969; *Biol. Rundsch.* 26: 65, 1988), Leedale (*Taxon* 23: 261, 1974; review early systems), Margulis (*Symbiosis in cell evolution*, edn 2, 1993), Moore (*Recent advances in microbiology*: 49, 1971; *Bot. Mar.* 23: 361, 1980; in Hawksworth (Ed.), *Identification and characterization of pest organisms*, 1994).

See also Classification, Phylogeny

Kinorhynchospora A.V. Adrianov & A.V. Rybakov (1991), Microsporidia. 1.

Kionocephala P.M. Kirk (1986), anamorphic *Pezizomycotina*, Hso.≡ eP.4. 1, British Isles. See Kirk (*TBMS* 86: 419, 1986).

Kionochaeta P.M. Kirk & B. Sutton (1986), anamorphic *Pezizomycotina*, Hso.0eH.15. 11, widespread (tropical). See Kirk & Sutton (*TBMS* 85: 712, 1985), Crous *et al.* (*Mycol.* 86: 447, 1994; S Africa), Goh & Hyde (*MR* 101: 1517, 1997), Okada *et al.* (*Mycoscience* 38: 409, 1997; phylogeny).

Kirchbaumia Schulzer (1866) = *Phallus* fide Stalpers (*in litt.*).

Kirkia Benny (1995) [non *Kirkia* Oliv. 1868, *Simaroubaceae*] ≡ *Kirkomyces*.

Kirkomyces Benny (1996), Mucoraceae. 1, India. See Benny (*Mycol.* 87: 922, 1995), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny).

Kirramyces J. Walker, B. Sutton & Pascoe (1992), anamorphic *Mycosphaerellaceae*, Cpd.≡ eP.19. 7, widespread (esp. Australia). See Walker *et al.* (*MR* 96: 919, 1992), Crous *et al.* (*S. Afr. J. Bot.* 63: 111, 1997), Andjic *et al.* (*MR* 111: 1184, 2007; phylogeny).

Kirschsteinia Syd. (1906) = *Nitschkia* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).

Kirschsteiniella Petr. (1923) = *Cyclothyrium* fide Hawksworth (*J. Linn. Soc. Bot.* 82: 35, 1981).

Kirschsteiniorthelia D. Hawksw. (1985), Dothideomycetes. Anamorph *Dendryphiopsis*. 7, widespread. See Barr (*SA* 12: 27, 1993), Barr (*Mycotaxon* 49: 129, 1993; posn), Shearer (*Mycol.* 85: 963, 1994; asci), Chen & Hsieh (*Sydowia* 56: 229, 2004; type sp.), Huang *et al.* (*Mycotaxon* 98: 153, 2006; Taiwan), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny), Wang *et al.* (*MR* 111: 1268, 2007; phylogeny).

Kjeldsenia Colgan, Castellano & Bougher (1995), Claustulaceae. 1, USA. Basidioma gasteroid.

Klasterskya Petr. (1940), ? Ophiostomataceae. Ana-

morph *Hyalorhinocladia*-like. 1 (from pine needles), Europe. See Minter (*TBMS* 80: 162, 1983; posn), Valldosera & Guarro (*MR* 92: 113, 1989), Malloch & Blackwell (*CJB* 68: 1712, 1990; posn).

Klastopsora Dietel (1904) = *Pucciniostele* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).

Klebahnia Arthur (1906) = *Uromyces* fide Arthur (*Manual Rusts US & Canada*, 1934).

Klebahnopycnis Kirschst. (1939) = *Hoehneliella* fide Petrak (*Annls mycol.* 38: 199, 1940).

Kleidiomyces Thaxt. (1908), Laboulbeniaceae. 3, America. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).

Klöckeria, see *Kloeckera*.

Kloeckera Janke (1923), anamorphic *Hanseniaspora*, Hso.0eH.?. 6, widespread. See Meyer *et al.* (*Antonie van Leeuwenhoek* 44: 79, 1978), Barnett *et al.* (*Yeasts: Characteristics and Identification* 2nd edn, 1990; 1 sp. accepted), Smith in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 580, 1998), Cadez *et al.* (*Int. J. Syst. Evol. Microbiol.* 56: 1157, 2006; phylogeny), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).

Kloeckeraspora Niehaus (1932) = *Hanseniaspora* fide Lodder (*Yeasts, a taxonomic study* 2nd edn, 1970), Esteve-Zarzoso *et al.* (*Antonie van Leeuwenhoek* 80: 85, 2001).

Kluyveromyces Van der Walt (1956), Saccharomycetaceae. 20, widespread. See Sidenberg & Lachance (*Int. J. Syst. Bacteriol.* 36: 94, 1986; isozymes, DNA homology), Fuson *et al.* (*Int. J. Syst. Bacteriol.* 37: 371, 1987; DNA relatedness), Martini & Martini (*Int. J. Syst. Bacteriol.* 37: 380, 1987), Kock *et al.* (*Syst. Appl. Microbiol.* 10: 293, 1988), Martini & Rosini (*Mycol.* 81: 317, 1989; killer relationships), Kämper (*Bibliotheca Mycol.* 136, 1990; DNA killer plasmid), Molnár *et al.* (*Antonie van Leeuwenhoek* 70: 67, 1996; coenzyme Q system), Belloch *et al.* (*Syst. Appl. Microbiol.* 20: 397, 1997; mtDNA), Belloch *et al.* (*Syst. Appl. Microbiol.* 21: 266, 1998; rDNA), Belloch *et al.* (*Yeast Chichester* 14: 1341, 1998; chromosomes), Lachance in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 227, 1998), Belloch *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 405, 2000; phylogeny), Kurtzman *et al.* (*Taxon* 50: 907, 2001; nomencl.), Kurtzman (*FEMS Yeast Res.* 4: 233, 2003; generic limits), Naumova *et al.* (*FEMS Yeast Res.* 5: 263, 2004; *K. lactis*), Zivanovic *et al.* (*FEMS Yeast Res.* 5: 315, 2005; mtDNA sequence), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny), Lachance (*FEMS Yeast Res.* 7: 642, 2007; review).

Kmetia Bres. & Sacc. (1902), anamorphic *Pezizomycotina*, Hsp.0fH.?. 1, Europe.

Kmetiopsis Bat. & Peres (1960), anamorphic *Pezizomycotina*, Hsp.0fH.15. 1, Brazil. See Batista & Peres (*Publicações Inst. Micol. Recife* 245: 4, 1960).

Kneallhazia Sokolova & Fuxa (2008), Microsporidia. 1. See Sokolova & Fuxa (*Parasitology* 135: 903, 2008).

Kneiffia Fr. (1836) [non *Kneiffia* Spach 1835, *Oenotheraceae*] ≡ *Kneiffiella* Underw. ≡ *Kneiffiella* Henn. (1898), ≡ *Neokneiffia* Sacc. (Aug. 1898) (q.v.), ≡ *Pycnodon* Underw. (Dec. 1898), = *Hyphoderma* (Cortic.) fide Jülich (*Persoonia* 8: 59, 1972).

Kneiffiella P. Karst. (1889), Schizoporaceae. c. 25 (widespread). See Larsson *et al.* (*Mycol.* 98: 926, 2007).

Kneiffiella Underw. (1897) ≡ *Neokneiffia*.

- Knemiothyrium** Bat. & J.L. Bezerra (1960), anamorphic *Pezizomycotina*, Cpt.1= eP.?. 1, Jamaica. See Batista & Bezerra (*Publções Inst. Micol. Recife* 280: 5, 1960).
- Kniep** (Karl Johannes Hans; 1881-1930; Germany). PhD, Jena (1904); Professor, Würzburg (1914); Professor of Plant Physiology (1924-1930) and Director of the Institute of Plant Physiology, Berlin-Dahlem. Noted for his work on the genetics of fungi. *Publs. Die Sexualität der Niederen Pflanzen* (1928); Vererbungserscheinungen bei Pilzen. *Bibliographica Genetica* (1929). *Biogs, obits etc.* Grummann (1974: 97); Harder (*Bericht der Deutschen Botanischen Gesellschaft* 48: (164), 1930).
- Knightiella** Müll. Arg. (1886) = *Icmadophila* fide Galloway (*N.Z. Jl Bot.* 18: 481, 1980), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998), Galloway (*Lichenologist* 32: 294, 2000).
- Knoxdaviesia** M.J. Wingf., P.S. van Wyk & Marasas (1988), anamorphic *Gondwanamyces*, Hso.0eH.15. 1, S. Africa. See Wingfield *et al.* (*Mycol.* 80: 26, 1988), Mouton *et al.* (*Mycotaxon* 46: 363, 1993; ontogeny), Marais *et al.* (*Mycol.* 90: 136, 1998; teleomorph), Hausner *et al.* (*CJB* 78: 903, 2000; phylogeny).
- Knufia** L.J. Hutchison & Unter. (1996), anamorphic *Pezizomycotina*, Hso.?.?. 1, Canada. See Hutchison *et al.* (*Mycol.* 87: 903, 1995), Tsuneda & Currah (*CJB* 83: 510, 2005; conidiogenesis), Tsuneda & Currah (*Rep. Tottori Mycol. Inst.* 42: 1, 2004).
- Knyaria** Kuntze (1891) = *Tubercularia* Tode.
- Kobayasia** S. Imai & A. Kawam. (1958), Phallaceae. 1, Japan. See Imai & Kawamura (*Science Rep. Yokohama Nat. Univ. Section 2* 7: 5, 1958).
- Kochiomyces** D.J.S. Barr (1980), Spizellomycetaceae. 1, USA. See Barr (*CJB* 58: 2386, 1980).
- Kochmania** Piątek (2005) = *Thecaphora* fide Vánky *et al.* (*Mycol. Progr.*: [in press], 2008).
- Koch's postulates**, Criteria for proving the pathogenicity of an organism. Steps include: (1) the suspected causal organism must be constantly associated with the disease; (2) it must be isolated and grown in pure culture; (3) when a healthy plant is inoculated with it the original disease must be reproduced; (4) the same organism must be reisolated from the experimentally infected plant. See Evans (*Yale Jl biol. Medic.* 49: 175, 1976).
- Kockovaella** Nakase, I. Banno & Y. Yamada (1991), anamorphic *Cuniculitremaeae*, Hso.0eH.?. 11 (ballistosporic yeast), S.E. Asia. See Nakase *et al.* (*J. gen. appl. Microbiol.* Tokyo 37: 175, 1991; taxonomy), Nakase *et al.* (*J. gen. appl. Microbiol.* Tokyo 39: 107, 1993; mol. phylogeny), Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 1351, 2000; mol. phylogeny), Fungsin *et al.* (*International Journal of Systematic and Evolutionary Microbiology* 52: 281, 2002; Thailand n.sp.).
- Kodamaea** Y. Yamada, Tom. Suzuki, M. Matsuda & Mikata (1995), Saccharomycetales. 4, USA; Australia. See Lachance *et al.* (*Can. J. Microbiol.* 45: 172, 1999), Rosa *et al.* (*Int. J. Syst. Bacteriol.* 49: 309, 1999), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Kodonospora** K. Ando (1993), anamorphic *Pezizomycotina*, Hso.0bP.15. 1, Japan. See Ando (*MR* 97: 506, 1993).
- Koerberia** A. Massal. (1854), Placynthiaceae (L). 2, widespread. See Henssen (*CJB* 41: 1347, 1963), Burgaz & Martínez (*Nova Hedwigia* 73: 381, 2001; Iberian peninsula).
- Koerberiella** Stein (1879), Porpidiaceae (L). 2, Europe. See Rambold *et al.* (*Lichenologist* 22: 225, 1990), Navarro-Rosinés & Hafellner (*Bibliotheca Lichenol.* 53: 179, 1993), Brodo (*Bryologist* 98: 609, 1995; N. Am.), Buschbom & Mueller (*Mol. Phylogen. Evol.* 32: 66, 2004; phylogeny).
- Koerberiellaceae** Hafellner (1984) = Porpidiaceae.
- Kohlmeyera** S. Schatz (1980) = *Mastodia* fide Eriksson (*Op. Bot.* 60, 1981).
- Kohlmeyeriella** E.B.G. Jones, R.G. Johnson & S.T. Moss (1983), Lulworthiaceae. 1 (marine), widespread (northern hemisphere). See Jones & Moss (*SA* 6: 179, 1987), Campbell *et al.* (*Fungal Diversity Res. Ser.* 7: 15, 2002; posn), Campbell *et al.* (*MR* 109: 556, 2005; phylogeny).
- Kohninia** Holst-Jensen, Vrålstad & T. Schumacher. (2004), Sclerotiniaceae. 1, Norway. See Holst-Jensen *et al.* (*Mycol.* 96: 139, 2004).
- koji mould**, *Aspergillus oryzae* and allied spp. used as starter for various fermented Japanese foods (saké, miso, shoyu, mirin, amazaké) by inoculating rice. See Murakami (*J. gen. Microbiol.* 17: 281, 1971), mould rice, miso, Industrial mycology.
- kojic acid**, characteristic metabolic product of *Aspergillus flavus*, *oryzae* and *tamarii* groups (Birkinshaw *et al.*, *Phil. Trans.* B220: 127, 1931). It gives a blood-red colour with ferric chloride (FeCl₃).
- Kokkalera** Ponnappa (1970) = *Podosphaera* fide Braun & Takamatsu (*Schlechtendalia* 4: 3, 2000).
- Koleroga** Donk (1958) = *Ceratobasidium* fide Talbot (*Persoonia* 3: 371, 1965) but see, Muthappa (*TBMS* 73: 159, 1979).
- Kolletes** Kohlm. & Volkm.-Kohlm. (2005), anamorphic *Pezizomycotina*. 1 (halotolerant), USA. See Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 48: 316, 2005).
- Kolman** Adans. (1763) nom. rej. = *Collema* F.H. Wigg. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Komagataea** Y. Yamada, M. Matsuda, K. Maeda, Sakak. & Mikata (1994), Phaffomycetaceae. 1, Asia; Europe. See James *et al.* (*Int. J. Syst. Bacteriol.* 48: 591, 1998; phylogeny), Kurtzman in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 413, 1998; synonymy with *Williopsis*), Yamada *et al.* (*Biosc., Biotechn., Biochem.* 63: 827, 1999), Naumova *et al.* (*Syst. Appl. Microbiol.* 27: 192, 2004).
- Komagataella** Y. Yamada, M. Matsuda, K. Maeda & Mikata (1995), Saccharomycetales. 1, widespread. See Kurtzman in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 273, 1998; synonymy with *Pichia*), Kurtzman (*Int. J. Syst. Evol. Microbiol.* 55: 973, 2005; phylogeny, definition), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Kommamyce** Nieuwl. (1916) = *Biscogniauxia*.
- Komposocypha** Pfister (1989), Sarcoscyphaceae. 4 or 4, widespread (tropical). See Pfister (*Mem. N. Y. bot. Gdn* 49: 339, 1989), Harrington *et al.* (*Mycol.* 91: 41, 1999; phylogeny).
- Kondoa** Y. Yamada, Nakagawa & I. Banno (1989), Kondoaceae. 2, Antarctic Ocean; Portugal. See Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 1351, 2000; mol. phylogeny), Fonseca *et al.* (*Antonie van Leeuwenhoek* 77: 293, 2000).
- Kondoaceae** R. Bauer, Begerow, J.P. Samp., M. Weiss & Oberw. (2006), Agaricostilbales. 1 gen., 2 spp. *Lit.*: Bauer *et al.* (*Mycol. Progr.* 5: 41, 2006).

- Konenia** Hara (1913), *Pezizomycotina*. 1, Japan; USA. See Petrak (*Sydowia* 6: 358, 1952).
- Konradia** Racib. (1900), *Clavicipitaceae*. 1, Asia. See Boedijn (*Annls mycol.* 33: 229, 1935), Bischoff & White (*Mycology Series* 19: 125, 2003).
- Kontospora** A. Roldán, Honrubia & Marvanová (1990), anamorphic *Pezizomycotina*, Hso.≡ eH.19. 1 (aquatic), Spain. See Roldán *et al.* (*MR* 94: 243, 1990).
- Koorchaloma** Subram. (1953), anamorphic *Kanasacus*, Hsp.0eH.15. 10, pantropical. See Nag Raj (*Mycotaxon* 19: 167, 1984), Sarma *et al.* (*Bot. Mar.* 44: 321, 2001), Treigien (*Mycotaxon* 96: 173, 2006).
- Koorchalomella** Chona, Munjal & J.N. Kapoor (1958), anamorphic *Pezizomycotina*, Hsp.0eH.15. 1, India; USA. See Nag Raj (*Mycotaxon* 19: 167, 1984).
- Koordersiella** Höhn. (1909), *Dothideomycetes*. Anamorph *Hansfordiellopsis*. 3 (on lichens), widespread (tropical). See Eriksson & Hawksworth (*SA* 6: 133, 1987).
- Koralionastes** Kohlm. & Volkm.-Kohlm. (1987), *Koralionastetaceae*. 5 (marine), widespread (tropics). See Kohlmeyer & Volkmann-Kohlmeyer (*CJB* 68: 1554, 1990), Volkmann-Kohlmeyer & Kohlmeyer (*Mycotaxon* 44: 417, 1992).
- Koralionastetaceae** Kohlm. & Volkm.-Kohlm. (1987), *Pezizomycotina* (inc. sed.). 1 gen., 5 spp.
Lit.: Kohlmeyer & Volkmann-Kohlmeyer (*Mycol.* 79: 764, 1987), Kohlmeyer & Volkmann-Kohlmeyer (*CJB* 68: 1554, 1990).
- Körber** (Gustav Wilhelm; 1817-1885; Germany). Born in Schlesien; studied in Breslau (now Wrocław, Poland) and Berlin; lecturer and later Professor at the University of Wrocław. An outstanding lichenologist who made major contributions to understanding the nature of lichen-forming fungi and to the systematics of crustose genera using microscopic features. Although his work was often eclipsed by the more prolific Nylander (q.v.), many genera Körber recognized in the 1850s-1860s came into use again in the 1980s (e.g. *Lecidella*, *Porpidia*, *Pyrrhospora*). Main collections in Leiden (L; incl. 'Typenherbar'); other material in Wrocław (WRSL). *Publs. De Gonidiis Lichenum* (1840); *Systema Lichenum Germaniae* (1854-55); *Parerga Lichenologica* (1859-65). *Biogs, obits etc.* Grumann (1974: 23); Stafleu & Cowan (*TL-2* 2: 603, 1979).
- Kordyana** Racib. (1900), *Brachybasidiaceae*. 5 (parasites esp. of *Commelinaceae*), widespread (tropical). See Gäumann (*Annls mycol.* 20: 257, 1922), Donk (*Reinwardtia* 4: 117, 1956).
- Kordyanella** Höhn. (1904) = *Tremellidium* fide Rogers (*Mycol.* 49: 902, 1957).
- Korfia** J. Reid & Cain (1963), *Hemiphacidiaceae*. 1, USA. See Reid & Cain (*Mycol.* 55: 783, 1963).
- Korfiella** D.C. Pant & V.P. Tewari (1970), *Sarcosomataceae*. 1, India. See Pant & Tewari (*TBMS* 54: 493, 1970), Prasad & Pant (*Journal of Mycology and Plant Pathology* 34: 147, 2004; spore ornamentation).
- Korfiomyces** Iturr. & D. Hawksw. (2004), *Lecanoromycetes*. 1, Venezuela. See Iturriaga & Hawksworth (*Mycol.* 96: 1155, 2004).
- Korkir** Adans. (1763) ? = *Ochrolechia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Korunomyces** Hodges & F.A. Ferreira (1981), anamorphic *Pezizomycotina*, Hso.1bH.1. 2, Brazil; Cuba. See Hodges & Ferreira (*Mycol.* 73: 335, 1981), Seixas *et al.* (*Mycol.* 99: 99, 2007; Brazil).
- Korupella** Hjortstam & P. Roberts (2000), *Agaricomycetidae*. 1, Cameroon. See Roberts (*Kew Bull.* 55: 817, 2000).
- Kostermansinda** Rifai (1968), anamorphic *Pezizomycotina*, Hsy.#eP.1. 3, pantropical. See Rifai (*Reinwardtia* 7: 376, 1968), Arambarri *et al.* (*Mycotaxon* 29: 29, 1987), Catania (*Lilloa* 40: 173, 2001).
- Kostermansindiopsis** R.F. Castañeda (1986), anamorphic *Pezizomycotina*, Hsy.#eP.1. 1, Cuba. See Castañeda (*Deuteromycotina de Cuba Hyphomycetes* IV: 8, 1986), Yanna & Hyde (*Aust. Syst. Bot.* 15: 755, 2002; key).
- Kotlabaea** Svrček (1969), *Pyronemataceae*. 2, Europe. See Benkert & Kristiansen (*Z. Mykol.* 65: 33, 1999; Norway), Khare (*Nova Hedwigia* 77: 445, 2003).
- Kramabeeja** G.V. Rao & K.A. Reddy (1981), anamorphic *Pezizomycotina*, Hso.≡ eP.1. 1, India.
- Kramasamuha** Subram. & Vittal (1973), anamorphic *Pezizomycotina*, Hso.≡ eP.11. 1, widespread. See Subramanian & Vittal (*CJB* 51: 1128, 1973).
- Kraurogymnocarpa** Udagawa & Uchiy. (1999), *Gymnoascaceae*. 2, Japan. See Udagawa & Uchiyama (*Mycoscience* 40: 277, 1999).
- Kravtzevia** Shvartsman (1961), *Pezizomycotina*. 1, former USSR. See Shvartsman (*Trudy Inst. Bot., Alma-Ata* 9: 75, 1961).
- Kregervanrija** Kurtzman (2006), *Pichiaceae*. 1, widespread. See Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Kreiseliella** Braun (1991), anamorphic *Pezizomycotina*, Cac.0-1eH.4/3/10. 1, former USSR. See Braun (*Boletus* 15: 39, 1991).
- Krempelhuberia** A. Massal. (1854) nom. rej. = *Pseudographis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Kretzschmaria** Fr. (1849), *Xylariaceae*. Anamorph *Geniculosporium*-like. 28, widespread. See Wilkins (*TBMS* 18: 320, 1934; pathogenicity), Dennis (*Kew Bull.*: 297, 1957), Dennis (*Bull. Jard. bot. Brux.* 31: 144, 1961), Silveira & Rogers (*Acta Amazon. Supl.* 15: 7, 1985; key 4 spp. Brazil), Narula & Rawla (*Nova Hedwigia* 40: 241, 1986; key 3 spp., Himalayas), San Martín & Rogers (*Mycotaxon* 48: 179, 1993; Mexico), Rogers & Ju (*Mycotaxon* 68: 345, 1998; monogr.), Hladki & Romero (*Mycotaxon* 79: 481, 2001; Argentina), Rogers & Ju (*Mycol. Progr.* 3: 37, 2004; revision), Ju *et al.* (*Mycol.* 99: 612, 2007; phylogeny).
- Kretzschmariella** Viégas (1944), *Xylariaceae*. Anamorph *Mirandina*-like. 1, Brazil. See Ju & Rogers (*Mycotaxon* 51: 241, 1994; anam.), Læssøe & Spooner (*Kew Bull.* 49: 1, 1994), Ju & Rogers (*Nova Hedwigia* 74: 75, 2002).
- Kriegeria** Bres. (1891), *Microbotryomycetes*. Anamorph *Zymoxenogloea*. 1, Europe; N. America. See Kao (*Mycol.* 48: 288, 1956).
- Kriegeria** G. Winter ex Höhn. (1914) [non *Kriegeria* Bres. 1891] = *Rutstroemia* fide Dennis (*Mycol. Pap.* 62, 1956).
- Kriegeriella** Höhn. (1918), *Pleosporaceae*. 4, Europe; N. America. See Barr (*Mycotaxon* 2: 104, 1975), von Arx & Müller (*Stud. Mycol.* 9, 1975), Barr (*Mycotaxon* 29: 501, 1987; posn).
- Kriegeriellaceae** M.E. Barr (1987) = *Pleosporaceae*.
- Krieglsteinera** Pouzar (1987), *Heterogastridiaceae*. 1 (on *Lasiosphaeria*), Europe. See Pouzar (*Beitr. Kenntn. Pilze Mitteleur.* 3: 404, 1987), Miller *et al.*

- (*Mycologist* 17: 12, 2003), Rödel (*Boletus* 28: 31, 2005).
- Krishnamyces** Hosag. (2003), anamorphic *Pezizomycotina*. 1, India. See Hosagoudar (*Zoos' Print Journal* 18: 1159, 2003).
- Krishtalia** P.J. Kilochitskii (1997), Microsporidia. 1.
- Krispiromyces** T.N. Taylor, Hass & W. Remy (1993), Fossil Fungi. 1 (Devonian), British Isles. See Taylor *et al.* (*Mycol.* 84: 906, 1992).
- Krogia** Timdal (2002), ? Ramalinaceae (L.). 1, Mauritius. See Timdal (*Lichenologist* 34: 293, 2002), Llop (*Lichenologist* 38: 519, 2006).
- Krombholzia** P. Karst. (1881) [non *Krombholzia* Rupr. ex E. Fourn. 1876, *Gramineae*] = *Leccinum*.
- Krombholziella** Maire (1937) = *Leccinum* fide Singer (*Farlowia* 2: 223, 1945).
- Kroswia** P.M. Jørg. (2002), Pannariaceae (L.). 2, widespread. See Jørgensen (*Lichenologist* 34: 297, 2002), Jørgensen & Sipman (*J. Hattori bot. Lab.* 100: 695, 2006).
- Kruphaiomyces** Thaxt. (1931), Laboulbeniaceae. 1, Fiji. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- Kryptastrina** Oberw. (1990), Pucciniomycotina. 1 (in corticioid fungi), Colombia. See Oberwinkler (*Rep. Tottori Mycol. Inst.* 28: 118, 1990).
- K-selection**, adaptation to the long-term colonization of habitats already occupied by other species; in fungi generally involving limited numbers of sexually produced and often long-lived propagules, e.g. large thick-walled ascospores; cf. r-selection (q.v. for *Lit.*).
- Kubickia** Svrček (1957) ? = *Ombrophila* Fr. fide Korf in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 249, 1973).
- Kubinya** Schulzer (1866) = *Mamiania* fide Saccardo (*Syll. fung.* 16: 1263, 1902).
- Kuehneola** Magnus (1898), Phragmidiaceae. 9 (on *Rosaceae*), widespread. *K. uredinis* (syn. *K. albida*) (blackberry (*Rubus*) stem (or yellow) rust). See Parmelee & Carteret (*Fungi Canadenses* 307, 1986), Helfer (*Nova Hedwigia* 81: 325, 2005; Europ. spp.) Species of *Kuehneola* reported from *Anacardiaceae*, *Malvaceae*, *Celastraceae* and *Verbenaceae* may belong to other phakopsoraceous genera.
- Kuehneromyces** Singer & A.H. Sm. (1946) = *Pholiota* fide Kuyper (*in litt.*) See Mykholz.
- Kuehniella** G.F. Orr (1976), Onygenaceae. 1, N. America. See Currah (*SA* 7: 1, 1988).
- Kuettlingeria** Trevis. (1857) = *Caloplaca* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Galloway (*Australasian Lichenology* 55: 21, 2004).
- Kühn** (Julius Gotthelf; 1825-1910; Germany). Self-educated farm estate manager (1848-1855, 1857-1862); student, Agricultural Academy, Bonn-Poppelsdorf (1855-1856); Professor of Agriculture and founder of the Agricultural Institute, Halle University (1862 onwards). Demonstrated that ergot sclerotia were a state of *Claviceps*; noted for his important book on plant diseases which resulted in the first widespread practical application of scientific principles of plant pathology. *Publs. Die Krankheiten der Kulturgewächse, ihre Ursachen und ihre Verhütung* (1858). *Biogs, obits etc.* Grumann (1974: 101); Stafleu & Cowan (*TL-2* 2: 682, 1979); Whetzel (*An outline of the History of Phytopathology* p. 122, 1918) [portrait]; Wilhelm & Tietz (*Annual Review of Phytopathology* 16: 343, 1978) [portrait].
- Kuhneria** P.A. Dang. (1933) nom. dub., Fungi. ? 'phycomycetes'.
- Kuklospora** Oehl & Sieverd. (2006) = *Entrophospora* fide Walker & Schüssler (*in litt.*) but see, Oehl & Sieverding (*J. Appl. Bot. Food Quality Angew. Botan.* 80: 74, 2006).
- Kulkarniella** Gokhale & Patel (1952) = *Monosporidium* fide Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983).
- Kullhemia** P. Karst. (1878), Dothideomycetes. 1, Europe.
- Kumanasamuha** P. Rag. Rao & D. Rao (1964), anamorphic *Pezizomycotina*, Hso.0eP.10. 4, widespread. See Rao & Rao (*Mycopathologia* 22: 333, 1964), Kirschner *et al.* (*Fungal Science Taipei* 16: 47, 2001; Taiwan).
- Kumarisporites** Kalgutkar & Janson. (2000), Fossil Fungi, anamorphic *Ascomycota*. 1, India. See Kalgutkar & Jansonius (*AASP Contributions Series* 39: 157, 2000).
- Kumbhamaya** M. Jacob & D.J. Bhat (2000) = *Cyphelophora* fide Jacob & Bhat (*Cryptog. Mycol.* 21: 82, 2000), Sreekala & Bhat (*Mycotaxon* 84: 65, 2002), Decock *et al.* (*Antonie van Leeuwenhoek* 84: 209, 2003).
- kumiss**, see Fermented food and drinks.
- Kunkelia** Arthur (1917), Phragmidiaceae. 1, N. America. See Laundon (*Mycotaxon* 3: 135, 1975; = *Gymnoconia*), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983), Buriticá (*Rev. Acad. Colomb. Cienc.* 18 no. 69: 131, 1991).
- Kuntzeomyces** Henn. ex Sacc. & P. Syd. (1899), ? Anthracoideaceae. 2 (on *Rhynchospora*), S. America. See Ling & Stevenson (*Mycol.* 41: 87, 1949), Molina-Valero (*Caldasia* 13: 49, 1980), Piepenbring (*MR* 105: 757, 2001), Piepenbring (*Fl. Neotrop. Monogr.* 86, 2003).
- Kupsura** Lloyd (1924) = *Lysurus* fide Zeller (*Mycol.* 40: 646, 1948).
- Kuraishia** Y. Yamada, K. Maeda & Mikata (1994), Saccharomycetaceae. 2 (from rotten wood and insect frass), widespread. See Kurtzman in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 273, 1998), Péter *et al.* (*Antonie van Leeuwenhoek* 88: 241, 2005; phylogeny, anamorph), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Kurosawaia** Hara (1954) = *Sphaceloma* fide Sutton (*Mycol. Pap.* 141, 1977).
- Kurssanovia** Kravtzev (1955), *Pezizomycotina*. 1, former USSR. See Kravtzev (*Trudy Inst. Bot., Alma-Ata* 2: 145, 1955).
- Kurssanovia** Pidopl. (1948) = *Fusariella* fide Sutton (*in litt.*).
- Kurtzmaniella** M.A. Lachance & W.T. Starmer (2008), Saccharomycetaceae. 1 (on cactus flowers, associated with beetles), USA. See Lachance & Starmer (*Int. J. Syst. Evol. Microbiol.* 58: 520, 2008).
- Kurtzmanomyces** Y. Yamada, Itoh, H. Kawas., I. Banno & Nakase (1989), anamorphic *Chionosphaeraceae*. 3, Europe. See Yamada *et al.* (*Agric. Biol. Chem.* 53: 2993, 1989; phylogeny), Boekhout & Phaff (*Yeasts in Food Beneficial and Detrimental Aspects*, 2003).
- Kusano** (Shunsuke; 1874-1962; Japan). DPhil, University of Rigakushi; Academic staff (1896-1908) then Assistant Professor of Botany (1908) then Professor (1927-1934), University of Tokyo; Botanical Laboratory, College of Agriculture, Komaba, Tokyo. An Japanese mycologist noted for his work on the biology of chytrid fungi. *Publs.* On the life-history and

- cytology of a new species of *Olpidium*, with special reference to the copulation of motile isogametes. *Journal of the College of Agriculture Tokyo Imperial University* (1912); The life-history and physiology of *Synchytrium fulgens* Schroet., with special reference to its sexuality. *Japanese Journal of Botany* (1930, 1936). *Biogs, obits etc.* Grumann (1974: 593).
- Kusanoa** Henn. (1900) = *Uleomyces* fide von Arx (*Persoonia* 2: 421, 1963).
- Kusanobotrys** Henn. (1904), Dothideomycetes. 1, Japan. See Eriksson & Hawksworth (*SA* 13: 141, 1994; posn), Hosagoudar (*Persoonia* 18: 123, 2002).
- Kusanoopsis** F. Stevens & Weedon (1923) = *Uleomyces* fide Thirumalachar & Jenkins (*Mycol.* 45: 781, 1953).
- Kusanotheca** Bat. & Cif. (1963) = *Dysrhynchis* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Kutchiathyrites** R.K. Kar (1979), Fossil Fungi. 1 (Oligocene), India.
- Kutilakesa** Subram. (1956) = *Sarcopodium* fide Sutton (*TBMS* 76: 97, 1981).
- Kutilakesopsis** Agnihothr. & G.C.S. Barua (1957) = *Sarcopodium* fide Sutton (*TBMS* 76: 97, 1981).
- Kuzuhaea** R.K. Benj. (1985), Piptocephalidaceae. 1, Japan. See Benjamin (*J. Linn. Soc. Bot.* 91: 117, 1985), Tanabe *et al.* (*Mol. Phylogen. Evol.* 16: 253, 2000; phylogeny), Tanabe *et al.* (*J. gen. appl. Microbiol.* Tokyo 51: 267, 2005; phylogeny).
- Kweilingia** Teng (1940), Phakopsoraceae. 2 (on *Bambusa* (*Poaceae*)), China. See Vánky (*Illustrated genera of smut fungi*, 1987), Buriticá (*Rev. Acad. Colomb. Cienc.* 22: 325, 1998; may include *Tunicopora* and *Dasturella* (on *Poaceae*, *Costaceae*)), Carvalho *et al.* (*Summa Phytopathologica* 27: 260, 2001).
- Kylindria** DiCosmo, S.M. Berch & W.B. Kendr. (1983), anamorphic *Chaetosphaeriaceae*, Hso.≡ eH.15. 9, widespread. See Rambelli & Onofri (*TBMS* 88: 393, 1987; emend.), Fernández & Huhndorf (*Fungal Diversity* 18: 15, 2005).
- Kymadiscus** Kohlm. & E. Kohlm. (1971) = *Dactylospora* fide Kohlmeyer (*in litt.*).
- Kyphomyces** I.I. Tav. (1985), Laboulbeniaceae. 14, widespread. See Tavares (*Mycol. Mem.* 9: 242, 1985).
- Kyphophora** B. Sutton (1991), anamorphic *Pezizomycotina*, St.0eH.38. 1 (on mangroves), Australia. See Sutton (*Sydowia* 43: 268, 1991).
- L**, Onderzoekinstituut Rijksherbarium/Hortus Botanicus (Leiden, Netherlands); founded 1575; part of the University of Leiden; see Anon. (*Meded. Rijks Herb.* 62-69, 1931), Kalkman & Smit (*Blumea* 25: 1, 1979).
- Laaseomyces** Ruhland (1900) ? = *Scopinella* fide Benny & Kimbrough (*Mycotaxon* 12: 1, 1980).
- labiate**, having lips; lip-like.
- Labidulomyces**, see *Labidulomyces*.
- Labiduromyces** Ishik. (1941) = *Filariomyces* fide Tavares (*Mycol. Mem.* 9, 1985).
- labium**, a lip.
- Laboratory safety**, see Safety, Laboratory.
- Laboulbenia** Mont. & C.P. Robin (1853), Laboulbeniaceae. c. 593 (on *Insecta*, *Arachnida*), widespread. See Kaur & Mukerji (*Mycoscience* 36: 311, 1995; India), Weir & Beakes *in* Jolivet & Cox (Eds) (*Chrysomelidae Biology* 2: 117, 1996), Rossi & Weir (*MR* 101: 129, 1997), De Kesel (*Sterbeeckia* 18: 13, 1998; Belgium), Santamaría (*Fl. Mycol. Iberica* 4, 1998; Iberian spp.), Terada (*Mycoscience* 42: 1, 2001), Hughes *et al.* (*Mycol.* 96: 1355, 2004; New Zealand), Terada (*Mycoscience* 45: 324, 2004; morphological variation), Terada *et al.* (*Bot. Bull. Acad. sin. Taipei* 45: 165, 2004; on carabids, Taiwan), Terada (*Mycoscience* 46: 215, 2005; on carabid beetles, Asia), Rossi & Santamaría (*Nova Hedwigia* 82: 189, 2006).
- Laboulbeniaceae** G. Winter (1886), Laboulbeniales. 126 gen. (+ 32 syn.), 1931 spp.
Lit.: Bánhegyi *et al.* (*Magyarország Mikroszkopikus Gombáinak Határozókönyve* 2. Kötet Eumycotina (Ascomycetes: A Discomycetéstől, Basidiomycetes, Deuteromycetes): 635 pp., 1985), Huldén (*Karstenia* 25: 1, 1985), Tavares (*Mycol. Mem.* 9: 627 pp., 1985), Lee (*Korean J. Pl. Taxon.* 16: 1, 1986), Santamaría (*Nova Hedwigia* 63: 63, 1996), Weir & Beakes (*Mycol.* 88: 677, 1996), Weir & Hammond (*Biodiv. Cons.* 6: 701, 1997), Santamaría & Rossi (*Pl. Biosystems* 133: 163, 1999), Rossi & Santamaría (*Mycol.* 92: 786, 2000), Weir & Hughes (*Mycol.* 94: 483, 2002), Hughes *et al.* (*Mycol.* 96: 834, 2004).
- Laboulbeniales** Lindau (1898). Laboulbeniomycetidae. 4 fam., 146 gen., 2050 spp. Stromata usually present, composed of a basal black haustorium and a dark cellular thallus, formed under tight developmental control. Ascomata perithecial, often surrounded by complex appendages, translucent, ovoid, thin-walled. Interascal tissue absent. Asci few, clavate, thin-walled, evanescent, usually 4-spored. Ascospores hyaline, elongate, 1-septate. Anamorph hyphomycetous, spermatial, fleeting. Ectocommensalists of *Insecta* (few on *Arachnida* and *Diplopoda*), cosmop.
- The 'host' is only rarely seriously damaged by the fungus, which generally does not extend below the chitin. Tavares (*Mycol. Mem.* 9, 1985; key gens., illustr.) is largely followed for generic and family concepts here. Fams:
- (1) **Ceratomycetaceae**
 - (2) **Euceratomycetaceae**
 - (3) **Herpomycetaceae**
 - (4) **Laboulbeniaceae**
- Lit.*: Benjamin (*in* Thaxter reprint, 1971; *in* Ainsworth *et al.* (Eds), *The Fungi* 4A: 223, 1973), Balazuc (*Bull. mens. Soc. linn. Lyon* 40: 134, 1971, bibliogr.; 42 (9)- 43 (9), 1973-1974; France), Blackwell (*Mycol.* 86: 1, 1994; molec. relationships), Blackwell & Rossi (*Mycotaxon* 25: 581, 1986; on termites), Lee (*Korean J. Pl. Taxon.* 16: 89, 1986; fams.), Huldén (*Karstenia* 23: 31, 1983, Finland; 25: 1, 1985, palearctic), Majewski (*Polish Bot. Stud.* 7, 1994; 179 spp. Poland, 116 pl.), Rossi & Cesari Rossi (*Giorn. Bot. ital.* 112: 63, 1978, Italy; *CJB* 57: 993, 1979, W. Africa), Rossi & Santamaría (*Mycol.* 92: 786, 2000; spp. on *Staphylinidae*), Santamaría (*L'ordre Laboulbeniales. a la Península Ibérica*, 1990; Spain), Santamaría *et al.* (*Trebalb d'Inst. Bot. Barcelona* 14: 1-123, 1991; checklist, host list, and distribution European spp.), Scheloske (*Parasitol SchrReihe* 19, 1969; biology, ecology, systematics), Shanor (*Mycol.* 47: 1, 1955; general review), Sugiyama (*Ginkgoana* 2, 1973; Japan), Tavares (*in* Batra (Ed.), *Insect-fungus symbiosis*, 1979; genera on host groups, *Mycologia Mem.* 9, 1985), Terada (*Trans. mycol. Soc. Japan* 19: 55, 1978; Taiwan), Thaxter (*Mem. Am. Acad. Arts Sci.* 12-16, 1896-1931 [reprint 1971]; monogr.), Weir & Rossi (*Mycol.* 93: 171, 2001; Bolivian spp.).

- Laboulbeniella** Speg. (1912) = *Laboulbenia* fide Thaxter (*Proc. Amer. Acad. Arts & Sci.* 50: 15, 1914).
- Laboulbeniomycetes** A. Engler (1897), *Pezizomycotina*. 2 ord., 5 fam., 151 gen., 2072 spp. Subcl.:
- (1) **Laboulbeniomycetidae**
Lit.: Benjamin (*in* Ainsworth *et al.* (Eds), *The Fungi* 4A: 223, 1973), Balazuc (*Bull. mens. Soc. linn. Lyon* 40: 134, 1971, bibliogr.; 42 (9)- 43 (9), 1973-1974; France), Blackwell (*Mycol.* 86: 1, 1994; molec. relationships), Thaxter (*Mem. Am. Acad. Arts Sci.* 12-16, 1896-1931 [reprint 1971]; monogr.).
- Laboulbeniomycetidae** Alexop. (1962), *Laboulbeniomycetes*. Ords:
- (1) **Laboulbeniales**
 (2) **Pyxidiophorales**
Lit.: Thaxter (*Mem. Amer. Acad. Arts & Sci.* 12-16, 1896-1931 [reprint 1971]; monogr.), and see fam.
- Laboulbeniopsis** Thaxt. (1920), *Laboulbeniales*. 1 (on termites), West Indies. See Kimbrough & Gouger (*J. Invert. Path.* 16: 205, 1970), Kimbrough & Gouger (*Mycol.* 68: 541, 1976; ultrastr.), Henk *et al.* (*Mycol.* 95: 561, 2003; posn).
- Labrella** Fr. (1828) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Labridella** Brenckle (1929), anamorphic *Griphosphaerioma*, Cpd.≡ eP.1. 1, N. America. See Jeewon *et al.* (*Mol. Phylogen. Evol.* 25: 378, 2002).
- Labridium** Vestergr. (1897) ? = *Seimatosporium* fide Sutton (*Mycol. Pap.* 141, 1977).
- labriform**, lip-shaped; frequently used for terminal soralia of lichens having this shape.
- Labyrinth** Malcolm, Elix & Owe-Larss. (1995), *Porpidiaceae* (L). 1, New Zealand. See Malcolm *et al.* (*Lichenologist* 27: 241, 1995), Fryday (*Bibliotheca Lichenol.* 88: 127, 2004).
- Labyrinthomyces** Boedijn (1939), *Tuberaceae*. 7 (hypogeous), Australia. See Zhang & Minter (*SA* 7: 45, 1988), Trappe *et al.* (*Aust. Syst. Bot.* 5: 597, 1992), O'Donnell *et al.* (*Mycol.* 89: 48, 1997; phylogeny), Bougher & Lebel (*Aust. Syst. Bot.* 14: 439, 2001), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Lacazia** Taborda, V.A. Taborda & McGinnis (1999), anamorphic *Onygenales*, Hso.???. 1, S. America; N. America; Europe. *L. lobo*i (lobomycopsis (q.v.), diseases in humans and dolphins). See Scholler *et al.* (*Sydowia* 51: 89, 1999; synonym of *Dactyliellina*), Taborda *et al.* (*J. Clin. Microbiol.* 37: 2031, 1999), Haubold *et al.* (*Medical Mycology* 38: 9, 2000; in dolphins), Herr *et al.* (*J. Clin. Microbiol.* 39: 309, 2001; phylogeny), Leandro *et al.* (*Phytopathology* 91: 659, 2001; relationship to *Cladosporium*), Mendoza *et al.* (*Revta Iberoamer. Micol.* 22: 213, 2005), Vilela *et al.* (*J. Clin. Microbiol.* 43: 3657, 2005).
- Laccaria** Berk. & Broome (1883), *Hydnangiaceae*. c. 75, widespread. See Fries & Mueller (*Mycol.* 76: 633, 1984; taxonomy), Mueller (*Fieldiana, Bot.* 30: 1, 1992; key N. Am. spp.), Mueller *et al.* (*Mycol.* 85: 850, 1993; spores), Kropp & Mueller (*Laccaria – Ectomycorrhizal fungi, key genera in profile*, 1999; ecology, phylogeny), Contu (*Boll. Gruppo Micol. 'G. Bresadola'* 46: 5, 2003; Italy), Osmundson (*Mycol.* 97: 949, 2005; USA).
- Laccariaceae** Jülich (1982) = *Hydnangiaceae*. The *Laccariaceae* are listed as nom. rej. against *Tricholomataceae*.
- laccate**, polished; varnished; shining.
- Laccocephalum** McAlpine & Tepper (1895), *Polyporaceae*. 5, Australia; Japan. See Núñez & Ryvarden (*Syn. Fung.* 10: 29, 1995).
- Lacellina** Sacc. (1913), anamorphic *Pezizomycotina*, Hso.0eP.13. 4, widespread (tropical). See Ellis (*Mycol. Pap.* 67, 1957).
- Lacellinopsis** Subram. (1953), anamorphic *Pezizomycotina*, Hso.0eP.3. 4, widespread (tropical). See Ellis (*Mycol. Pap.* 67, 1957).
- lacerate**, as if roughly cut or torn.
- Lachancea** Kurtzman (2003), *Saccharomycetaceae*. 6, widespread. See Kurtzman (*FEMS Yeast Res.* 4: 239, 2003), Naumova *et al.* (*Doklady Biological Sciences* 405: 469, 2005; speciation), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Lachnaceae** Raitv. (2004) = *Hyaloscyphaceae*.
- Lachnaster** Höhn. (1917) = *Lachnum* fide Korf *in* Ainsworth *et al.* (Eds) (*The Fungi* 4A: 249, 1973).
- Lachnea** (Fr.) Gillet (1879) [non *Lachnea* L. 1753, *Thymeleaceae*] ≡ *Scutellinia* fide Schumacher (*Op. Bot.* 101, 1990).
- Lachnea** Boud. (1885) = *Humaria* Fuckel.
- Lachneaceae** Velen. (1934) = *Pyronemataceae*.
- Lachnella** Boud. (1885) = *Lachnum* fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).
- Lachnella** Fr. (1836), *Niaceae*. 6, widespread. See Singer (*Fl. Neotrop.* 17: 58, 1976; key), Bodensteiner *et al.* (*Mol. Phylogen. Evol.* 33: 501, 2004; phylogeny), Agerer & Treu (*Z. Mykol.* 72: 115, 2006; Papua New Guinea).
- Lachnellaceae** Boud. (1907), nom. inval., see *Hyaloscyphaceae*.
- Lachnellula** P. Karst. (1884), *Hyaloscyphaceae*. Anamorph *Naemospora*. 40 (on conifers), widespread (temperate). *L. willkommii* (larch (*Larix*) canker). See Manners (*TBMS* 36: 362, 1953), Manners (*TBMS* 40: 500, 1957; as *Trichoscyphella*), Dennis (*Persoonia* 2: 171, 1962), Dharne (*Phytopath. Z.* 53: 101, 1965; key), Baral (*Beitr. Kenntn. Pilze Mitteleur.* 1: 143, 1986; key 22 spp., Europ.), Cantrell & Hanlin (*Mycol.* 89: 745, 1997; DNA), Baral & Matheis (*Z. Mykol.* 66: 45, 2000; white-haired spp.), Leenurm & Raitviir (*Folia cryptog. Estonica* 38: 41, 2001; ultrastr.), Minter (*IMI Descr. Fungi Bact.* 165 nos 1641-1650, 2005).
- Lachnidium** Giard (1891) = *Fusarium* fide Mussat (*Syll. fung.* 15: 184, 1901), Summerbell & Schroers (*J. Clin. Microbiol.* 40: 2866, 2002; anamorph of *Haematonectria*).
- Lachnobelonium** Höhn. (1926) = *Lachnum* fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).
- Lachnocaulon** Clem. & Shear (1931) [non *Lachnocaulon* Kunth 1841, *Eriocaulaceae*] ? = *Stereocaulon* Hoffm. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Lachnocaulum** (orthographic variant), see *Lachnocaulon*.
- Lachnocladiaceae** D.A. Reid (1965), *Russulales*. 8 gen. (+ 3 syn.), 124 spp.
Lit.: Hallenberg (*Lachnocladiaceae and Coniophoraceae of North Europe*, 1985), Hallenberg (*The Lachnocladiaceae and Coniophoraceae of North Europe*: 96 pp., 1985), Boidin & Lanquetin (*Bibliotheca Mycol.* 114: 130 pp., 1987), Nakasone & Micales (*Mycol.* 80: 546, 1988), Stalpers (*Stud. Mycol.* 40: 185 pp., 1996), Welden (*Revta Biol. trop.* 44 Suppl. 4: 91, 1996), Ginns (*Mycol.* 90: 19, 1998), Müller *et al.* (*MR* 104: 1485, 2000), Hibbett & Donoghue (*Syst.*

- Biol.* 50: 215, 2001), Wagner (*Mycotaxon* 79: 235, 2001), Larsson & Larsson (*Mycol.* 95: 1037, 2003), Larsson (*MR* 111: 1058, 2007; syn. of *Peniophoraceae*).
- Lachnocladiales** = Russulales.
- Lachnocladium** Lév. (1846) nom. cons., Lachnocladiaceae. 5, widespread. See Corner (*Ann. Bot. Mem.* [A monograph of *Clavaria* and allied genera] 1: 416, 1950), Stalpers (*Stud. Mycol.* 40: 85, 1996; key), Larsson & Larsson (*Mycol.* 95: 1037, 2003; phylogeny).
- Lachnodoichium** Marchal (1895), anamorphic *Pezizomycotina*, Hsp.0eH.10. 1, Europe.
- Lachnum** Retz. (1795), Hyaloscyphaceae. c. 251, widespread. See also *Dasyscyphus*. See Haines & Dumont (*Mycotaxon* 19: 1, 1984; key 9 long-spored spp.), Raitviir (*Eesti NSV Tead. Akad. Toim. Biol.* seer 36: 313, 1987; concept), Spooner (*Bibliotheca Mycol.* 116, 1987; 37 spp. Australasia), Raitviir & Saccini (*Mycol. Helv.* 4: 161, 1991), Haines (*Nova Hedwigia* 54: 97, 1992; key 13 spp. Guayana), Galán & Raitviir (*Nova Hedwigia* 58: 453, 1994), Verkley (*Nova Hedwigia* 63: 215, 1996; ultrastr.), Cantrell & Haines (*MR* 101: 1081, 1997; trop. spp.), Cantrell & Hanlin (*Mycol.* 89: 745, 1997; phylogeny), Wu & Haines (*Mycotaxon* 67: 341, 1998), Zhuang (*Mycotaxon* 69: 359, 1998; spp. trop. China), Leenurm *et al.* (*Sydowia* 52: 30, 2000; ultrastr.), Tanaka & Hosoia (*Mycoscience* 42: 597, 2001; Japan), Zhuang & Hyde (*Mycol.* 93: 606, 2001; key long-spored spp.), Ye & Zhuang (*Mycosystema* 21: 340, 2002; phylogeny), Zhuang (*Mycotaxon* 86: 375, 2003; key Chinese spp.), Zhuang (*Nova Hedwigia* 78: 425, 2004; on bamboo), Suková (*Czech Mycol.* 57: 183, 2005; Czech Republic), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006; phylogeny), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- lacinia**, a delicate branch of a foliose lichen thallus having an anatomical structure typical of foliose lichens.
- lacinate** (of an edge, etc.), as if cut into delicate bands (Fig. 23.47).
- Laciniocladium** Petri (1917), anamorphic *Pezizomycotina*, Hso.0eH.?15. 1, Europe.
- Lacrimasporonites** R.T. Clarke (1965), Fossil Fungi. 9 (Cretaceous, Paleocene, Tertiary), widespread.
- lacrimiform** (lacrimoid), like a tear drop.
- Lacrymaria** Pat. (1887), Psathyrellaceae. 14, widespread. See Hopple & Vilgalys (*Mol. Phylogen. Evol.* 13: 1, 1999; phylogeny), Cortez & Coelho (*Mycotaxon* 93: 129, 2005).
- Lacrymospora** Aptroot (1991), Requienellaceae. 1 (on lichens), Madagascar. Placed in the *Pyrenulaceae* by Eriksson (*in litt.*).
- Lactarelis** Earle (1909) = *Russula* fide Singer (*Agaric. mod. Tax.*, 1951).
- Lactaria** Pers. (1797) [non *Lactaria* Rafin. 1838, *Apocynaceae*] = *Lactarius*.
- Lactariaceae** Gäum. (1926) = Russulaceae.
- Lactariella** J. Schröt. (1889) = *Lactarius* fide Singer (*Agaric. mod. Tax.*, 1951).
- Lactariopsis** Henn. (1901) = *Lactarius* fide Singer (*Agaric. mod. Tax.*, 1951).
- Lactarius** Pers. (1797), Russulaceae. c. 450, widespread (esp. temperate). The milk-caps, *L. deliciosus* (saffron milk cap) and other spp. are edible. The genus is expanded and includes gasteroid taxa although requires a split in two genera. See Hesler & Smith (North American species of *Lactarius*, 1979; key North American spp.), Korhonen (*Suomen rouskut*, 1984; key Europ. spp.), Thiers (*Sydowia* 37: 296, 1984; key spp. W. USA), Verbeken (*Mycotaxon* 66: 363, 1998; keys African spp.), Hutchison (*Lactarius – Ectomycorrhizal fungi, key genera in profile*, 1999; ecology), Lebel & Trappe (*Mycol.* 92: 1188, 2000; type studies, gasteroid forms), Miller *et al.* (*Mycol.* 93: 344, 2001; phylogeny), Péter *et al.* (*MR* 105: 1231, 2001; molecular phylogeny, ectomycorrhiza), Verbeken & Horak (*Aust. Syst. Bot.* 13: 649, 2001; Papua New Guinea), Lebel (*Australasian Mycologist* 21: 4, 2002; Australia sp.), Van Rooij *et al.* (*Nova Hedwigia* 77: 721, 2003; Benin), Nuytinck *et al.* (*Belg. Jl Bot.* 136: 145, 2003; European spp.), Nuytinck & Verbeken (*Mycotaxon* 92: 125, 2005; sect. *Deliciosi* in Europe), Rayner *et al.* (*British Fungus Flora. Agarics and Boleti* 9: 203 pp., 2005; key Brit. spp.), Nuytinck *et al.* (*Fungal Diversity* 22: 171, 2006; sect. *Deliciosi* in Asia), Nuytinck *et al.* (*Mycotaxon* 96: 261, 2006; sect. *Deliciosi* in N & C America), Buyck *et al.* (*MR* 111: 787, 2007; Madagascar), Le *et al.* (*Fungal Diversity* 24: 61, 2007; Thailand), Le *et al.* (*Fungal Diversity* 24: 173, 2007; Thailand), Buyck *et al.* (*Fungal Diversity* 28: 15, 2008; phylogeny; two monophyletic clades).
- lacteous**, like milk.
- lactescent**, becoming like milk.
- lactifer**, a latex-carrying hypha (Singer, 1960: 33).
- lactiferous**, having a milk-like juice.
- lactiferous hypha**, see hypha.
- Lactifluus** (Pers.) Roussel (1806) = *Lactarius*.
- Lactocollybia** Singer (1939), ? Marasmiaceae. 17, widespread (tropical). See Singer (*Fl. Neotrop.* 3: 55, 1970), Singer *et al.* (*Butlletí. Societat Catalana de Micologia, Barcelona* 13: 67, 1990; Spain), Reid & Eicker (*Mycotaxon* 66: 153, 1998; key South African spp.), Contu (*Bollettino dell'Associazione Micologica ed Ecologica Romana* 16: 9, 2000; Sardegna).
- Lactomyces** Boulanger (1899) ? = *Mucor* Fresen. fide Foster (*Chemical activities of fungi*, 1949).
- Lactydina** Subram. (1978), anamorphic *Pezizomycotina*, Hso. = eH.1. 1 (on amoebae), USA. See Subramanian (*Kavaka* 5: 95, 1977), Rubner (*Stud. Mycol.* 39, 1996).
- lacuna**, a hole or hollow.
- lacunose**, having lacunae.
- Lacunospora** Cailleux (1969) ? = *Apiosordaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Lacustromyces** Longcore (1993), Cladochytriaceae. 1, USA. See Longcore (*CJB* 71: 415, 1993).
- Ladrococcus** Locq. (1985), Fossil Fungi. 1, Sahara.
- Laestadia** Auersw. (1869) [non *Laestadia* Kunth ex Less. 1832, *Compositae*] = *Plagiostoma* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Laestadiella** Höhn. (1918) = *Guignardia* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Laestadites** Mesch. (1892), Fossil Fungi. 1 (Pliocene, Pleistocene), Japan.
- Laeticorticium** Donk (1956) = *Corticium* Pers.
- Laetifomes** Hattori (2001), Polyporaceae. 1, Solomon Is. See Hattori (*Mycoscience* 42: 26, 2001).
- Laetinaevia** Nannf. (1932) nom. cons., Helotiales. Anamorph *Eriosporella*. 13, Europe. See Hein (*Willdenowia Beih.* 9, 1976; key), Nauta & Spooner (*Mycologist* 13: 65, 1999; Brit. spp.).
- Laetiporaceae** Jülich (1982) = Polyporaceae.

- Laetiporus** Murrill (1904), Fomitopsidaceae. 5, widespread. *L. sulphureus* on oak. See Corner (*Beih. Nova Hedwigia* 78: 181, 1984), Burdsall & Banik (*Harvard Pap. Bot.* 6: 43, 2001; N. Am.).
- Laetisaria** Burds. (1979), Corticiaceae. 3, widespread. See Burdsall (*TBMS* 72: 420, 1979).
- laevigate**, smooth (Fig. 20.1).
- Laeviomeliola** Bat. (1960), Meliolaceae. 1, Brazil. See Batista (*Atas Inst. Micol. Univ. Recife* 1: 224, 1960).
- Laeviomycetes** D. Hawksw. (1981), anamorphic *Pezizomycotina*, Cpd.0eP.19. 2 (on lichens), Europe; N. America. See Hawksworth (*Bull. Br. Mus. nat. Hist. Bot.* 9: 26, 1981).
- Lagarobasidium** Jülich (1974), Schizoporaceae. 1, Europe. See Langer (*Bibliotheca Mycol.* 154, 1994), Larsson *et al.* (*Mycol.* 98: 926, 2007).
- lageniform**, swollen at the base, narrowed at the top; like a Florence flask (Fig. 23.28).
- Lageniformia** Plunkett (1925) ? = *Eutypa* fide Petrak (*Sydowia* 5: 169, 1951).
- Lagenomyces** Cavalc. & A.A. Silva (1972), anamorphic *Pezizomycotina*, St.0eH.?. 1, Brazil. See Cavalcanti & Silva (*Publicações. Instituto de Micologia da Universidade de Pernambuco* 647: 28, 1972), Lücking *et al.* (*Lichenologist* 30: 121, 1998; non-lichenized status).
- Lagenula** G. Arnaud (1930) [non *Lagenula* Lour. 1790, *Vitaceae*] = *Caliciopsis* fide Fitzpatrick (*Mycol.* 34: 464, 1942).
- Lagenulopsis** Fitzp. (1942), Coryneliaceae. 1 (on *Podocarpus*), widespread (pantropical). See Benny *et al.* (*Bot. Gaz.* 146: 431, 1985).
- lager**, see beer, brewing.
- Lagerbergia** J. Reid (1971) = *Ascocalyx* fide Müller & Dorworth (*Sydowia* 36: 193, 1983).
- Lagerheima** Sacc. (1892), Helotiaceae. 3 or 4, widespread. See Gamundí (*Sydowia* 34: 82, 1981).
- Lagerheimina** Kuntze (1891) = *Diploschistes* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- lagynocarpus ascomycetes**, Pyrenomycetes (Moreau, 1953).
- Lagynodella** Petr. (1922) = *Cryptosporiopsis* fide Wollenweber (*Arb. Biol. Reichsans. Berl.* 22: 521, 1938).
- Lahmia** Körb. (1861), Lahmiaceae. 1 (from bark), widespread (north temperate). See Eriksson (*Mycotaxon* 27: 347, 1986).
- Lahmiaceae** O.E. Erikss. (1986), Lahmiales. 1 gen. (+ 1 syn.), 1 spp.
Lit.: Eriksson (*Mycotaxon* 27: 347, 1986), Ostry (*CJB* 64: 1834, 1986).
- Lahmiales** O.E. Erikss. (1986). *Pezizomycotina*. 1 fam., 1 gen., 1 spp. Fam.:
Lahmiaceae
For *Lit.* see under fam.
- Lahmiomyces** Cif. & Tomas. (1953), Patellariaceae. 1, Italy. See Eriksson (*Mycotaxon* 27: 347, 1986; posn).
- Lalaria** R.T. Moore (1990), anamorphic *Taphrina*, Hso.0eH.10. 23, widespread. Yeast phase anamorphs. See Moore in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 582, 1998).
- Lamb** (Ivan Mackenzie; 1911-1990; England, later Argentina, Canada, USA). Assistant for Lichens, British Museum (Natural History), London (1935-1946); Professor of Cryptogams, Tucumán University (1947) [after expedition to Antarctica and the Falklands / Malvinas]; Curator of Cryptogams, Canadian National Museum, Ottawa (1950); Director, Farlow Herbarium, Cambridge, Massachusetts (1954-1974). Noted for his studies on *Stereocaulon*; also for his catalogue of lichen names. Collections are in BM, FH, CAN, LIL. *Publs. Index Nominum Lichenum inter Annos 1932 et 1960 Divulgatorum* (1963). *Biogs, obits etc.* Ainsworth (*Brief Biographies of British Mycologists* p. 106, 1996); Stafleu & Cowan (*TL-2* 2: 735, 1979).
- Lambdasporium** Matsush. (1971), anamorphic *Pezizomycotina*, Hso.1bH.10. 2, S.E. Asia. See Matsushima (*Bull. natn. Sci. Mus. Tokyo*, B 14: 467, 1971), Chen *et al.* (*Bot. Bull. Acad. sin. Taipei* 41: 81, 2000; Taiwan).
- Lambertella** Höhn. (1918), ? Rutstroemiaceae. Anamorph *Helicodendron*. 63, widespread. See Dumont (*Mem. N. Y. bot. Gdn* 33, 1971; monogr.), Korf & Zhuang (*Mycotaxon* 24: 361, 1985; key), Korf & Zhuang (*Mycotaxon* 39: 477, 1990), Korf & Zhuang (*Mycosystema* 8-9: 15, 1996; 15 spp. China), Holst-Jensen *et al.* (*Mycol.* 89: 885, 1997; phylogeny, polyphyly), Zhuang & Zhang (*Taxon* 51: 769, 2002; China), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Lambertellinia** Korf & Lizoň (1994), Sclerotiniaceae. Anamorph *Idriella*. 3, Japan. See Korf & Lizoň (*Mycotaxon* 50: 167, 1994).
- Lambiella** Hertel (1984) = *Rimularia* fide Hertel (*Mitt. bot. StSamml., München* 23: 321, 1987).
- Lambionia** Sérus. & Diederich (2005), anamorphic *Pezizomycotina*. 1 (lichenicolous), widespread. See Sérusiaux & Diederich (*Lichenologist* 37: 500, 2005).
- Lambottiella** (Sacc.) Sacc. (1913) = *Lophiostoma* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Lambro** Racib. (1900), Diaporthales. 1, Indonesia. See Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962), Monod (*Beih. Sydowia* 9: 1, 1983).
- lamella** (pl. **lamellae**) (of an agaric), one of the characteristic hymenium-covered vertical plates on the underside of the pileus (Fig. 4B); gill.
- lamellate** (1) having lamellae; (2) made up of thin plates.
- Lamelloporus** Ryvar den (1987), Meruliaceae. 1, America (tropical). See Ryvar den (*Mycotaxon* 28: 529, 1987).
- lamellula** (pl. **lamellulae**), a small lamella which runs from the edge of the pileus towards the stipe, as in *Russula*.
- Lamia** Nowak. (1884) = *Entomophthora* Fresen. fide Remaudière & Keller (*Mycotaxon* 11: 323, 1980).
- lamina** (pl. **laminae**), (1) blade; (2) the main part of the thallus in foliose lichens; (3) epithecium + hymenium + subhymenium in an apothecium (Hertel, *Beih. Nova Hedw.* 24, 1967); (4) (of leaves) the flat surface; -l, on the lamina.
- Lamproconium** (Grove) Grove (1937), anamorphic *Pezizomycotina*, ?0eP.19. 1, Europe. See Scheuer *et al.* (*Fritschiana* 24: 36, 2001).
- lamprocystidium**, see cystidium.
- Lamprospora** De Not. (1863), Pyronemataceae. c. 46 (many bryophilous), widespread (north temperate). See Benkert (*Z. Mykol.* 53: 195, 1987; 29 spp.), Caillet & Moyne (*Bull. Soc. Hist. nat. Doubs* 84: 9, 1991; keys), Schumacher (*Sydowia* 45: 307, 1993; key 13 arctic-alpine spp.), Yao & Spooner (*MR* 99: 1521, 1995; Brit. spp.), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).

Lampteromyces Singer (1947), Marasmiaceae. 1 (poisonous), Japan; China. See Mo *et al.* (*Mycosystema* 19: 529, 2000; China), Moncalvo *et al.* (*Syst. Biol.* 49: 278, 2000; phylogeny).

Lamyella Berl. (1899) $\equiv$ Neolamyia.

Lamyella Fr. (1849) = *Cytospora* fide Clements & Shear (*Gen. Fung.*, 1931).

Lamyxis Raf. (1820) nom. dub., ? Boletales. See Donk (*Persoonia* 1: 173, 1960).

lanate, like wool; covered with short hair-like processes.

Lanatonectria Samuels & Rossman (1999), Nectriaceae. Anamorph *Actinostilbe*. 4 (twigs and old fungi etc.), widespread (pantropical). See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Samuels *et al.* (*CBS Diversity Ser.* 4, 2006; USA), Zhang & Zhuang (*Mycosystema* 25: 15, 2006; phylogeny).

Lanatosphaera Matzer (1996), Dothideomycetes. 2, Costa Rica. See Matzer (*Mycol. Pap.* 171: 129, 1996).

Lanatospora Voronin (1986), Microsporidia. 2.

Lanceispora Nakagiri, Okane, Tad. Ito & Katum. (1997), Xylariales. 2, E. Asia; Australia. Perhaps close to *Ceriospora* and *Urosporellopsis*. See Nakagiri *et al.* (*Mycoscience* 38: 207, 1997), Sarma & Hyde (*Mycoscience* 42: 97, 2001; Singapore), Jee-won *et al.* (*MR* 107: 1392, 2003; phylogeny).

Lancisporomyces Santam. (1997), Legeriomycetaceae. 4 (in *Plecoptera*), widespread. See Santamaría (*Mycol.* 89: 639, 1997), Strongman & White (*CJB* 84: 1478, 2006; Canada), White *et al.* (*Mycol.* 98: 333, 2006; USA), Valle *et al.* (*Mycol.* 100: 149, 2008; Mexico).

Lange (Jakob Emanuel; 1864-1941; Denmark). Teacher, Agricultural Folk High School, Dalum (1888-1918); Principal, Smallholders Agricultural School, Odense (1918-1934). Agaricologist. *Publs. Studies on the agarics of Denmark I-XII. Dansk Botanisk Arkiv* (1914-1938) [see M. Lange, *Friesia* 9: 121, 1969]; *Flora Agaricina Danica* 5 vols (1935-1940). *Biogs, obits etc.* Buchwald (*Botanisk Tidsskrift* 46: 81, 1942) [portrait]; Pearson (*Mycol.* 39: 1, 1947) [portrait]; Stafleu & Cowan (*TL-2* 2: 745, 1979).

Langermannia Rostk. (1838) nom. rej., Agaricaceae. 3, widespread. The basidioma of *L. gigantea* (giant puff-ball) may be 120 cm across and have 10^{13} spores (see record fungi). See Kreisel (*Persoonia Supplement* 14: 431, 1992), Coetzee & Van Wyk (*Bothalia* 33: 156, 2003; *Calvatia* sect. *Macrocalvatia*), Coetzee & Van Wyk (*Taxon* 54: 541, 2005; nomencl.) Nom. rej. vs. *Calvatia* s.l. (q.v.) but used for segregate of it.

Langeron (Maurice Charles Pierre; 1874-1950; France). Doctor of medicine, botanist, parasitologist, and mycologist, Institut de Parasitologie, Paris (1903-1950). Made many important contributions to medical and general mycology. *Publs. Précis de Microscopie* (1913) [edn 7, 1949]; *Précis de Mycologie* (1945) [edn 2, by Vanbreuseghem, 1952]. *Biogs, obits etc.* Vanbreuseghem (*Mycopathologia et Mycologia Applicata* 6: 58, 1951) [bibliography, portrait]; Stafleu & Cowan (*TL-2* 2: 750, 1979).

Langeronia Vanbreus. (1950) = *Trichophyton* fide Ajello (*Sabouraudia* 6: 153, 1968).

Langloisula Ellis & Everh. (1889) nom. conf., Fungi. See Rogers & Jackson (*Farlowia* 1: 263, 1943) and, Donk (*Fungus Wageningen* 26: 3, 1956).

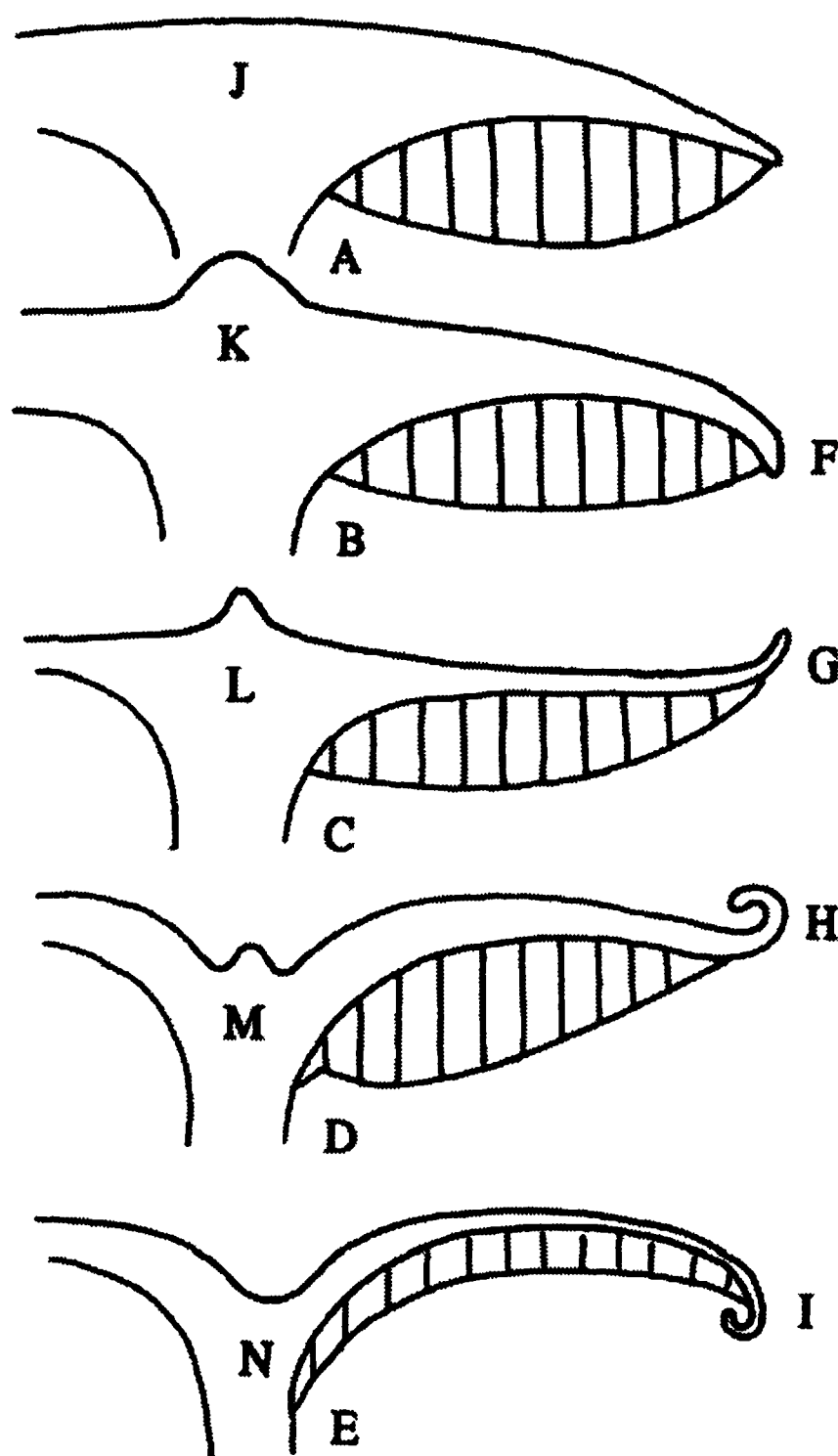


Fig. 19. A-E. Insertion of lamellae (gills). A, free; B, adnexed; C, adnate; D, sinuate; E, decurrent. F-I. Margin of pileus (cap). F, inflexed; G, reflexed; H, revolute; I, involute. J-N. Pileus. J, plano-convex; K, bulgating; L, umbonate; M, umbilicate; N, depressed.

languid, feeble; hanging down.

Lanolea Nieuwl. (1916) $\equiv$ *Entoloma*.

Lanomyces Gäum. (1922) = *Cystotheca* fide Katumoto (*Rep. Tottori mycol. Inst.* 10: 437, 1973).

Lanopila Fr. (1848) nom. rej. prop. = *Langermannia* fide Demoulin & Dring (*Bull. Jard. bot. nat. Belg.* 45: 361, 1975).

Lanosa Fr. (1825) nom. dub., ? Fungi.

lanose, see lanate.

Lanspora K.D. Hyde & E.B.G. Jones (1986), Halosphaeriaceae. 1 (marine), Seychelles. See Hyde & Jones (*CJB* 64: 1581, 1986), Hyde & Jones (*Bot. Mar.* 32: 205, 1989).

lanuginose, see lanate; see also nematogenous.

Lanzia Sacc. (1884), Rutstroemiaceae. Anamorph *Myrioconium*. c. 54, widespread. See Sharma & Sharda (*Int. J. Mycol. Lichenol.* 2: 95, 1985; key 15 spp., India), Spooner (*Bibliotheca Mycol.* 116, 1987; 7 spp. Australasia), Baral (*SA* 13: 113, 1994; synonymy with *Rutstroemia*), Zhuang (*Mycosystema* 8-9: 15, 1996; 5 spp. China), Holst-Jensen *et al.* (*Mycol.* 89: 885, 1997; phylogeny), Zhuang (*Mycotaxon* 72: 325, 1999; spp. trop. China), Simpson & Grgurinovic

- (*Australas. Mycol.* 22: 11, 2003; Australia), Zhuang & Liu (*Mycotaxon* 99: 123, 2007; phylogeny).
- lao-chao**, see Fermented food and drinks.
- Laocoön** J.C. David (1997), anamorphic *Mycosphaerellaceae*, Hso.?.?. 1, Colombia. See David (*Mycol. Pap.* 172: 116, 1997).
- Lappodochium** Matsush. (1975), anamorphic *Pezizomycotina*, Hsp.0eH.10. 1, Brazil. See Matsushima (*Icon. microfung. Matsush. lect.*: 91, 1975).
- lapsus** (Lat.), a slip; **-calami**, a slip of the pen.
- Laquearia** Fr. (1849), ? Rhytismatales. 1, Europe.
- Larger fungi**, see Macromycetes.
- largest fungi**, see longevity, record fungi.
- Laricifomes** Kotl. & Pouzar (1957) = *Fomitopsis* fide Ryvarden (*Syn. Fung.* 5: 171, 1991).
- Laricifomitaceae** Jülich (1982) = *Fomitopsidaceae*.
- Laricina** Velen. (1934), ? Helotiales. 1, former Czechoslovakia.
- Laridospora** Nawawi (1976) = *Monacrosporium* fide Nawawi (*TBMS* 66: 344, 1976), Rubner (*Stud. Mycol.* 39, 1996).
- Larseniella** Munk (1942) = *Neorehmia* fide Barr (*Mycotaxon* 39: 43, 1990), Samuels & Barr (*CJB* 75: 2165, 1998).
- Larssonia** Vidtmann & Sokolova (1994), Microsporidia. 1.
- Larssoniella** J. Weiser & David (1997), Microsporidia. 2.
- Lasallia** Mérat (1821), Umbilicariaceae (L). 12, widespread (esp. temperate). See Llano (*A monograph of the lichen family Umbilicariaceae in the Western Hemisphere*, 1950), Llano (*Hvalråd. Skr.* 48: 112, 1965), Dombrovskaya (*Bot. Zh. SSSR* 63: 233, 1978), Blum (*Dokl. Akad. Nauk. Ukr. SSR B* 12: 58, 1986; DNA homology, status), Krog & Swinscow (*Nordic Jt Bot.* 6: 75, 1986; E. Afr.), Sancho & Balaquer (*An. Jard. bot. Madr.* 46: 273, 1989; anatomy 4 spp.), Wei & Jiang (*Mycosystema* 2: 135, 1989; key 8 spp. China), Posner *et al.* (*Z. Naturf.* 46c: 19, 1991; chemotax.), Wei & Jiang (*The Asian Umbilicariaceae (Ascomycota) [Mycosystema, Monogr.* 1], 1993; keys, descr. 60 spp. Asia), Valladares *et al.* (*CJB* 72: 415, 1994), Wei (*Proc. First Korea-China Jt Sem. Mycol.*: 5, 1994; molec. syst.), Ivanova *et al.* (*Lichenologist* 31: 477, 1999; phylogeny), Narui *et al.* (*Bryologist* 102: 80, 1999; polysaccharides), Cohen (*Lichenologist* 34: 521, 2002; anthraquinones), Türk & Uhl (*Biblthca Lichenol.* 86: 465, 2003; Austria), Krzewicka (*Polish Bot. Stud.* 17, 2004; Poland), Peršoh *et al.* (*Mycol. Progr.* 3: 103, 2004; asci, phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Laschia** Fr. (1830) nom. rej. = *Campanella* fide Donk (*Persoonia* 1: 173, 1960).
- Laschia** Jungh. (1838) = *Junghuhnia*.
- Lascoderma**, see *Lasioderma*.
- Lasiella** Qué. (1875) = *Lasiosphaeria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Lasiobelonis** Clem. & Shear (1931) = *Lasiobelonium* Ellis & Everh. fide Spooner (*Biblthca Mycol.* 116, 1987).
- Lasiobelonium** (Sacc.) Sacc. & P. Syd. (1899) = *Belonidium* fide Korf (*Mycotaxon* 7: 399, 1978).
- Lasiobelonium** Ellis & Everh. (1897), Hyaloscyphaceae. c. 20, Europe; Australasia. See Korf (*Mycotaxon* 7: 399, 1978), Raitviir (*Scripta Mycol.* 9, 1980; key 13 spp.), Spooner (*Biblthca Mycol.* 116, 1987; 3 spp. Australasia, concept), Baral (*SA* 13: 113, 1994).
- Lasiobertia** Sivan. (1978), Apiosporaceae. Anamorph *Melanographium*. 1 (on dead wood), Ghana; Puerto Rico. See Hyde (*Sydowia* 45: 204, 1993; posn), Wang & Hyde (*Fungal Diversity* 3: 159, 1999; posn), Huhndorf *et al.* (*MR* 108: 1384, 2004; phylogeny).
- Lasiobolidium** Malloch & Cain (1971), Pyronemataceae. 7 (coprophilous), N. Africa; N. America. See Loquin-Linard (*Cryptog. Mycol.* 4: 283, 1983), van Brummelen in Hawksworth (Ed.) (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. 269 269: 400, 1994), van Brummelen (*Persoonia* 16: 425, 1998; posn), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny, polyphyly), Hansen *et al.* (*Mycol.* 97: 1023, 2005; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Lasiobolus** Sacc. (1884), Ascodesmidaceae. 11, widespread (temperate). See Bezerra & Kimbrough (*CJB* 53: 1206, 1975; key), van Brummelen in Hawksworth (Ed.) (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. 269 269: 400, 1994; posn), Yao (*MR* 100: 737, 1996; Brit. spp.), Landvik *et al.* (*Mycoscience* 39: 49, 1998; posn), Prokhorov (*Mikol. Fitopatol.* 32: 14, 1998; key), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Lasiobotrys** Kunze (1823), Venturiaceae. Anamorph *Ulocladium*-like. 2 or 2 (on *Lonicera*), widespread (temperate). See Müller (*Adv. Front. Myc. Pl. Path.* 11, 1981).
- Lasiochlaena** Pouzar (1990), Fomitopsidaceae. 1, Europe. See Pouzar (*Česká Mykol.* 44: 92, 1990) = *Ischnoderma* fide Ryvarden (*Gen. Polyp.*, 1991).
- Lasioderma** Mont. (1845) ? = *Phleogenia* fide Stalpers (*in litt.*).
- Lasiodiplodia** Ellis & Everh. (1896), anamorphic *Botryosphaeriaceae*, St.1eP.1. 9, widespread. *L. theobromae* (syn. *Botryodiplodia theobromae*), a common trop. saprobe and wound parasite. See Punithalingam (*IMI Descr. Fungi Bact.* 519, 1976), Robell & Forester (*Sabouraudia* 14: 155, 1976; keratomycosis in humans), Punithalingam (*Biblthca Mycol.* 71, 1980), Yaguchi & Nakamura (*Jl Agr. Sci.* 35: 282, 1991; TEM of conidial wall), Denman *et al.* (*Stud. Mycol.* 45: 129, 2000; review), Zhou & Stanosz (*Mycol.* 93: 516, 2001; phylogeny), Pavlic *et al.* (*Stud. Mycol.* 50: 313, 2004), Summerbell *et al.* (*Medical Mycology* 42: 543, 2004; phaeohyphomycosis), Mohali *et al.* (*Forest Pathology* 35: 385, 2005; endophytic strains), Burgess *et al.* (*Mycol.* 98: 423, 2006; n. spp. from tropics), Crous *et al.* (*Stud. Mycol.* 55: 235, 2006; phylogeny, review), Damm *et al.* (*Mycol.* 99: 664, 2007; S Africa, on *Prunus*), Alves *et al.* (*Fungal Diversity* 28: 1, 2008; cryptic species), Phillips *et al.* (*Persoonia* 21: in press, 2008; phylogeny).
- Lasiodiplodiella** Zambett. (1955), anamorphic *Pezizomycotina*, Hso.1eP.?. 3, widespread (tropical). See Zambettakis (*BSMF* 70: 229, 1954).
- Lasioloma** R. Sant. (1952), Ectolechiaceae (L). 8, widespread (tropical). See Lücking & Sérusiaux (*Mycotaxon* 77: 301, 2001; key).
- Lasiolomataceae** Hafellner (1984) = *Ectolechiaceae*.
- Lasiomollisia** Raitv. & Vesterh. (2006), ? Hyaloscyphaceae. 1, Europe. See Baral *et al.* (*Bulletin Mycologique et Botanique Dauphiné-Savoie* 46 no. 183: 33, 2006), Raitviir (*Fungi Non Delineati Raro vel*

- Haud Perspecte et Explore Descripti aut Definite Picti 31, 2006).
- Lasionectria** (Sacc.) Cooke (1884), Bionectriaceae. Anamorph *Acremonium*-like. 6 (dead wood and stem), widespread (temperate). See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Lasiophoma** Naumov (1916) = *Pyrenochaeta* fide Sutton (*Mycol. Pap.* 141, 1977).
- Lasiophoma** Speg. (1918), anamorphic *Pezizomycotina*, Cpd.0eH.?. 3, widespread. See Sutton (*Mycol. Pap.* 141, 1977).
- Lasiosordaria** Chenant. (1919) = *Cercophora* fide Lundqvist (*Symb. bot. upsal.* 20 no. 1, 1972).
- Lasiosordariella** Chenant. (1919) = *Lasiosphaeria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Lasiosordariopsis** Chenant. (1919) = *Cercophora* fide Lundqvist (*Symb. bot. upsal.* 20 no. 1, 1972).
- Lasiosphaera** Reichardt (1870) = *Langermannia* fide Demoulin & Dring (*Bull. Jard. bot. nat. Belg.* 45: 362, 1975).
- Lasiosphaeria** Ces. & De Not. (1863), Lasiosphaeriaceae. 60 (from wood), widespread. See Lundqvist (*Symb. bot. upsal.* 20 no. 1, 1972), Hilber & Hilber (*Sydowia* 36: 105, 1983), Réblová (*Sydowia* 50: 229, 1998), Candoussau *et al.* (*Mycotaxon* 80: 201, 2001; France), Taylor *et al.* (*Mycoscience* 42: 369, 2001; on palms), Hilber & Hilber (*The genus Lasiosphaeria and Allied Taxa*, 2002; review), Huhndorf *et al.* (*Mycol.* 96: 368, 2004; phylogeny, family limits), Miller & Huhndorf (*MR* 108: 26, 2004; phylogeny), Miller & Huhndorf (*Mycol.* 96: 1106, 2004; phylogeny), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Lasiosphaeriaceae** Nannf. (1932), Sordariales. 36 gen. (+ 30 syn.), 308 spp. The family is paraphyletic.
- Lit.*: Lundqvist (*Symb. bot. upsal.* 20 no. 1, 1972), Lundqvist (*Symb. bot. upsal.* 20: 374 pp., 1972), Barr (*Mycotaxon* 39: 43, 1990) separated the *Tripterosporeaceae* from the fam. The previous edition of the *Dictionary* largely followed Barr's circumscription, which has proved to be polyphyletic. The family as circumscribed here is much more tightly defined.
- Lit.*: Khan & Krug (*Mycol.* 81: 862, 1989), Guarro *et al.* (*SA Reprint of Volumes 1-4 (1982-1985)* 10: 79, 1991), Taylor & White (*Fungal Genetics Newsl. Suppl.* 38: 26, 1991), Krug & Scott (*CJB* 72: 1302, 1994), Bell & Mahoney (*Mycol.* 87: 375, 1995), Bell & Mahoney (*Mycol.* 88: 163, 1996), Bell & Mahoney (*Mycol.* 89: 908, 1997), Coppin *et al.* (*Microbiol. Mol. Biol. Rev.* 61: 411, 1997), Chen *et al.* (*Mycol.* 91: 84, 1999), Lee & Hanlin (*Mycol.* 91: 434, 1999), Gams (*Stud. Mycol.* 45: 192, 2000), Huhndorf *et al.* (*Mycol.* 96: 368, 2004), Miller & Huhndorf (*Mycol.* 96: 1106, 2004), Miller & Huhndorf (*MR* 108: 26, 2004), Cai *et al.* (*Fungal Diversity* 19: 1, 2005), Cai *et al.* (*MR* 110: 137, 2006), Cai *et al.* (*MR* 110: 359, 2006), Lumbsch & Huhndorf (*MR* 111: 1064, 2007).
- Lasiosphaeriella** Sivan. (1975), Sordariomycetidae. 2, widespread (pantropical). See Huhndorf & Fernández (*Mycol.* 91: 544, 1999), Huhndorf *et al.* (*Mycol.* 96: 368, 2004; phylogeny), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Lasiosphaeriopsis** D. Hawksw. & Sivan. (1980), Coronophorales. 3 (lichenicolous), widespread. See Eriksson & Santesson (*Mycotaxon* 25: 569, 1986), Alstrup & Hawksworth (*Meddr Grønland Biosc.* 31, 1990), Huhndorf *et al.* (*MR* 108: 1384, 2004), Zhurbenko & Triebel (*Mycol. Progr.* 4: 317, 2005; on *Polyporus*).
- Lasiosphaeris** Clem. (1909), Sordariales. 2, widespread (temperate). See Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Lasiostemma** Theiss., Syd. & P. Syd. (1917), Pseudoperisporiaceae. Anamorph *Chaetosticta*. c. 15, widespread (tropical). See Farr (*Mycol.* 71: 243, 1979; sects.), Barr (*Mycotaxon* 64: 149, 1997).
- Lasiostemmella** Petr. (1950) = *Epipolaeum* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Lasiostictella** Sherwood (1986), Rhytismatales. 1, France. See Candoussau *et al.* (*Sydowia* 38: 28, 1986).
- Lasiostictis** (Sacc. & Berl.) Sacc. (1889) = *Naemacys* fide Di Cosmo *et al.* (*Eur. J. For. Path.* 13: 206, 1983).
- Lasiostroma** Griffon & Maubl. (1911) = *Phomopsis* (Sacc.) Bubák. fide Sutton (*Mycol. Pap.* 141, 1977).
- Lasiothelebolus** Kimbr. & Luck-Allen (1974) = *Thelebolus* fide Lundqvist (*SA* 7: 77, 1988), van Brummelen (*Persoonia* 16: 425, 1998).
- Lasiothyrium** Syd. & P. Syd. (1913), anamorphic *Pezizomycotina*, Cpt.0fP.?. 1, Philippines.
- Lasmenia** Speg. (1886), anamorphic *Pezizomycotina*, St.0eP.1. 5, S. America; Philippines.
- Lasmeniella** Petr. & Syd. (1927), anamorphic *Pezizomycotina*, St.0eP.19. 13, widespread (esp. tropical). See Bhat & Hedge (*Acta Bot. Indica* 19: 90, 1991).
- Lasseria** Dennis (1960), ? Helotiales. 1, Venezuela. See Dennis (*Kew Bull.* 14: 434, 1960).
- lateral**, at the side.
- Latericonis** G.V. Rao, K.A. Reddy & de Hoog (1984), anamorphic *Pezizomycotina*, Hsp.#eP.10. 1, India. See Rao *et al.* (*Mycotaxon* 19: 409, 1984).
- Lateriramulosa** Matsush. (1971), anamorphic *Pezizomycotina*, Hso.1bH.10. 1, Japan; Australasia. See Matsushima (*Microfungi of the Solomon Islands and Papua-New Guinea*: 34, 1971), Matsushima (*Matsush. Mycol. Mem.* 6, 1989).
- Laterispora** Uecker, W.A. Ayers & P.B. Adams (1982), anamorphic *Pezizomycotina*, Hso.0fP.1. 1 (on sclerotia), USA. See Uecker *et al.* (*Mycotaxon* 14: 492, 1982).
- lateritiin**, see enniatin A.
- Laterna** Turpin (1822), Phallaceae. 2, America (tropical).
- Lateropeltis** Shanor (1946) = *Kiehlia* fide Farr (*Mycol.* 60: 924, 1968).
- Laterotheca** Bat. (1963) = *Acrogenotheca* fide Hughes (*Mycol.* 68: 693, 1976).
- Laterradea** Raspail (1824) nom. dub., Agaricales.
- latex**, a milk-like juice, as in *Lactarius*.
- Lathagrium** (Ach.) Gray (1821) = *Collema* F.H. Wigg. fide Degelius (*Symb. bot. upsal.* 13 no. 2, 1954).
- Lathraeodiscus** Dissing & Sivertsen (1989), Pyrenomataceae. 1, Svalbard. See Dissing & Sivertsen (*Mycol.* 80: 832, 1989).
- Latin**. Acquaintance with Latin is an asset to any biologist and a working knowledge of the language is particularly useful to systematists because scientific names of all taxa are latinized. Latin descriptions or diagnoses are currently required under the international code governing the naming of fungi (see Nomenclature) to validate the names of fungi at all formal ranks, and many early works on systematic mycology are in Latin, as are descriptions in Saccardo's *Sylloge Fungorum*. Botanical Latin is derived from the classical language with liberal borrowing from

Greek, but with a simplified syntax. Although not generally spoken, differences in stress and pronunciation of latinized names may cause confusion: guidance can be found at the start of Latin dictionaries or in Allen (Ed.) (*Vox Latina*, 1978).

Stearn (*Botanical Latin*, 1966 [edn 4, 1992]) provides an excellent introduction to grammar, syntax, and vocabulary and gives much helpful guidance together with examples of mycological descriptions. This work may be supplemented by Cash (A mycological English-Latin glossary. *Mycol. Mem.* 1, 1965); Baranov (*Botanical Latin for Plant Taxonomists*, 1968) [reprint 1971]; Borror (*Dictionary of Word Roots and Combining Forms*, 1960) [11th print, 1971]; Clements & Shear (*The Genera of Fungi*, 1931) [useful Latin/English glossary]. Nybakken (*Greek and Latin in Scientific Terminology*, 1960), gives much information on derivation of scientific and medical terms.

Further articles which may be consulted for guidance on the correct formulation of Latin names are Zabinkova (*Taxon* 17: 19, 1968) [generic stems ending in -is]; Nicholson (*Taxon* 43: 97, 1994) [gender of generic names, particularly those ending in -ma]; Manara (*Taxon* 41: 52, 1992) [geographical epithets]; Manara (*Taxon* 40: 301, 1991) [gender of generic names]; Nicholson & Brooks (*Taxon* 23: 163, 1974) [orthography, stems and compounds].

See Classification, Colour, Nomenclature.

latticed, cross-barred; like a network.

lattice-work fungus, basidioma of *Clathrus* spp.

Latzeilia, see *Latzelia*.

Latzelia Zahlbr. (1926) = *Epiphloea* fide Gyelnik (*Rabenh. Krypt.-Fl.* 9 2.2, 1940).

Latzinaea Kuntze (1891) = *Entoloma*.

Laudatea Johow (1884) = *Dictyonema* C. Agardh ex Kunth fide Parmasto (*Nova Hedwigia* 29: 99, 1978).

Lauderlindsaya J.C. David & D. Hawksw. (1989) = *Normandina* fide Aptroot (*Willdenowia* 21: 263, 1991), Diederich & Sérusiaux (*Lichenologist* 25: 97, 1993), Aptroot (*Lichenologist* 30: 501, 1998).

Laurera Rchb. (1841) nom. cons. prop., Trypetheliaceae (L.) 20, widespread (tropical). See Letrouit-Galinou (*Revue bryol. lichén.* 26: 207, 1957), Letrouit-Galinou (*Revue bryol. lichén.* 27: 66, 1958), Harris (*Acta Amazon. Supl.* 14: 55, 1984; gen. concept., key 4 spp. Brazil), Upreti & Singh (*Bull. Jard. bot. nat. Belg.* 57: 367, 1987; key 10 spp. India), Makhija & Patwardham (*Mycotaxon* 31: 565, 1988; key 17 spp. India), McCarthy & Kantvilas (*Lichenologist* 25: 51, 1993; Tasmania), McCarthy (*Lichenologist* 27: 310, 1995; Papua New Guinea), McCarthy (*Flora of Australia* 58 A: 242 pp., 2001), Prado *et al.* (*MR* 110: 511, 2006; phylogeny), Aptroot *et al.* (*Biblhca Lichenol.* 97, 2008; Costa Rica).

Laureriella Hepp (1867) = *Glypholecia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Laureromyces Cif. & Tomas. (1953) = *Laurera* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Laurilia Pouzar (1959), Echinodontiaceae. Anamorph *Spiniger*. 2, widespread (northern hemisphere). See Gross (*Mycopath. Mycol. appl.* 24: 1, 1964), Eriksson & Ryvar den (*Cortic. N. Europ.* 4: 787, 1976), Chamuris (*Mycol. Mem.* 14, 1988; key) = *Echinodontium* (Echinodont.) fide.

Lauriomyces R.F. Castañeda (1990), anamorphic *Pezizomycotina*, Hso.0eH.3. 5, widespread. See

Castañeda (*Univ. Waterloo Biol. Ser.* 32: 21, 1990), Crous & Wingfield (*Sydowia* 46: 193, 1994; Switzerland), Somrithpol *et al.* (*Nova Hedwigia* 82: 209, 2006; Thailand), Somrithpol & Jones (*Nova Hedwigia* 84: 479, 2007; Thailand).

Laurobasidium Jülich (1982), Exobasidiaceae. 1 (on *Laurus*), Europe. See Begerow *et al.* (*Mycol. Progr.* 1: 187, 2002).

Lauterbachella Henn. (1898) = *Rhagadolobium* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).

Lautisporopsis E.B.G. Jones, Yusoff & S.T. Moss (1998), Halosphaeriaceae. 1 (marine), Atlantic Ocean; Pacific Ocean. See Yusoff *et al.* (*CJB* 72: 1550, 1994), Jones (*Mycotaxon* 67: 1, 1998).

Lautitia S. Schatz (1984), ? Phaeosphaeriaceae. 1 (on marine algae), USA. See Schatz (*CJB* 62: 31, 1984).

Lautospora K.D. Hyde & E.B.G. Jones (1989), Lautosporaceae. 2, Brunei; N. America. See Kohlmeyer *et al.* (*Bot. Mar.* 38: 165, 1995).

Lautosporaceae Kohlm., Volkm.-Kohlm. & O.E. Erikss. (1995), Pezizomycotina (inc. sed.). 1 gen., 2 spp.

Lit.: Hyde & Jones (*Bot. Mar.* 32: 479, 1989), Kohlmeyer *et al.* (*Bot. Mar.* 38: 165, 1995).

Lawalreea Dieder. (1990), anamorphic *Pezizomycotina*, Cpd.0eH.15. 1 (on lichens), Luxembourg. See Diederichs (*Mycotaxon* 37: 308, 1990).

Laxitextum Lentz (1956), Hericiaceae. 3, widespread. See Lentz (*Sydowia* 14: 123, 1960), Gross (*Mycopath. Mycol. appl.* 24: 1, 1964), Chamuris (*Mycol. Mem.* 14, 1988; key), Ginns & Freeman (*Biblhca Mycol.* 157, 1994) = *Echinodontium* (Echinodont.) fide.

Lazarenkoa Zerova (1938), Dothideomycetes. 1 (on *Selaginella*), Siberia.

Lazaroa Gonz. Frag. [not traced] = *Phellinus* fide Donk (*Verh. K. ned. Akad. Wet.* tweede sect. 62: 1, 1974).

Lazuardia Rifai (1988), Pyronemataceae. 1, widespread (pantropical). See Rifai (*Mycotaxon* 31: 239, 1988), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).

Lazulinospora Burds. & M.J. Larsen (1974) = *Amauroderma* Murrill fide Kõljalg (*Syn. Fung.* 9, 1996).

LCP, see PC.

LD, lethal dose; **LD₅₀** (of the concentration of a fungicide, etc.), that which kills 50% of the spores (cells or individuals) of the test organism. Cf. ED.

LE, Komarov Botanical Institute (St Petersburg, Russia); founded 1714; directed by the Academy of Sciences.

leaf curl (1) of peach and almond (*Taphrina deformans*); (2) of cherry (*T. minor*).

Leaia Banker (1906) = *Gloiodon* fide Banker (*Mycol.* 2: 10, 1910).

Leandria Rangel (1915), anamorphic *Pezizomycotina*, Hso.#eP.1. 1, S. America.

leather fungi, members of the *Thelephoraceae* s. lat.

Lecanactidaceae Stizenb. (1862) = Graphidaceae.

Lecanactiomyces Cif. & Tomas. (1953) = *Lecanactis* Kõrb. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Lecanactis Eschw. (1824) nom. rej. = *Phaeographis* fide Tehler (*Taxon* 35: 382, 1986).

Lecanactis Kõrb. (1855) nom. cons., Roccellaceae (L.) c. 54, widespread. See Tehler (*Taxon* 35: 382, 1986; nomencl.), Torrente & Egea (*Biblhca Lichenol.* 32, 1989), Tehler (*CJB* 68: 2458, 1990; cladistics),

- Tehler (*Willdenowia* 22: 201, 1992), Egea *et al.* (*Pl. Syst. Evol.* 187: 103, 1993; *L. grumulosa* group), Tehler & Egea (*Lichenologist* 29: 397, 1997; phylogeny), Myllys *et al.* (*Bryologist* 101: 70, 1998; phylogeny), Kantvilas (*Symb. bot. ups. 34* no. 1: 183, 2004; Tasmania), Tehler & Irestedt (*Cladistics* 23: 432, 2007).
- Lecanephebe** Frey (1929) = *Zahlbrucknerella* fide Henssen (*Symb. bot. ups. 18* no. 1, 1963).
- Lecania** A. Massal. (1853), Lecanorales (L). c. 64, widespread (esp. temperate). Possibly related to *Crocynia*. See Mayrhofer (*Bibliotheca Lichenol.* 28, 1988; 19 spp. on rock, Eur.), van den Boom (*Nova Hedwigia* 54: 229, 1992; key 11 spp. on rock, Netherlands), Ekman & Wedin (*Pl. Biol.* 2: 350, 2000; phylogeny), Ekman (*MR* 105: 783, 2001; phylogeny), Boom & Khodosovtsev (*Graphis Scripta* 16: 1, 2004; Europe, Asia), Lumbsch *et al.* (*Mol. Phylogen. Evol.* 31: 822, 2004; phylogeny), Boom & Brand (*Lichenologist* 37: 277, 2005; Europe), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Naesborg *et al.* (*MR* 111: 581, 2007; phylogeny).
- Lecaniascus** Moniez (1887) nom. dub., ? Fungi.
- Lecanicillium** W. Gams & Zare (2001), anamorphic *Cordycipitaceae*. 15, widespread. See Gams & Zare (*Nova Hedwigia* 72: 332, 2001), Zare & Gams (*Nova Hedwigia* 73: 1, 2001), Cortez-Madrigal *et al.* (*Bio-Control* 48: 321, 2003; biocontrol of cocoa pests), Kouvelis *et al.* (*Fungal Genetics Biol.* 41: 930, 2004; mitochondrial genome), Kope & Leal (*Mycotaxon* 94: 331, 2005; on white pine weevil).
- Lecanidiaceae** O.E. Erikss. (1981) = Patellariaceae.
- Lecanidiales** = Patellariales.
- Lecanidiella** Sherwood (1986), Patellariaceae. 1, USA. See Sherwood (*Sydowia* 38: 267, 1986), Kutorga & Hawksworth (*SA* 15: 1, 1997).
- Lecanidion** Endl. (1830) = Patellaria Fr. fide Hawksworth (*Taxon* 35: 787, 1986).
- Lecanidium** A. Massal. (1856) = *Pertusaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Lecaniella** Jatta (1889) = *Lecania* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Lecaniella** Vain. (1896) = *Gonolecania*.
- Lecaniocola** Brain (1923), anamorphic *Pezizomycotina*, ?0eH.10. 15 (in scale insects), widespread (tropical).
- Lecaniomyces** E.A. Thomas (1939) nom. inval. = *Lecania* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Lecaniopsis** (Vain.) Zahlbr. (1926) = *Coenogonium* Ehrenb. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Rivas Platas *et al.* (*Fungal Diversity* 23: 255, 2006).
- Lecanocaulon** Nyl. (1860) = *Stereocaulon* Hoffm. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Lecanocybe** Desjardin & E. Horak (1999), Marasmiaceae. 1, Java; Hawaii. See Desjardin & Horak (*Sydowia* 51: 21, 1999).
- Lecanographa** Egea & Torrente (1994), Roccellaceae (L). 30, widespread. See Egea & Torrente (*Bibliotheca Lichenol.* 54: 116, 1994), Hawksworth (*Taxon* 55: 528, 2006; nomencl.), Sparrius *et al.* (*Lichenologist* 38: 27, 2006; SE Asia).
- Lecanora** Ach. (1809), Lecanoraceae (L). c. 552, widespread (esp. temperate). See Poelt (*Mitt. bot. StSamml., München* 2: 411, 1958), Imshaug & Brodo (*Nova Hedwigia* 12: 1, 1966; *L. pallida* group), Eigler (*Diss. Bot., Lehre* 4, 1969; gen. concept), Brodo (*Beih. Nova Hedwigia* 79: 63, 1984; key 38 spp., N. Am. *subfusca*-group), Leuckert & Poelt (*Nova Hedwigia* 49: 121, 1989; *L. rupicola*-group), Nimis & Bolognini (*Not. Soc. Lich. Ital.* 6: 29, 1993; key spp. Italy), Poelt & Grube (*Nova Hedwigia* 57: 305, 1993; key 22 spp. subgen. *Placodium* in Himalaya), Lumbsch (*J. Hattori bot. Lab.* 77: 1, 1994; key 46 spp. Australasia), Dickhäuser *et al.* (*Mycotaxon* 56: 303, 1995; *L. subcarnea* group), Lumbsch *et al.* (*Bryologist* 99: 269, 1996), Lumbsch *et al.* (*Symb. bot. ups. 32* no. 1: 131, 1997; *L. palida*-group), Ryan & Nash (*Nova Hedwigia* 64: 111, 1997), Ryan & Nash (*Nova Hedwigia* 64: 393, 1997), Arup & Grube (*Lichenologist* 30: 415, 1998; DNA subg. *Placodium*), Ryan in Glenn *et al.* (Eds) (*Lichenogr. Thomsoniana*: 105, 1998; subgen. *Placodium*), Upreti (*Bryologist* 10: 256, 1998; Indian spp. *L. subfusca* group), Upreti & Chatterjee (*Feddes Repert.* 109: 279, 1998; Indian spp. subg. *Placodium*), Guderley (*J. Hattori bot. Lab.* 87: 131, 1999; *L. subfusca* group), Guderley & Lumbsch (*Lichenologist* 31: 197, 1999; multispored spp.), Ekman & Wedin (*Pl. Biol.* 2: 350, 2000; phylogeny), Feige *et al.* (*Bibliotheca Lichenol.* 75: 99, 2000; chemistry), Guderley *et al.* (*Bryologist* 103: 139, 2000; S America), Śliwa & Wetmore (*Bryologist* 103: 475, 2000; *L. varia* group, N. Am.), LaGreca & Lumbsch (*Bryologist* 104: 204, 2001; N America), Printzen (*Bryologist* 104: 382, 2001; Sonoran Desert), Laundon (*Nova Hedwigia* 76: 83, 2003; *L. varia* group), Lumbsch *et al.* (*Bryologist* 106: 552, 2003; N America), Grube *et al.* (*MR* 108: 506, 2004; *L. rupicola* group), Martínez & Aragón (*Bryologist* 107: 222, 2004; Spain), Peršoh *et al.* (*Mycol. Progr.* 3: 103, 2004; asci, phylogeny), Wedin *et al.* (*MR* 109: 159, 2005; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Lecanoraceae** Körb. (1855), Lecanorales (L). 23 gen. (+ 26 syn.), 766 spp.
- Lit.*: Hafellner (*Nova Hedwigia Beih.* 79: 241, 1984), Gargas *et al.* (*Mol. Biol. Evol.* 12: 208, 1995), Kärnefelt (*Abstracta Botanica* 21: 21, 1997), Lumbsch *et al.* (*Symb. bot. ups. 32* no. 1: 131, 1997), Ryan & Nash (*Nova Hedwigia* 64: 393, 1997), Arup & Grube (*Lichenologist* 30: 415, 1998), Rambold & Hagedorn (*Lichenologist* 30: 473, 1998), Arup & Grube (*CJB* 78: 318, 2000), Ekman & Wedin (*Pl. Biol.* 2: 350, 2000), Grube *et al.* (*MR* 108: 506, 2004), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Arup *et al.* (*Mycol.* 99: 42, 2007; phylogeny), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny).
- lecanoralean** (1) (of asci), of asci which are essentially bitunicate in structure, generally thick-walled with an especially strongly thickened apex, and in which discharge is by a rostrate eversion of the endoascus; see ascus; (2) (of apothecioid ascomata), see lecanorine.
- Lecanorales** Nannf. (1932), (±L). Lecanoromycetidae. 26 fam., 269 gen., 5695 spp. Thallus very varied. Ascomata apothecial, with or without a thalline margin, rarely mazaedial. Interascal tissue of paraphyses, usually branched and swollen at the apices, often with a pigmented epithecium, rarely absent. Hymenial gel often prominent. Asci with a single wall layer visible in LM but thick-walled, almost always with a conspicuous thick cap-like apical part, often with an internal beak (ocular chamber) and sometimes also

with complex apical structures, ascus walls and/or apical structures often J+; rarely thin-walled and evanescent. Ascospores very varied. Anamorphs pycnidial, poorly known. Mainly lichen-forming (almost all with protococcoid green photobionts), some lichenicolous or saprobes (then esp. on wood in xeric situations).

Probably still the largest order of the *Ascomycota*, but many groups have been removed in recent years. An extended subordinal classification was proposed by Rambold & Triebel (*Bibl. Lich.* 48, 1992) which recognized 6 suborders, but much of this research has been superseded by sequence-based studies. The following fams are accepted here; all are exclusively lichen-forming unless otherwise indicated. Not all have been studied using molecular methods, and the order may contract further. Fams:

- (1) **Aphanopsidaceae**
- (2) **Biatorellaceae**
- (3) **Brigantiaeaceae**
- (4) **Cladoniaceae**
- (5) **Crocyniaceae**
- (6) **Dactylosporaceae**
- (7) **Ectolechiaceae**
- (8) **Gypsoplacaceae**
- (9) **Haematommataceae**
- (10) **Helocarpaceae**
- (11) **Lecanoraceae**
- (12) **Megalariaceae**
- (13) **Miltideaceae**
- (14) **Mycoblastaceae**
- (15) **Parmeliaceae** (syn. *Hypogymniaceae*, *Usneaceae*)
- (16) **Pilocarpaceae** (syn. *Micareaceae*)
- (17) **Psoraceae**
- (18) **Ramalinaceae** (syn. *Bacidiaceae*, *Megalariaceae*)
- (19) **Sphaerophoraceae**
- (20) **Stereocaulaceae**
- (21) **Tephromelataceae**
- (22) **Vezdaeaceae** (±L)

Further references to family treatments are included in the fam. entries and under the type genera.

Lit.: Brodo *et al.* (Eds) (*J. Hattori bot. Lab.* 52: 303, 1982; papers from symp. 'Evolution in Lichenized Fungi'), Eriksson (1981; nomencl. fams), Hafellner (*Beih. Nova Hedw.* 79: 241, 1984, fams, asci; in Galun (Ed.), *Handbook of lichenology* 3: 41, 1988; fams; in Hawksworth (Ed.), 1994: 315), Henssen & Jahns (1973), Hertel (*Ergebn. Forsch. Unternehm. Nepal Himalaya* 6: 154, 1977; lecideine gen.), Ozenda & Clauzade (*Les lichens*, 1970; key 2188 spp. France), Poelt (*Bestimmungsschlüssel europäischer Flechten*, 1969, & Vězda, *Ergänzungsheft* I-II, 1977-81; keys Eur. spp.), Purvis *et al.* (*Lichen flora of Great Britain and Ireland*, 1992), Rambold (*Cryptogamic Botany* 5: 111, 1995), Rambold & Hagedorn (*Lichenologist* 30: 473, 1998), Santesson (*Symb. bot. upsal.* 12 (1), 1952; foliicolous taxa), Timdal (*Opera Bot.* 110, 1991; fam. concepts), Wirth (*Die Flechten Baden-Württembergs*, edn 2, 2 vols, 1995), Zahlbruckner (*Naturl. PflFam.*, edn 2, 8: 61, 1926; fams and gen.).

Lecanorella Frey (1926) = *Koerberiella* fide Hafellner (*Beih. Nova Hedwigia* 79: 241, 1984).

lecanorine (of an apothecium), having an excipulum (q.v.) thallinum (e.g. *Lecanora*, *Parmelia*) (Fig. 20A); lecanoroid.

Lecanoromyces E.A. Thomas ex Cif. & Tomas. (1953) ≡ *Lecanora*.

Lecanoromycetes O.E. Erikss. & Winka (1997), *Pezizomycotina*. 12 ord., 77 fam., 630 gen., 14199 spp. The largest and most varied group of lichenized *Ascomycota*. Subcl.:

(1) **Acarosporomycetidae**

(2) **Lecanoromycetidae**

(3) **Ostropomycetidae**

Lit.: Hofstetter *et al.* (*Mol. Phylogenet. Evol.* 44: 412, 2007), Lumbsch *et al.* (*Mol. Phylogenet. Evol.* 31: 822, 2004), Lutzoni *et al.* (*Am. J. Bot.* 91: 1446, 2004), Miądlikowska *et al.* (*Mycol.* 98: 1088, 2006), Wedin *et al.* (*MR* 109: 159, 2005).

Lecanoromycetidae P.M. Kirk, P.F. Cannon, J.C. David & Stalpers ex Miadl., Lutzoni & Lumbsch (2007), *Lecanoromycetes*. Thallus very varied. Ascomata almost always apothecial, flat to strongly cup-shaped, with or without a thalline margin, rarely mazaedial. Interascal tissue of paraphyses, usually branched and swollen at the apices, often with a pigmented or J+ epithecium, rarely absent. Asci typically with a single wall layer visible in LM but thick-walled, almost always with a conspicuous thick cap-like apical part, often with complex apical structures, often J+, rarely thin-walled and evanescent. Ascospores very varied. Mainly lichen-forming (with protococcoid green or cyanobacterial photobionts), some lichenicolous or saprobes (then esp. on wood in xeric situations). Ords:

(1) **Lecanorales**

(2) **Peltigerales**

(3) **Teloschistales**

The *Umbilicariales* may belong in this order, along with the *Catillariaceae* and *Rhizocarpaceae*, but relative positions are still uncertain.

Lit.: see under ord. and fam.

Lecanoropsis M. Choisy (1949) = *Lecanora* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Lecanosticta Syd. (1922), anamorphic *Eruptio*, Cac. ≡ eP.19. 3 (on pines), N. America; C. America. See Wolf & Barbour (*Phytopathology* 31: 61, 1941), Petrak (*Sydowia* 15: 252, 1961), Evans (*Mycol. Pap.* 153, 1984), Han *et al.* (*J. Nanjing For. Univ.* 15: 1, 1991; pathotypes of *L. acicola*), Suto & Ougi (*Mycoscience* 39: 319, 1998; Japan), Marmolejo (*Mycotaxon* 76: 393, 2000; Mexico), Verkley & Priest (*Stud. Mycol.* 45: 123, 2000; review), Crous *et al.* (*Mycol.* 93: 1081, 2001; phylogeny), Verkley *et al.* (*Mycol.* 96: 558, 2004; phylogeny).

Lecanostictopsis B. Sutton & Crous (1997), anamorphic *Pezizomycotina*, Cpd.???. 4, widespread. See Sutton & Crous (*MR* 101: 215, 1997).

Leccinellum Bresinsky & Manfr. Binder (2003), *Boletaceae*. 10, widespread (north temperate). See Bresinsky & Besl (*Regensb. Mykol. Schr.* 11: 231, 2003).

Leccinum Gray (1821), *Boletaceae*. c. 75, widespread (mainly north temperate). See Lannoy & Estades (*Monographie des Leccinum d'Europe*, 1995), Halling & Mueller (*Mycol.* 95: 488, 2003; Costa Rica), Den Bakker *et al.* (*Mycol.* 96: 102, 2004; ITS phylogeny), Den Bakker *et al.* (*New Phytol.* 163: 201, 2004; ectomycorrhizae, evolution and host specificity), Den Bakker & Noordeloos (*Persoonia* 18: 511, 2005; rev. Europ. spp.), Fu *et al.* (*Mycotaxon* 96: 47, 2006; China), Den Bakker *et al.* (*MR* 111: 663, 2007; phylogeography).

Lecidea Ach. (1803), Lecideaceae ($\pm$ L). c. 427, widespread. *Lecidea* s.str. contains $\pm$ 100 species; other species have been redispersed over many segregate genera. See Lowe (*Lloydia* 2: 225, 1939), Poelt (*Ber. bayer. bot. Ges.* 34: 82, 1961), Hertel (*Beih. Nova Hedwigia* 24, 1967), Hertel (*Herzogia* 1: 25, 1968), Hertel (*Herzogia* 1: 321, 1969), Thomson *et al.* (*Bryologist* 72: 137, 1969), Hertel (*Herzogia* 1: 405, 1970; parasitic spp.), Hertel (*Herzogia* 2: 231, 1971), Hertel (*Herzogia* 2: 479, 1973), Hertel (*Herzogia* 3: 365, 1975), Hertel (*Decheniana* 127: 37, 1975; key saxic. holarctic spp.), Hertel (*Ergebn. Forsch. Unternehems Nepal Himalaya* 6: 145, 1977; Asia), Inoue (*J. Sci. Hiroshima Univ.* B(2) 18: 1, 1982; Japan), Schwab (*Mitt. bot. StSamml., München* 22: 221, 1986; key 17 spp.), Hertel (*Mitt. bot. StSamml., München* 30: 297, 1991; arctic spp.), Hertel (*Biblthca Lichenol.* 58: 137, 1995; key Europe spp.), Casares-Porcel *et al.* (*Lichenologist* 28: 37, 1996; spp. on gypsum), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998; DNA), Inoue (*Bull. natn. Sci. Mus. Tokyo*, B 28: 7, 2002; Hawaii), Leuckert & Hertel (*Biblthca Lichenol.* 86: 13, 2003; *L. atrobrunnea* complex, Americas), Arup (*Symb. bot. upsala.* 34 no. 1: 39, 2004; Sweden), Buschbom & Mueller (*Mol. Phylogen. Evol.* 32: 66, 2004; phylogeny), Peršoh *et al.* (*Mycol. Progr.* 3: 103, 2004; asci, phylogeny), Hafellner (*Fritschiana* 52: 31, 2006; on *Rhizocarpon*), Hertel (*Central European Lichens*: 19, 2006; Europe), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Upreti *et al.* (*Mycotaxon* 95: 323, 2006; India).

Lecideaceae Chevall. (1826), Lecideales (L). 7 gen. (+ 8 syn.), 436 spp.

Lit.: Hertel & Rambold (*Bot. Jb.* 107: 469, 1985), Hertel (*Biblthca Lichenol.* 25: 219, 1987), Rambold (*Biblthca Lichenol.* 34: 345 pp., 1989), Triebel (*Biblthca Lichenol.* 35: 278 pp., 1989), Pietschmann (*Nova Hedwigia* 51: 521, 1990), Hertel (*Cryptog. Bot.* 5: 99, 1995; gen. concepts), Hertel (*Biblthca Lichenol.* 58: 137, 1995), Hertel (*Symb. bot. upsala.* 32: 95, 1997), Rambold & Hagedorn (*Lichenologist* 30: 473, 1998), Kantvilas & McCarthy (*Lichenologist* 31: 555, 1999), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny).

Lecideales Vain. (1934), (L). Lecanoromycetidae. 2 fam., 23 gen., 494 spp. Fams:

(1) **Lecideaceae**

(2) **Porpidiaceae**

For *Lit.* see under fam.

lecideine (of an apothecium), one having no excipulum thallinum (q.v.) and the margin usually consisting only of the excipulum proprium (e.g. *Lecidea*, *Bacidia*) (Fig. 20B).

Lecidella Körb. (1855), Lecanoraceae (L). 79, widespread (esp. temperate). See Hertel & Leuckert (*Willdenowia* 5: 369, 1969), Knoph (*Biblthca Lichenol.* 36, 1990; key 15 spp. rock), Leuckert & Knoph (*Lichenologist* 24: 383, 1992; chloroxanthone spp.), Leuckert & Knoph (*Biblthca Lichenol.* 53: 161, 1993; chemistry), Inoue (*Bull. natn. Sci. Mus. Tokyo*, B 23: 127, 1997), Knoph *et al.* (*Mycotaxon* 71: 163, 1999), Ekman & Wedin (*Pl. Biol.* 2: 350, 2000; phylogeny), Inoue (*Bull. natn. Sci. Mus. Tokyo*, B 26: 139, 2000; Japan), Knoph & Leuckert (*Herzogia* 14: 1, 2000; chemistry), Peršoh *et al.* (*Mycol. Progr.* 3: 103, 2004; asci, phylogeny), Miadlikowska *et al.*

(*Mycol.* 98: 1088, 2006; phylogeny).

Lecidellomyces E.A. Thomas (1939) nom. inval. = *Lecidella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Lecideola A. Massal. (1861) = *Lecidella* fide Knoph (*Biblthca Lichenol.* 36, 1990).

Lecideomyces E.A. Thomas ex Cif. & Tomas. (1953) = *Adelolecia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Lecideopsella Höhn. (1909), Schizothyriaceae. c. 10, widespread (esp. tropical).

Lecideopsis (Almq.) Rehm (1891) = *Arthonia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Lecidocollema Vain. (1890) = *Homothecium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Lecidoma Goth. Schneid. & Hertel (1981), Lecanorales (L). 1, Europe. See Pietschmann (*Nova Hedwigia* 51: 521, 1990; posn), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).

Lecidopyrenopsis Vain. (1907), Lichinaceae (L). 1, Thailand. See Schultz & Büdel (*Lichenologist* 34: 39, 2002; key).

Lecidora Motyka (1996) nom. inval. = *Lecanora* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Lecidorina Motyka (1996) nom. inval. = *Lecanora* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Leciographa A. Massal. (1854) = *Opegrapha* Ach. See also *Dactylospora*. fide Hafellner (*Beih. Nova Hedwigia* 62, 1979), Ertz *et al.* (*J. Linn. Soc. Bot.* 144: 235, 2004).

Leciophysma Th. Fr. (1865), Collemataceae (L). 2, temperate. See Henssen (*Lichenologist* 3: 29, 1965), Henssen (*Biblthca Lichenol.* 96: 129, 2007; Subantarctic).

Lecithium Sacc. (1895) $\equiv$ *Lecythium*.

Lecoglyphis Clem. (1909) = *Opegrapha* Ach. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Lecophagus M.W. Dick (1990), anamorphic *Pezizales*, Hso. $\equiv$ eH.6. 2, N. America; Antarctica. See Dick (*MR* 94: 347, 1990; key), Morikawa *et al.* (*MR* 97: 421, 1993; synonymy with *Cephalophora*), Tanabe *et al.* (*Mycol.* 91: 830, 1999; ascomycete anamorph & phylogeny), McInnes (*Polar Biol.* 26: 79, 2003; Antarctica).

Lecotheciaceae Körb. (1855) = *Placynthiaceae*.

Lecothecium Trevis. (1851) = *Placynthium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Lecozonia Trevis. (1857) = *Placynthium* fide Hafellner (*Beih. Nova Hedwigia* 62: 94, 1979).

lectotype, see type.

Lectularia Stirt. (1878) = *Diploschistes* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Lecythea Lév. (1847) = *Phragmidium* fide Dietel (*Nat. Pflanzenfam.* 6, 1928) Anamorph name for (II).

lecythiform, like a stoppered bottle; ninepin-shaped (Fig. 23.13).

Lecythispora Chowdhry (1985), anamorphic *Pezizomycotina*. 1. See Chowdhry (*Curr. Sci.* 54: 469, 1985).

Lecythium Zukal (1893), Sordariomycetes. 1, Austria. Type material is missing and identity is obscure. See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).

Lecythophora Nannf. (1934), Coniochaetaceae. 1 (on

- wood or dung), widespread. See Goidanich (*Ent. naz. Cell. e Cart., Roma* 112, 1938), Weber (*Nova Hedwigia* 74: 159, 2002; morphology), Weber *et al.* (*Nova Hedwigia* 74: 187, 2002; phylogeny), García *et al.* (*MR* 110: 1271, 2006; phylogeny).
- Lecythothecium** Réblová & Winka (2001), ? Chaetosphaeriaceae. Anamorph *Ellisembia*-like. 1, Europe (central). See Réblová & Winka (*Mycol.* 93: 478, 2001), Shenoy *et al.* (*MR* 110: 916, 2006; anamorph).
- Leeina** Petr. (1923), anamorphic *Pezizomycotina*, St.0eH.?. 1, Philippines.
- Legerioides** M.M. White (1999), Legeriomycetaceae. 1 (in *Caecidotea*), USA. See White (*Mycol.* 91: 1022, 1999).
- Legeriomyces** Pouzar (1972), Legeriomycetaceae. 5 (in *Ephemeroptera*), Canada; Spain; USA. See Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986; key), Williams & Lichtwardt (*CJB* 71: 1109, 1993), White (*MR* 110: 1011, 2006; phylogeny), Strongman (*CJB* 85: 949, 2007; Canada), Valle (*Mycol.* 99: 442, 2007; Spain).
- Legeriomycetaceae** Pouzar (1972), Harpellales. 31 gen. (+ 5 syn.), 158 spp.
Lit.: Moss (*TBMS* 65: 115, 1975), Moss & Young (*Mycol.* 70: 944, 1978), Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*: 343 pp., 1986), Lichtwardt (*Fourth International Mycological Congress Abstracts*, 1986), Lichtwardt *et al.* (*TMSJ* 28: 376, 1987), Longcore (*Mycol.* 81: 482, 1989), Lichtwardt & Williams (*CJB* 68: 1045, 1990), Peterson *et al.* (*Mycol.* 83: 389, 1991), Lichtwardt & Williams (*CJB* 70: 1196, 1992), Williams & Lichtwardt (*CJB* 71: 1109, 1993), Benny in McLaughlin *et al.* (Eds) (*The Mycota A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research* 7A: 147, 2001), Lichtwardt (*Cellular Origin and Life in Extreme Habitats* 4: 577, 2002), Beard & Adler (*Mycol.* 95: 317, 2003), Valle & Santamaría (*Mycol.* 96: 682, 2004).
- Legeriosimilis** M.C. Williams, Lichtw., M.M. White & Misra (1999), Legeriomycetaceae. 2 (in *Ameletus*), Europe; N. America. See Williams & Lichtwardt (*Mycol.* 91: 400, 1999), White & Lichtwardt (*Mycol.* 96: 891, 2004; Norway), White *et al.* (*Mycol.* 98: 333, 2006; USA).
- legitimate** (1) (of validly published names or epithets), in accordance with the *Code*, priorable; **illegitimate**, contrary to the *Code*, impriorable. A recognized taxon of uncertain taxonomic position may have more than one legitimate name according to the position or rank given to it; (2) (of mating types), compatible. See Nomenclature.
- Leifia** Ginns (1998) = *Odonticium* fide Zmitrovich & Spirin (*Mycena* 6: 4, 2006).
- Leifidium** Wedin (1993), Sphaerophoraceae (L.). 1, Australia; S. America. See Wedin (*Nord. J. Bot.* 10: 539, 1991; spore, ascoma ontogeny), Wedin (*Pl. Syst. Evol.* 187: 213, 1993), Wedin (*Symb. Bot. Upsal.* 31 no. 1, 1995; key, monograph), Tibell (*Symb. bot. upsal.* 32: 291, 1997; anamorphs), Wedin *et al.* (*Pl. Syst. Evol.* 209: 75, 1998; DNA).
- Leightonina** Trevis. (1853) = *Endocarpon* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Leightonina** Trevis. (1861) = *Trypethelium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Leightoniella** Henssen (1965), Collemataceae (L.). 1, Sri Lanka. See Henssen (*Lichenologist* 3: 39, 1965).
- Leightoniomyces** D. Hawksw. & B. Sutton (1977), anamorphic *Pezizomycotina*, Hso.0eP.19. 1 (on lichens), Azores; British Isles. See Hawksworth & Sutton (*J. Linn. Soc. Bot.* 75: 199, 1977).
- Leioderma** Nyl. (1888), Pannariaceae (L.). 9, mostly southern hemisphere. See Galloway & Jørgensen (*Lichenologist* 19: 345, 1987), Jørgensen & Galloway (*Lichenologist* 21: 295, 1989; key), Jørgensen & Galloway (*J. Jap. Bot.* 69: 383, 1994; Japan), Ekman & Jørgensen (*CJB* 80: 625, 2002; phylogeny), Wiklund & Wedin (*Cladistics* 19: 419, 2003; phylogeny), Wedin & Wiklund (*Symb. bot. upsal.* 34 no. 1: 469, 2004; phylogeny), Jørgensen (*Lichenologist* 37: 369, 2005; Malaysia), Jørgensen & Tønsberg (*Bryologist* 108: 412, 2005; USA).
- leiodisc** (of an apothecium), having a smooth glazed disc.
- Leiogramma** Eschw. (1833) = *Leiorreuma*.
- Leiophallus** (Fr.) Nees (1858) = *Phallus* fide Stalpers (*in litt.*).
- Leiophloea** (Ach.) Gray (1821) = *Arthopyrenia* fide Riedl (*Sydowia* 15: 257, 1961), Riedl (*Sydowia* 16: 263, 1962).
- Leiophloea** Trevis. (1860) = *Leiophloea* (Ach.) Gray.
- Leiopoda** Velen. (1947) ? = *Mycena* fide Singer (*Agric. mod. Tax.*, 1951).
- Leiorreuma** Eschw. (1824), Graphidaceae (L.). 1, pantropical. See Archer (*Biblthca Lichenol.* 94, 2006; Australia), Archer (*Systematics & Biodiversity* 5: 9, 2007; Solomon Is).
- Leiosepium** Sacc. (1900) = *Sepedonium* fide Damon (*Mycol.* 44: 95, 1952).
- Leiosphaerella** Höhn. (1919), Xylariales. Anamorph *Beltraniella*. 9, widespread. See Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962), Samuels & Rossman (*Mycotaxon* 28: 461, 1987), Kang *et al.* (*Mycoscience* 40: 151, 1999), Jeewon *et al.* (*MR* 107: 1392, 2003; phylogeny).
- leiosporous**, having smooth spores.
- Leiostigma** Kirschst. (1944) = *Sordaria* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Leiothecium** Samson & Mouch. (1975), Eurotiales. 1, Greece. See Samson & Mouchaca (*CJB* 53: 1364, 1975).
- Lejophallus**, see *Leiophallus*.
- Lejophlea**, see *Leiophloea* (Ach.) Gray.
- Lejosphaerella**, see *Leiosphaerella*.
- Lelum** Racib. (1900) ? = *Kordyana* fide Donk (*Reinwardtia* 4: 117, 1956; affinities).
- Lemalis** Fr. (1825), ? Helotiales. 3, widespread.
- Lemania** Bory (1824), Algae. Algae.
- Lembidium** Körb. (1855) nom. rej. prop. = *Anisomeridium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Lembopodia** Bat. (1960) = *Cirsosia* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Lembosia** Lév. (1845), Asterinaceae. c. 60, widespread (esp. warmer areas). See Mibey & Hawksworth (*Mycol. Pap.* 174, 1997; Kenya), Sivanesan & Shivas (*Fungal Diversity* 11: 159, 2002; Australia), Song & Li (*Mycotaxon* 84: 401, 2002; China).
- Lembosiaceae** Höhn. (1918) = Asterinaceae.
- Lembosidium** Speg. (1923) = *Lembosia* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Lembosiella** Sacc. (1891), ? Microthyriaceae. 1, Africa.
- Lembosiellina** Bat. & H. Maia (1960) = *Lembosia* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Lembosina** Theiss. (1913), ? Asterinaceae. 21, wide-

- spread. See Mibey & Hawksworth (*Mycol. Pap.* 174, 1997; Kenya), Sivanesan & Shivas (*Fungal Diversity* 11: 159, 2002; Australia).
- Lembosiodothis** Höhn. (1917) = *Echidnodes* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Lembosiopeltis** Bat. & J.L. Bezerra (1967) = *Uleothyrium* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Lembosiopsis** Theiss. (1918), ? *Asterinaceae*. 1, N. America. See Farr (*Sydowia* 38: 65, 1986).
- Lembuncula** Cif. (1954), anamorphic *Pezizomycotina*, Cpt.0eP.?. 1, Santo Domingo. See Ciferri (*Sydowia* 8: 259, 1954).
- Lemkea** Morgan-Jones & R.C. Sinclair (1983), anamorphic *Pezizomycotina*, Hso.0eP.1. 1, S. Africa; N. America. See Morgan-Jones & Sinclair (*Mycol.* 75: 159, 1983), Chamuris *et al.* (*Mycotaxon* 24: 319, 1985).
- Lemmopsis** (Vain.) Zahlbr. (1906), *Lichinaceae* (L). 3, Europe. See Ellis (*Lichenologist* 13: 123, 1981; key), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key).
- Lemniscium** Wallr. (1827) = *Leptogium* fide Jørgensen (*Op. Bot.* 45, 1978).
- Lemonniera** De Wild. (1894), anamorphic *Helotiales*, Hso.1bH.15. 6 (aquatic), widespread. See Descals *et al.* (*TBMS* 69: 89, 1977; key), Campbell *et al.* (*MR* 110: 1025, 2006; phylogeny, polyphyly).
- Lempholemma** Körb. (1855), *Lichinaceae* (L). c. 33, widespread. See Schiman-Czeika (*Pl. Syst. Evol.* 158: 283, 1988), Kantvilas & Jørgensen (*Muelleria* 11: 45, 1998; Australia), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key), Schultz (*Biblthca Lichenol.* 86: 155, 2003; Socotra), Schultz (*Lichenologist* 37: 227, 2005; Yemen).
- Lennisia** Nieuwl. (1916) = *Monochaetia* fide Sutton (*Mycol. Pap.* 141, 1977).
- Lenormandia** Delise (1841) [non *Lenormandia* Sond. 1845, nom. cons., *Rhodophyceae*] = *Normandina* fide Aptroot (*Lichenologist* 30: 501, 1998).
- Lentaria** Corner (1950), *Lentariaceae*. 17, widespread. See Sharda (*Biovigyanam* 10: 131, 1984; Himalayan spp.), Govorova (*Mikol. Fitopatol.* 36: 24, 2002; Far East of Russia), Dentinger & McLaughlin (*Mycol.* 98: 746, 2006; phylogeny).
- Lentariaceae** Jülich (1982), *Gomphales*. 3 gen., 23 spp.
- Lentescospora** Linder (1944) nom. dub., *Pezizomycotina*. See Kohlmeyer & Kohlmeyer (*Marine Mycology*, 1979).
- lenthionine**, an odorous metabolic product of *Lentinula edodes* (Nishikawa, *Chem. Pharm. Bull., Tokyo* 15: 756, 1967).
- lentic**, habitat still water (lakes). Cf. lotic.
- lenticular**, like a double convex lens in form (Fig. 23.5c).
- lentiginose (lentiginous)**, having very small spots as though freckled.
- Lentinaceae** Jülich (1982) = *Polyporaceae*. *Lentinaeae* is listed as nom. rej. against *Tricholomataceae*.
- Lentinaria** Pilát (1941) nom. nud. = *Lentinellus* fide Stalpers (*in litt.*).
- Lentinellaceae** Locq. (1972) = *Auriscalpiaceae*.
- Lentinellus** P. Karst. (1879), *Auriscalpiaceae*. 15, widespread. See Miller & Stewart (*Mycol.* 63: 333, 1971; key), Printz (*Svampe* 14: 59, 1986; key), Stalpers (*Stud. Mycol.* 40: 88, 1996; key), Miller & Methven (*Mycol.* 92: 792, 2000; taxonomy), Hughes & Petersen (*Biblthca Mycol.* 198: 249, 2004; phylogeny), Petersen (*Biblthca Mycol.* 198: 181, 2004; types), Petersen & Hughes (*Biblthca Mycol.* 198: 1, 2004; monograph).
- Lentinopanus** Pilát (1941) = *Panus* fide Singer (*Agaric. mod. Tax.*, 1951).
- Lentinula** Earle (1909), *Marasmiaceae*. 8, widespread (tropical). *L. edodes* is the edible shii-take mushroom. See Pegler (*Kew Bull. Addit. Ser.* 6, 1977), Pegler (*Sydowia* 36: 227, 1983; key), Mata & Petersen (*Mycotaxon* 79: 217, 2001; New World types), Mata & Petersen (*Mycol.* 93: 1102, 2001; Americas), Zhang *et al.* (*Mycosystema* 24: 517, 2005; molecular typing).
- Lentinus** Fr. (1825), *Polyporaceae*. 40, widespread (esp. subtropical). Wood (e.g. railway sleepers) is attacked by *L. lepideus*. See Pegler (*Kew Bull. Addit. Ser.* 10: 1, 1983; monogr. s.l.), Hibbett & Vilgalys (*Mycol.* 83: 425, 1991; s.str.), Hibbett & Vilgalys (*Syst. Bot.* 18: 409, 1993) Not all species treated by Pegler have been reclassified.
- Lentispora** Fayod (1889) = *Coprinopsis* P. Karst. fide Redhead *et al.* (*Mycotaxon* 50: 203, 2001).
- Lentodiellum** Murrill (1915) = *Lentinus* fide Kuyper (*in litt.*).
- Lentodiopsis** Bubák (1895) = *Pleurotus* fide Singer (*Agaric. mod. Tax.*, 1951).
- Lentodium** Morgan (1895) = *Lentinus*. Abnormal variants of *L. tigrinus*, with which it is sexually incompatible. fide Rosinsky & Robinson (*Am. J. Bot.* 55: 242, 1968; arising under the absence of light), Hibbett (*Am. J. Bot.* 81: 466, 1994; developmental variant with a recessive allele at a single locus).
- Lentomita** Niessl (1876) = *Chaetosphaeria* fide Kohlmeyer & Kohlmeyer (*Marine Mycology*, 1979).
- Lentomitella** Höhn. (1906), *Sordariomycetes*. 1, widespread (temperate). See Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Réblová (*Mycol.* 98: 68, 2006; phylogeny).
- Lentus** Lloyd ex Torrend (1920) = *Polyporus* P. Micheli ex Adans. fide Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974).
- Lenzitella** Ryvarden (1991) = *Lenzitopsis* fide Stalpers (*Stud. Mycol.* 35: 168 pp., 1993).
- Lenzites** Fr. (1836), *Polyporaceae*. 6, widespread. *L. sepiaria* causes timber rot. See Gilbertson & Ryvarden (*N. Amer. Polyp.* 1: 424, 1987).
- Lenzitina** P. Karst. (1889) = *Gloeophyllum* fide Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974).
- Lenzitites** Mesch. (1892), *Fossil Fungi*. 1 (Miocene), Italy.
- Lenzitopsidaceae** Jülich (1982) = *Thelephoraceae*.
- Lenzitopsis** Malençon & Bertault (1963), *Thelephoraceae*. 1, Morocco; Spain. See Stalpers (*Stud. Mycol.* 35: 43, 1993; key).
- Leohumicola** N.L. Nickers. (2005), anamorphic *Leotiomyces*. 4, Canada; Chile. See Nickerson (*Stud. Mycol.* 53: 41, 2005).
- Leolophia** Klotzsch (1836) nom. inval., *Basidiomycota*.
- Leotia** Pers. (1794), *Leotiaceae*. 4, widespread (temperate). See Tai (*Lloydia* 7: 146, 1944), Honegger (*Lichenologist* 15: 57, 1983; TEM), Verkley (*Periconia* 15: 405, 1994; asci), Döring & Triebel (*Cryptog. Bryol.-Lichénol.* 19: 123, 1998; DNA), Landvik *et al.* (*Mycoscience* 39: 49, 1998), Lizoň *et al.* (*Mycotaxon* 67: 73, 1998; posn), Gernandt *et al.* (*Mycol.* 93: 915, 2001; phylogeny), Korf & Lizon (*Czech Mycol.* 52: 255, 2001; nomencl.), Zhong & Pfister (*Mycol. Progr.* 3: 237, 2004; phylogeny), Wang *et al.*

(*Mycol.* 98: 1065, 2006; phylogeny).

Leotiaceae Corda (1842), Leotiales. 7 gen. (+ 11 syn.), 34 spp. The family is much more restricted in extent than in previous editions of this *Dictionary*; see also *Helotiaceae*.

Lit.: Verkley (*Persoonia* 15: 405, 1994; asci), Gargas & Taylor (*Exp. Mycol.* 19: 7, 1995), Döring & Triebel (*Cryptog. Bryol.-Lichénol.* 19: 123, 1998), Gamundi & Romero (*Fl. criptog. Tierra del Fuego* 10: 130 pp., 1998), Landvik *et al.* (*Mycoscience* 39: 49, 1998), Lizoň *et al.* (*Mycotaxon* 67: 73, 1998), Korf (*Mycotaxon* 73: 493, 1999), Liu *et al.* (*Mol. Biol. Evol.* 16: 1799, 1999), Zhong & Pfister (*Mycol. Progr.* 3: 237, 2004), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006).

Leotiales Korf & Lizoň (2001). Leotiomyetidae. 2 fam., 11 gen., 41 spp. Fams:

- (1) **Bulgariaceae**
- (2) **Leotiaceae**

For *Lit.* see under fam.

Leotiella Plötn. (1900) ? = *Cudonia* fide Clements & Shear (*Gen. Fung.*, 1931), Nannfeldt (*Nova Acta R. Soc. Scient. Upsal.* IV 8, 1932).

Leotiomyetes O.E. Erikss. & Winka (1997), Pezizomycotina. 5 ord., 19 fam., 641 gen., 5587 spp. The inoperculate discomycetes as traditionally circumscribed, but with the inclusion of the powdery mildews. Ords.:

- (1) **Cyttariales**
- (2) **Erysiphales**
- (3) **Helotiales**
- (4) **Leotiales**
- (5) **Rhytismatales**

Lit.: Wang *et al.* (*Mycol.* 98: 1065, 2006).

Still in need of major revision; the *Thelebolales* may belong here also.

Leotiomyetidae, see *Leotiomyetes*.

Lepadolemma Trevis. (1853) = *Haematomma* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Lepidella E.-J. Gilbert (1925) [non *Lepidella* Tiegh. 1911, *Loranthaceae*] = *Amanita* Adans. fide Bas (*Persoonia* 5: 285, 1969).

Lepidocollema Vain. (1890) = *Collema* F.H. Wigg. fide Swinscow & Krog (*Lichenologist* 18: 309, 1986), Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Lepidogium Clem. & Shear (1931) ≡ *Lepidoleptogium*.

Lepidoleptogium A.L. Sm. (1922) = *Pannaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Lepidoma (Ach.) Gray (1821) ≡ *Lecidoma*.

Lepidoma Link (1809) ≡ *Rhizocarpon*.

Lepidomyces Jülich (1979), Pterulaceae. 2, Europe. See Jülich (*Persoonia* 10: 330, 1979).

Lepidonectria Speg. (1910) ? = *Ijuhya* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).

Lepidophyton Trib. (1899) nom. dub., anamorphic *Pezizomycotina*. No spp. Described.

Lepidopterella Shearer & J.L. Crane (1980), Argynnaeae. 1 (aquatic), USA. See Shearer & Crane (*TBMS* 75: 194, 1980).

Lepidosphaeria Parg.-Leduc (1970), Testudinaceae. 1, Sahara. See Hawksworth (*CJB* 57: 91, 1979), Krusys *et al.* (*MR* 110: 527, 2006; phylogeny), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).

Lepidostroma Mägd. & S. Winkl. (1967), Polyporales (L). 1, Europe. See Oberwinkler (*Dtsch. bot. Ges. N.F.* 4: 139, 1970).

lepidote, covered with small scales.

Lepidotia Boud. (1885), Pezizaceae. 1, USA. See Korf (*Persoonia* 7: 205, 1973), Norman & Egger (*Mycol.* 91: 820, 1999; phylogeny), Hansen *et al.* (*Mycol.* 93: 958, 2001; phylogeny).

Lepidotus Clem. (1902) ≡ *Lepiota*.

lepiochlorin, an antibacterial antibiotic from *Lepiota* cultivated by the gardening ant (*Cyphomyrmex costatus*); see Hervey & Nair (*Mycol.* 71: 1064, 1979).

Lepiota (Pers.) Gray (1821), Agaricaceae. Anamorph *Coccobotrys*. c. 400, widespread. *L. scobinella* and several pink, red or orange spp. are very poisonous. See Kauffman (*Pap. Mich. Acad. Sci.* 4: 311, 1924; N. Am. spp.), Beeli (*Bull. Soc. Bot. Belg.* 64: 206, 1931), Beeli (*Fl. Icon. Champ. Congo* 2: 29, 1936; Congo spp.), Dennis (*Kew Bull.* 7: 459, 1952; W. Indian spp.), Aberdeen (*Kew Bull.* 16: 129, 1962; Australian type studies), Pegler (*Kew Bull.* 27: 155, 1972; key 34 Sri Lanka spp.), Pegler (*Kew Bull. Addit. Ser.* 6, 1977; key 30 E. Afr. spp.), Candusso & Lanzoni (*Lepiota s.l.*, 1990; key Europ. spp.), Johnson & Vilgalys (*Mycol.* 90: 971, 1998; phylogeny), Johnson (*Mycol.* 91: 443, 1999; phylogeny), Vellinga (*Mycol. Progr.* 2: 305, 2003; phylogeny), Vellinga (*MR* 108: 354, 2004; phylogeny).

Lepiotasporites T.C. Huang (1981), Fossil Fungi. 1 (Miocene), Taiwan.

Lepiotella (E.-J. Gilbert) Konrad (1934) = *Chamaemyces* fide Singer (*Agaric. mod. Tax.* edn 3, 1975).

Lepiotella Rick (1938) ≡ *Volvolepiota*.

Lepiotophyllum Locq. (1942) nom. inval. [as subgenus?] = *Leucocoprinus* fide Kirk (*in litt.*).

Lepiotula (Maire) Locq. ex E. Horak (1968) = *Lepiota* fide Kuyper (*in litt.*).

Lepista (Fr.) W.G. Sm. (1870), Tricholomataceae. c. 50, widespread. Blewits. See Bigelow & Smith (*Brittonia* 21: 144, 1969; as *Clitocybe*), Harmaja (*Karstenia* 14: 82, 1974), Pegler & Young (*Kew Bull.* 29: 659, 1974; basidiospore form), Harmaja (*Karstenia* 18: 49, 1978; gen. division), Chiari (*Bollettino del Circolo Micologico 'Giovanni Carini'* 42: 38, 2001), Consiglio & Contu (*Rivista di Micologia* 46: 131, 2003; Italy), Stott *et al.* (*MR* 109: 205, 2005; molec. analysis of Australian and European isolates).

Lepistella T.J. Baroni & Ovrebo (2007), Tricholomataceae. 1, C. America. See Ovrebo & Baroni (*Fungal Diversity* 27: 157, 2007).

Lepocolla Eklund (1883) nom. dub., ? Actinobacteria. or anamorphic fungi.

Lepolichen Trevis. (1853) = *Coccotrema* fide Henssen *in* Brown *et al.* (Eds) (*Lichenology: progress and problems*: 107, 1976), Galloway & Watson-Gandy (*Bryologist* 95: 227, 1992), Schmitt *et al.* (*Lichenologist* 33: 315, 2001; phylogeny).

Leporina Velen. (1947) = *Coprotus* fide van Brummelen *in* Hawksworth (Ed.) (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. 269 269: 400, 1994).

Lepra Chevall. (1826) nom. dub., anamorphic *Pezizomycotina*.

Lepra Scop. (1777) nom. rej. = *Pertusaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Lepra Willd. (1787) = *Illosporium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Leprantha Dufour ex Körb. (1855) = *Arthonia* fide

- Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Lepraria** Ach. (1803) nom. cons., anamorphic *Stereocaulaceae*, ??? (L (sterile)). c. 71, widespread. See Laundon (*Lichenologist* 24: 315, 1992; key 9 Br. spp.), Lohtander (*Ann. bot. fenn.* 31: 223, 1994; key 11 spp. Finland), Leuckert *et al.* (*Biblthca Lichenol.* 58: 245, 1995; chemistry), Orange (*British Lichen Society Bulletin* 74: 1, 1995; UK), Saag & Saag (*Folia cryptog. Estonica* 34: 55, 1999; Estonia), Kukwa (*Biblthca Lichenol.* 82: 67, 2001; Poland), Ekman & Tønsberg (*MR* 106: 1262, 2002; phylogeny), Kukwa (*Ann. bot. fenn.* 39: 225, 2002), Kukwa *et al.* (*Botanica Lithuanica* 9: 259, 2003; Russia), Elix & Tønsberg (*Graphis Scripta* 16: 43, 2004; chemistry), Sipman (*Herzogia* 17: 23, 2004; tropical spp.), Myllys *et al.* (*Taxon* 54: 605, 2005; phylogeny), Baruffo *et al.* (*Nova Hedwigia* 83: 387, 2006; Italy), Kukwa (*Lichenologist* 38: 293, 2006; Poland), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Slavíková-Bayerová & Orange (*Lichenologist* 38: 503, 2006), Flakus & Kukwa (*Lichenologist* 39: 463, 2007; S America), Nelsen & Gargas (*Nova Hedwigia* 86: 115, 2008; chemistry, phylogeny).
- Leprariaceae** Rchb. (1841) = *Stereocaulaceae*.
- Leprieuria** Laessøe, J.D. Rogers & Whalley (1989), Xylariaceae. Anamorph *Geniculosporium*. 1, C. & S. America (tropical). See Læssøe *et al.* (*MR* 93: 152, 1989), San Martín & Rogers (*Mycotaxon* 48: 179, 1993; Mexico), González *et al.* (*Mycol.* 96: 675, 2004).
- Leprieurina** G. Arnaud (1918), anamorphic *Pezizomycotina*, Cpt.0eP.1. 1, S. America; Vietnam. See Reynolds (*Gdms' Bull.* Singapore 51: 71, 1999).
- Leprieurinella** Bat. & H. Maia (1961), anamorphic *Pezizomycotina*, Cpt.???. 1, Brazil. See Batista & Maia (*Publções Inst. Micol. Recife* 338: 18, 1961).
- Leprocaulon** Nyl. (1878), anamorphic *Lecanorales*, ??? (L (sterile)). 10, widespread. See Lamb & Ward (*J. Hattori bot. Lab.* 38: 499, 1974; key), Marcano *et al.* (*Trop. Bryol.* 13: 47, 1997; Venezuela), Ekman & Tønsberg (*MR* 106: 1262, 2002; phylogeny).
- Leprocollema** Vain. (1890), Lichinaceae (L). 3, widespread. See Magnusson (*Hedwigia* 78: 219, 1938), Henssen (*SA* 5: 137, 1986), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key).
- Leproloma** Nyl. ex Croub. (1883), *Stereocaulaceae* (L (sterile)). 6, widespread. See Laundon (*Lichenologist* 21: 1, 1989; key), Leuckert & Kümmerling (*Nova Hedwigia* 52: 17, 1991; chemotax.), Jørgensen in Hawksworth (Ed.) (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. 269 269: 392, 1994; posn), Leuckert *et al.* (*Biblthca Lichenol.* 58: 245, 1995; chemistry), Lohtander (*Ann. bot. fenn.* 32: 49, 1995; Finland), Tønsberg & Jørgensen (*Lichenologist* 29: 597, 1997; comments on alleged ascoma), Kukwa (*Biblthca Lichenol.* 82: 67, 2001; Poland), Ekman & Tønsberg (*MR* 106: 1262, 2002; phylogeny), Kukwa (*Ann. bot. fenn.* 39: 225, 2002), Myllys *et al.* (*Taxon* 54: 605, 2005; phylogeny).
- Leproncus** Vent. (1799) nom. rej. = *Pertusaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Lepropinacia** Vent. (1799) = *Buellia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Leproplaca** (Nyl.) Nyl. ex Hue (1888) = *Caloplaca* fide Jørgensen & Tønsberg (*Nordic Jl Bot.* 8: 293, 1988), Kärnefelt (*Cryptog. Bot.* 1: 147, 1989), Hafellner & Vězda (*Nova Hedwigia* 55: 183, 1992).
- leprose** (of lichens), having the surface or the whole thallus entirely dissolved into soredia (e.g. *Lepraria*) (Fig. 21A).
- Leprosis** Neck. ex Kremp. (1869) nom. dub., *Fungi* (L).
- Leptascospora** Speg. (1918), *Meliolaceae*. 1, Java.
- Leptasteromella** Petr. (1968) ? = *Leptodothiorella* Höhn. fide Sutton (*Mycol. Pap.* 141, 1977).
- Lepteutypa** Petr. (1923), *Amphisphaeriaceae*. Anamorph *Seiridium*. 10, widespread. See Shoemaker & Müller (*CJB* 43: 1459, 1965), von Arx (*Gen. Fungi Sporul. Cult.* Edn 3, 1981), Nag Raj & Kendrick (*Sydowia* 38: 178, 1986; key), Kang *et al.* (*Fungal Diversity* 1: 147, 1998; DNA), Kang *et al.* (*MR* 103: 53, 1999), Dulymamode *et al.* (*MR* 105: 247, 2001; key), Jeewon *et al.* (*MR* 107: 1392, 2003; phylogeny).
- Lepteutypella** Petr. (1925) = *Lepteutypa* fide Müller & von Arx in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 87, 1973).
- Leptina** Bat. & Peres (1960) ? = *Discosia* fide Sutton (*Mycol. Pap.* 141, 1977).
- Leptinia** Juel (1897) = *Puccinia* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- Leptobelonium** Höhn. (1924) = *Strossmayeria* fide Iturriaga (*Mycotaxon* 20: 169, 1984), Iturriaga & Korf (*Mycotaxon* 36: 383, 1990).
- Leptocapnodium** (G. Arnaud) Cif. & Bat. (1963) = *Scorias* fide Reynolds (*Bull. Torrey bot. Club* 98: 157, 1971).
- Leptochaete** Lév. (1846) = *Hymenochaete*.
- Leptochaete** Zmitr. & Spirin (2006), *Agaricomycetes*. 5, widespread.
- Leptochidium** M. Choisy (1952), *Massalongiaceae* (L). 2, Europe; N. America. See Choisy (*Bull. mens. Soc. linn. Lyon* 21: 165, 1952), Burgaz & Martínez (*Nova Hedwigia* 73: 381, 2001; Iberian peninsula), Jørgensen (*Graphis Scripta* 18: 19, 2006), Wedin *et al.* (*Lichenologist* 39: 61, 2007; n. fam.).
- Leptochlamys** Died. (1921), anamorphic *Pezizomycotina*, St.0fH.10. 1 (on *Musci*), Europe.
- Leptocladia** Marvanová & Descals (1985) [non *Leptocladia* J. Agardh 1892, *Rhodophyta*] = *Stenocradiella*.
- Leptocorticium** Hjortstam & Ryvarden (2002), *Corticaceae*. 5, widespread. See Hjortstam & Ryvarden (*Syn. Fung.* 15: 23, 2002), Nakasone (*Mycol. Progr.* 4: 251, 2005).
- Leptocoryneum** Petr. (1925) = *Seimatosporium* fide Sutton (*Mycol. Pap.* 141, 1977).
- Leptocrea** Syd. & P. Syd. (1916) ? = *Stigmatula* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Leptocucurthis** Aptroot (1998), *Dacampiaceae* (L). 1, Papua New Guinea. See Aptroot & van Iperen (*Nova Hedwigia* 67: 481, 1998).
- leptocystidium**, see *cystidium*.
- Leptodendrisium** Vain. (1890) = *Polychidium* fide Henssen (*Symb. bot. upsal.* 18 no. 1, 1963).
- leptodermatous** (of hyphae), having the outer wall thinner than the lumen; cf. *mesodermatous*.
- Leptodermella** Höhn. (1915), anamorphic *Pezizomycotina*, Cac.0eH.1. 1, Europe.
- Leptodermopsis** Speg. ex Höhn. (1923) nom. dub., anamorphic *Pezizomycotina*. See Falk (*Mykol. Unters.* 1: 331, 1923), Sutton (*Mycol. Pap.* 141, 1977).
- Leptodiscella** Papendorf (1969), anamorphic *Pezizo-*

- mycotina*, Hsp/Cac.1eH.10. 1, S. Africa; Japan. See Papendorf (*TBMS* 53: 146, 1969), Udagawa & Toyazaki (*Mycotaxon* 22: 407, 1985).
- Leptodiscus** Gerd. (1953) [non *Leptodiscus* Hertwig 1877, *Algae*] $\equiv$ *Mycoleptodiscus*.
- Leptodon** Quél. (1886) [non *Leptodon* D. Mohr 1803, nom. cons., *Musci*] $\equiv$ *Mycoleptodon*.
- Leptodontidium** de Hoog (1979), anamorphic *Helotiales*, Hso.0eH.10. 10, widespread. See de Hoog (*Taxon* 28: 347, 1979), Tsuneda *et al.* (*Mycotaxon* 60: 485, 1996), Tsuneda *et al.* (*CJB* 75: 1649, 1997; antagonism to *Lentinula*), Grünig *et al.* (*CJB* 80: 1239, 2002; phylogeny).
- Leptodontium** de Hoog (1977) [non *Leptodontium* (Müll. Hal.) Hampe ex Lindb. 1864, *Musci*] $\equiv$ *Leptodontidium*.
- Leptodothiora** Höhn. (1918) = *Dothiora* Fr. (1849) fide Froidevaux (*Nova Hedwigia* 23: 679, 1973).
- Leptodothiorella** Aa (1973) = *Leptodothiorella* Höhn. fide Sutton (*Mycol. Pap.* 141, 1977).
- Leptodothiorella** Höhn. (1918), anamorphic *Guignardia*, Cpd.0eH.15. 6, widespread (tropical).
- Leptodothis** Theiss. & Syd. (1914) nom. dub., *Fungi*. See Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- lepto-form**, see *Pucciniales*.
- Leptogiaceae** Körb. (1855) = *Collemataceae*.
- Leptogidiomyces** Cif. & Tomas. (1953) $\equiv$ *Leptogidium*.
- Leptogidium** Nyl. (1873) = *Polychidium* fide Henssen (*Symb. bot. upsal.* 18 no. 1, 1963).
- Leptogiomyces** E.A. Thomas ex Cif. & Tomas. (1953) = *Leptogium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Leptogiopsis** Müll. Arg. (1882) = *Leptogium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Leptogiopsis** Nyl. (1884) = *Mastodia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Leptogiopsis** Trevis. (1880) = *Leptogium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Leptogium** (Ach.) Gray (1821), *Collemataceae* (L). c. 189, widespread. See Sierk (*Bryologist* 67: 245, 1964; N. Am.), Jørgensen (*Svensk bot. Tidskr.* 67: 53, 1973; *Mallotium*), Jørgensen in Poelt & Vězda (*Best. europ. Flecht.*, 1977; Eur.), Awasthi (*Geophytology* 8: 189, 1979; India), Poelt & James (*Lichenologist* 15: 109, 1983; W. Eur.), Jørgensen (*Lichenologist* 26: 1, 1994; key small spp. Eur.), Jørgensen (*Symb. bot. upsal.* 32 no. 1: 113, 1997; key hairy spp.), Galloway (*Nova Hedwigia* 69: 317, 1999; NZ), Jørgensen & Tønsberg (*Bryologist* 102: 412, 1999; Pacific NW), Guttová (*Lichenologist* 32: 291, 2000; Europe), Martin *et al.* (*Bryologist* 105: 358, 2002; Pacific NW), Wiklund & Wedin (*Cladistics* 19: 419, 2003; phylogeny), Aragón & Otálora (*Nova Hedwigia* 78: 353, 2004; Iberian peninsula), Miadlikowska & Lutzoni (*Am. J. Bot.* 91: 449, 2004; phylogeny), Aragón *et al.* (*Nova Hedwigia* 80: 199, 2005; Iberian peninsula), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Stenroos *et al.* (*Cladistics* 22: 230, 2006; phylogeny, photobiont association), Lindström (*Bibliotheca Lichenol.* 95: 405, 2007; neotropics), Jørgensen & Kashiwadani (*Lichenologist* 40: 123, 2008; key, Papua New Guinea).
- Leptoglossum** (Cooke) Sacc. (1884) = *Microglossum* Gillet fide Maas Geesteranus (*Persoonia* 3: 89, 1964).
- Leptoglossum** P. Karst. (1879) = *Arrhenia* fide Redhead (*CJB* 62: 865, 1984).
- leptogonidium**, a photobiont consisting of small-sized cells (obsol.); cf. gonidium.
- Leptographa** (Th. Fr.) M. Choisy (1950) = *Ptychographa* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Leptographa** Jatta (1892) = *Toninia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Leptographium** Lagerb. & Melin (1927), anamorphic *Ophiostoma*, Hso.0eH.21. c. 68, widespread (temperate). See Shaw & Hubert (*Mycol.* 44: 693, 1952), Wingfield (*TBMS* 85: 81, 1985; gen. relationships), Harrington & Cobb (*Leptographium Root Diseases on Conifers*, 1988), Ayer *et al.* (*J. Nat. Prod.* 52: 119, 1989; metabolites from *L. wagneri* var. *pseudotsugae*), Zambino & Harrington (*Mycol.* 81: 122, 1989; isozyme variation), Zambino & Harrington (*Mycol.* 84: 12, 1992; isozyme characterization), Wingfield in Wingfield *et al.* (Eds) (*Ceratocystis and Ophiostoma Taxonomy, Ecology and Pathogenicity*: 43, 1993; anamorphs), Strydom *et al.* (*Syst. Appl. Microbiol.* 20: 295, 1997; ribosomal DNA), Jacobs *et al.* (*CJB* 76: 1660, 1998), Jacobs *et al.* (*CJB* 76: 1660, 1998; on conifers), Jacobs *et al.* (*S. Afr. J. Bot.* 65: 388, 1999; Congo), Jacobs *et al.* (*MR* 104: 1524, 2000; Russia), Jacobs *et al.* (*Mycoscience* 41: 595, 2000; Indonesia, N America), Masuya *et al.* (*Mycoscience* 41: 425, 2000; Japan), Zhou *et al.* (*Mycoscience* 41: 573, 2000; China), Jacobs & Wingfield (*Leptographium Species: Tree Pathogens, Insect Associates, and Agents of Blue-stain*, 2001), Jacobs *et al.* (*Mycol.* 93: 380, 2001; Europe), Jacobs *et al.* (*CJB* 79: 719, 2001; phylogeny), Jacobs *et al.* (*MR* 105: 490, 2001; on pine), Six *et al.* (*Mycol.* 95: 781, 2003; associations with bark beetles), Jacobs *et al.* (*MR* 108: 411, 2004; introduction to N America), Kim *et al.* (*MR* 108: 699, 2004; on *Pinus*), Masuya *et al.* (*Mycol.* 96: 548, 2004; on *Prunus*, Japan), Jacobs *et al.* (*MR* 109: 1149, 2005; phylogeny), Kim *et al.* (*MR* 109: 275, 2005; Korea), Alamouti *et al.* (*Mycol.* 98: 149, 2006; Canada), Jacobs *et al.* (*CJB* 84: 759, 2006; N America).
- Leptoguignardia** E. Müll. (1955), *Botryosphaeriaceae*. Anamorph *Dothichiza*-like. 1, France. See Barr (*Prodr. Cl. Loculoasc.*, 1987).
- Leptogydiomyces**, see *Leptogidiomyces*.
- Leptojum** Beltr. (1858) = *Leptogium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Leptokalpion** Brumm. (1977), *Thelebolaceae*. 2, Asia. See Wang (*Bull. natn. Sci. Mus. Tokyo*, B 7: 131, 1996), van Brummelen (*Persoonia* 16: 425, 1998; posn), Hoog *et al.* (*Stud. Mycol.* 51: 33, 2005).
- Leptomassaria** Petr. (1914), *Xylariaceae*. 2, Europe. See Læssøe (*SA* 13: 43, 1994; ? synonym of *Anthostomella*), Rappaz (*Mycol. Helv.* 7: 99, 1995).
- Leptomelanconium** Petr. (1923), anamorphic *Pezizomycotina*, Cac.0-1eP.15. 5, widespread. See Sutton (*The Coelomycetes*, 1980), Hunt (*CJB* 63: 1157, 1985), Vujanovic & St-Arnaud (*Mycol.* 93: 212, 2001; on *Abies*).
- Leptomeliola** Höhn. (1919), *Parodiopsidaceae*. Anamorph *Ophiotrichum*. 9, widespread (tropical). See Hughes (*Mycol. Pap.* 166, 1993), Thaung (*Australas. Mycol.* 25: 5, 2006; Burma).
- Leptomyces** Mont. (1856) nom. dub. ? = *Mycena* fide Kuyper (*in litt.*).
- Leptomycorhaphis** Cif. & Tomas. (1953) nom. rej.

- prop. = *Leptorhaphis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Leptonema** J. Sm. Dalry (1896), Fossil Fungi (mycel.) Fungi. 1 (Carboniferous), British Isles. See Smith (*Trans. Geol. Soc. Glasgow* 10: 321, 1896).
- Leptonia** (Fr.) P. Kumm. (1871) = *Entoloma* fide Kuyper (*in litt.*).
- Leptoniella** Earle (1909) = *Entoloma*.
- Leptopeltella** Höhn. (1917) = *Leptopeltis* fide Holm & Holm (*Bot. Notiser* 130: 215, 1977), Shoemaker *et al.* (*Sydowia* 41: 308, 1989).
- Leptopeltidaceae** Höhn. ex Trotter (1928), Microthyriales. 6 gen. (+ 8 syn.), 14 spp.
Lit.: von Arx (*Acta Bot. Neerl.* 13: 182, 1964), Holm & Holm (*Bot. Notiser* 130: 215, 1977), Eriksson (*Op. Bot.* 60, 1981), Spooner & Kirk (*MR* 94: 223, 1990), Cannon (*SA* 15: 121, 1997).
- Leptopeltina** Petr. (1947) = *Leptopeltinella*.
- Leptopeltina** Speg. (1924) = *Stomiopeltis* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Leptopeltinella** Petr. (1951) = *Leptopeltis*.
- Leptopeltis** Höhn. (1917), Leptopeltidaceae. Anamorph *Leptothyrium*-like. 7 or 9, widespread (north temperate). See Holm & Holm (*Bot. Notiser* 130: 215, 1977; key), Eriksson (*Op. Bot.* no. 60: 1, 1981; posn), Cannon (*SA* 15: 121, 1997).
- Leptopeltopsis** Petr. (1947) = *Leptopeltis* fide Holm & Holm (*Bot. Notiser* 130: 215, 1977).
- Leptoperidia** Rappaz (1987), Diatrypaceae. 4, widespread. See Rappaz (*Mycol. Helv.* 2: 285, 1987), Rappaz (*Mycol. Helv.* 3: 281, 1989), Chacón Zapata (*Brenesia* 62: 41, 2004; key, Mexico).
- Leptopeza** G.H. Oth (1871) = *Plicaria* fide Eckblad (*Nytt Mag. Bot.* 15: 1, 1968).
- Leptopeziza** Rostr. (1888) ? = *Pyrenopeziza* fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).
- Leptophacidium** Höhn. (1918) = *Guignardia* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Leptophoma** Höhn. (1915) = *Phoma* Sacc. fide Sutton (*Mycol. Pap.* 141, 1977).
- Leptophrys** Hertwig & Lesser (1885), Cercozoa. q.v.
- Leptophyllosticta** I.E. Brezhnev (1939), anamorphic *Pezizomycotina*, Cpd.0eH.?. 1, former USSR.
- Leptophyma** Sacc. (1889) = *Helostroma* fide Moore (*Mycotaxon* 14: 13, 1982).
- Leptopodia** Boud. (1885) = *Helvella* fide Seaver (*North American Cup Fungi* (Operculates), 1928).
- Leptopora** Raf. (1808) = *Perenniporia* fide Merrill (*Index Rafinesq.*, 1949).
- Leptoporellus** Spirin (2001), Polyporaceae. 5, widespread. See Spirin (*Mycena* 1: 69, 2001).
- Leptoporus** Qué. (1886), Polyporaceae. 1, widespread (north temperate). See Ryvarden & Gilbertson (*Eur. Polyp.* 1: 281, 1993), Yu *et al.* (*Mycosystema* 23: 596, 2004; China).
- Leptopterygium** Zahlbr. (1930) = *Zahlbrucknerella* fide Henssen (*Symb. bot. upsal.* 18 no. 1, 1963).
- Leptopuccinia** (G. Winter) Rostr. (1902) = *Puccinia* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- lepto-Puccinia**, a *Puccinia* of lepto-form; see *Pucciniales*.
- Leptorhaphiomyces** Cif. & Tomas. (1953) = *Leptorhaphis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Leptorhaphis** Körb. (1855) nom. cons., ? *Naetrocymbaceae* ($\pm$ L). 15, widespread (northern hemisphere). See Aguirre-Hudson (*Bull. Br. Mus. nat. hist. Bot.* 21: 85, 1991; key), Aguirre-Hudson & Fiol (*Lichenologist* 25: 207, 1993; Balearic Is).
- Leptosacca** Syd. (1928), *Pezizomycotina*. 1, Chile.
- Leptosillia** Höhn. (1928), *Diaporthales*. Anamorph *Harpostroma*. 1, Europe. See Hawksworth (*SA* 6: 136, 1987).
- Leptosphaerella** (Sacc.) Hara (1913) = *Phaeosphaeria* fide Shoemaker & Babcock (*CJB* 67: 1500, 1989), Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Leptosphaerella** Speg. (1909), *Pezizomycotina*. 7, S. America.
- Leptosphaeria** Ces. & De Not. (1863) nom. cons., Leptosphaeriaceae. Anamorphs *Coniothyrium*, *Phoma*. c. 134, widespread. *L. bondari* (areolate spot of citrus in S. Am.), *L. coniothyrium* (rose stem canker, raspberry cane blight), *L. maculans* (anamorph *Phoma lingam*; dry rot of turnips, canker of crucifers). At one time a much more widely circumscribed genus, see segregates esp. *Phaeosphaeria*, many pathogens of grasses. See Müller (*Sydowia* 4: 185, 1950), Müller (*Sydowia* 5: 49, 1951; Swiss spp.), Wehmeyer (*Mycol.* 44: 621, 1952), Holm (*Symb. bot. upsal.* 14 no. 3: 1, 1957), Holm (*Taxon* 24: 475, 1975; nomencl.), Shoemaker (*CJB* 62: 2688, 1984; key 64 spp.), Crane & Shearer (*Illinois nat. Hist. Bull.* 34, 1991; disposition 1689 names), Huhndorf (*Illinois nat. Hist. Bull.* 34: 479, 1992; spp. on *Rosaceae*), Ahn & Shearer (*CJB* 73: 573, 1995), Khashnobish *et al.* (*Mycotaxon* 54: 91, 1995), Morales *et al.* (*MR* 99: 593, 1995), Khashnobish & Shearer (*MR* 100: 1341, 1996), Khashnobish & Shearer (*MR* 100: 1355, 1996; phylogeny), Ahn & Shearer (*CJB* 76: 258, 1998), Dong *et al.* (*MR* 102: 151, 1998; DNA), Voigt *et al.* (*J. Phytopath.* 146: 567, 1998; RAPDs of *L. maculans*), Ahn & Shearer (*Mycol.* 91: 684, 1999; *L. vagabunda* group), Pongam *et al.* (*Pl. Dis.* 83: 149, 1999; genetic variation in *L. maculans*), Purwantara *et al.* (*MR* 104: 772, 2000; genetic diversity in *L. maculans*), Howlett *et al.* (*Fungal Genetics Biol.* 33: 1, 2001; *L. maculans*, review), Voigt *et al.* (*Microbiol. Res.* 156: 169, 2001; *L. maculans*, Poland), Câmara *et al.* (*Mycol.* 94: 630, 2002; phylogeny), Kuusk *et al.* (*J. Phytopath.* 150: 349, 2002; *L. maculans*, Sweden), Moreno-Rico *et al.* (*Can. J. Pl. Path.* 24: 69, 2002; *L. maculans*, Mexico), Mendes-Pereira *et al.* (*MR* 107: 1287, 2003; phylogeny, *L. maculans* complex), Barrins *et al.* (*Australas. Pl. Path.* 33: 529, 2004; *L. maculans*, Australia), Abo *et al.* (*Phytopathology* 95: 1391, 2005; genetic diversity), Voigt *et al.* (*Mol. Phylogen. Evol.* 37: 541, 2005; phylogeny, *L. maculans*), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny), Vincenot *et al.* (*Phytopathology* 98: 321, 2008; Australia).
- Leptosphaeriaceae** M.E. Barr (1987), Pleosporales. 8 gen. (+ 19 syn.), 302 spp.
Lit.: Holm (*Symb. bot. upsal.* 14 no. 3: 1, 1957), Petersen (*TBMS* 50: 641, 1967), Shoemaker (*CJB* 62: 2688, 1984), Barr (*Prodr. Cl. Loculoasc.*: 168 pp., 1987), Shearer *et al.* (*Fourth International Mycological Congress Abstracts*: 156, 1990), Crane & Shearer (*Bull. Ill. St. nat. Hist. Surv.* 34: 1, 1991), Crane & Shearer (*Illinois nat. Hist. Bull.* 34, 1991; disposition 1689 names), Huhndorf (*Bull. Ill. nat. Hist. Surv.* 34: 475, 1992), Yuan & Barr (*Mycotaxon* 52: 495, 1994), Khashnobish *et al.* (*Mycotaxon* 54: 91, 1995), Morales *et al.* (*MR* 99: 593, 1995), Khashnobish &

- Shearer (*MR* 100: 1355, 1996; phylogeny), Mahuku *et al.* (*CJB* 75: 1485, 1997), Ahn & Shearer (*CJB* 76: 258, 1998), Dong *et al.* (*MR* 102: 151, 1998; DNA), Ahn & Shearer (*Mycol.* 91: 684, 1999), Olivier *et al.* (*Mycol.* 92: 736, 2000), Purwantara *et al.* (*MR* 104: 772, 2000), Câmara *et al.* (*Mycol.* 94: 630, 2002), Boerema *et al.* (*Phoma Identification Manual* Differentiation of Specific and Infra-Specific Taxa in Culture: 470 pp., 2004), Kodsueb *et al.* (*Mycol.* 98: 571, 2006).
- Leptosphaeriopsis** Berl. (1892) = *Ophiobolus* fide Walker (*Mycotaxon* 11: 1, 1980).
- Leptosphaerites** Richon (1885), Fossil Fungi. 2 (Tertiary), France; former USSR.
- Leptosphaerulina** McAlpine (1902), Pleosporales. Anamorph *Pithoascus*. 27, widespread (temperate). See Graham & Luttrell (*Phytopathology* 51: 680, 1961; key), Crivelli (*Über die heterogene Ascomycetengattung Pleospora Rbh.*, 1983; key), Irwin & Davis (*Aust. J. Bot.* 33: 233, 1985; Australia), Roux (*TBMS* 86: 319, 1986; anamorph), Wu & Hanlin (*Mycol.* 84: 241, 1992; ontogeny), Silva-Hanlin & Hanlin (*MR* 103: 153, 1999; DNA), Kodsueb *et al.* (*Mycol.* 98: 571, 2006; phylogeny).
- Leptospora** Rabenh. (1857), Dothideomycetes. 1, Europe; N. America. See Walker (*Mycotaxon* 11: 1, 1980).
- Leptospora** Raf. (1808) nom. dub., Fungi. See Donk (*Persoonia* 1: 173, 1960).
- leptospor** (of *Pucciniales*), a teliospore (q.v.) adapted for immediate germination without a dormant period.
- Leptosporella** Penz. & Sacc. (1897), Sordariomycetes. 2, Java; S. America. See Huhndorf *et al.* (*Mycol.* 96: 368, 2004; phylogeny).
- Leptosporina** Chardón (1939), Pezizomycotina. 1, S. America.
- Leptosporium** (Sacc.) Höhn. (1923) = *Fusicolla* fide Clements & Shear (*Gen. Fung.*, 1931).
- Leptosporium** Bonord. (1857) = *Vibrisea* fide Sánchez & Korf (*Mycol.* 58: 733, 1966).
- Leptosporomyces** Jülich (1972), Atheliaceae. 11, widespread (north temperate). See Greslebin & Rajchenberg (*N.Z. J. Bot.* 41: 437, 2003; Patagonia).
- Leptosporopsis** Höhn. (1920) = *Leptosphaeria* fide Walker (*Mycotaxon* 11: 1, 1980).
- Leptostroma** Fr. (1815), anamorphic *Lophodermium*, St.0eH.10. c 200, widespread. See Minter (*CJB* 58: 906, 1980; spp. on *Pinus*), Sieber-Canavesi *et al.* (*Mycol.* 83: 89, 1991; ecology endophytic spp.), Guo *et al.* (*MR* 107: 680, 2003; endophytes), Ortiz-García *et al.* (*Mycol.* 95: 846, 2003; phylogeny).
- Leptostromataceae** Sacc. (1884) = *Rhytismataceae*.
- Leptostromella** (Sacc.) Sacc. (1884), anamorphic *Pezizomycotina*, St.0e-fH.?. 20, widespread (temperate).
- Leptostromites** Poinar (2003), Fossil Fungi. 1, Dominican Republic. See Poinar (*MR* 107: 121, 2003).
- Leptoteichion** Kleb. (1933) = *Phacidiopycnis* fide Rupprecht (*Sydowia* 13: 10, 1959).
- Leptothyrella** Sacc. (1885), anamorphic *Pezizomycotina*, Cpt.1eH.?. 10, widespread.
- Leptothyrina** Höhn. (1915), anamorphic *Pezizomycotina*, St.0eH.10. 1, Switzerland.
- Leptothyriomyces** Kräusel (1929), Fossil Fungi, Asterinaceae. 2 (Miocene), Sumatra.
- Leptothyrites** Poinar (2003), Fossil Fungi. 1, Dominica. See Poinar (*MR* 107: 121, 2003).
- Leptothyrium** Kunze (1823), anamorphic *Pezizomycotina*, Cpt.0eH.15. 2, widespread. See Sutton (*Mycol. Pap.* 141, 1977).
- leptotichous** (of tissue), thin-walled.
- Leptotrema** Mont. & Bosch (1855), Thelotremataceae (L). 1, pantropical. See Hale (*Bull. Br. Mus. nat. hist. Bot.* 8: 227, 1981), Matsumoto & Deguchi (*Bryologist* 102: 86, 1999; anamorph), Matsumoto (*J. Hattori bot. Lab.* 88: 1, 2000; Japan), Kalb (*Mycotaxon* 79: 319, 2001; Australia), Frisch (*Biblthca Lichenol.* 92: 3, 2006; monograph).
- Leptotrichum** Corda (1842) nom. dub., anamorphic *Pezizomycotina*. See Holubová-Jechová (*Sydowia* 45: 95, 1993).
- Leptotritum** Pouzar (1966) = *Incrustoporia* fide Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974).
- Leptotrochila** P. Karst. (1871), ? Dermateaceae. Anamorph *Sporonema*. 16, widespread. See Schüepp (*Phytopath. Z.* 36: 236, 1959; key), Romaszewska-Salata & Salata (*Scripta Mycologica Tartu* 17: 102, 1989; Poland), Nauta & Spooner (*Mycologist* 14: 65, 2000; key British spp.).
- Leptotus** P. Karst. (1879) = *Arrhenia* fide Redhead (*CJB* 62: 865, 1984).
- Leptoxyphium** Speg. (1918), anamorphic *Aithaloderma*, Hsy.0-1eH-P.15. 2, widespread (tropical). See Hughes (*Mycol.* 68: 693, 1976), Roquebert & Bury (*CJB* 66: 2265, 1988; ultrastr. conidiomata), Olejnik & Ingrouille (*MR* 103: 333, 1999; numerical taxonomy), Reynolds & Faull (*Taxon* 50: 1183, 2001; nomencl.).
- Leptuberia** Raf. (1808), Fungi (L). 1, N. America.
- Le-Ratia** Pat. (1907) [non *Le-Ratia* Broth. & Paris 1909, *Musci*] = *Leratiomyces* fide Heim (*Revue Mycol. Paris* 33: 137, 1968).
- Leratiomyces** Bresinsky & Binder ex Bridge, Spooner, Beever & Park (2008), Strophariaceae. 4, New Caledonia. Basidioma gasteroid. See Bresinsky & Binder (*Z. Mykol.* 64: 79, 1998; phylogeny).
- Lesdainea** Harm. (1910) nom. dub., ? Verrucariaceae. 1, France. See Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Ertz & Diederich (*Mycol. Progr.* 3: 229, 2004).
- lesion**, a wound; a well-marked but limited diseased-area.
- Lespiaultinia** Zobel (1854) = *Tuber* fide Trappe (*Mycotaxon* 9: 247, 1979), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Letendraea** Sacc. (1880), Pleosporales. 2, Europe; Africa. See Samuels (*CJB* 51: 1275, 1973), Rossman (*Mycol. Pap.* 157, 1987; key), Lumbsch & Lindemuth (*MR* 105: 901, 2001; phylogeny), Kodsueb *et al.* (*Fungal Diversity* 21: 105, 2006; phylogeny, morphology).
- Letendraeopsis** K.F. Rodrigues & Samuels (1994), ? Tubeufiaceae. 1, Brazil. See Rodrigues & Samuels (*Mycol.* 86: 254, 1994), Crane *et al.* (*CJB* 76: 602, 1998), Kodsueb *et al.* (*Fungal Diversity* 21: 105, 2006).
- Lethagrium** A. Massal. (1853) = *Lathagrium*.
- Letharia** (Th. Fr.) Zahlbr. (1892) nom. cons., Parmeliaceae (L). 2, widespread. See Schade (*Ber. bayer. bot. Ges.* 30: 108, 1954), Schade (*Feddes Repert.* 58: 179, 1955), Kroken & Taylor (*Mycol.* 93: 38, 2001; phylogeny), Högborg *et al.* (*Mol. Ecol.* 11: 1191, 2002; genetic variation), Arnerup *et al.* (*MR* 108: 311, 2004; population structure), Thell *et al.* (*Symb. bot. upsal.* 34 no. 1: 429, 2004; biogeography).

- Lethariella** (Motyka) Krog (1976), Parmeliaceae (L). 10, widespread. See Obermayer (*Biblthca Lichenol.* 68: 45, 1997), Obermayer (*Biblthca Lichenol.* 78: 321, 2001), Niu *et al.* (*Lichenologist* 39: 549, 2007; chemistry, China).
- Lethariicola** Grummann (1969) = *Odontotrema* fide Lumbsch & Hawksworth (*Biblthca Lichenol.* 38: 325, 1990; key), Diederich *et al.* (*Lichenologist* 34: 479, 2002).
- Lethariopsis** Zahlbr. (1926) = *Caloplaca* fide Eriksson & Hawksworth (*SA* 10: 141, 1991).
- Letrouitia** Hafellner & Bellem. (1982), Letrouitiaceae (L). 15, widespread. See Hafellner (*Nova Hedwigia* 35: 645, 1983; key), Awasthi & Srivastava (*Proc. Indian Acad. Sci. Pl. Sci.* 99: 165, 1989; India), Johanson *et al.* (*Mycol. Progr.* 4: 139, 2005; chemistry), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Letrouitiaceae** Hafellner & Bellem. (1982), Teloschistales (L). 1 gen., 15 spp.
Lit.: Hafellner & Bellemère (*Nova Hedwigia* 35: 263, 1982), Awasthi & Srivastava (*Proc. Indian Acad. Sci. Pl. Sci.* 99: 165, 1989), Kärnefelt (*Cryptog. bot.* 1: 147, 1989), Kärnefelt (*Lichenologist* 22: 307, 1990), Kasalicky *et al.* (*CJB* 78: 1580, 2000), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Lettauia** D. Hawksw. & R. Sant. (1990), ? Fuscideaceae. 1 (on lichens, esp. *Cladonia*), Europe. See Ihlen & Tønsberg (*Bryologist* 99: 32, 1996), Etayo (*Biblthca Lichenol.* 84, 2002; Colombia).
- Leucangium** Quél. (1883), ? Helvellaceae. 1 (hypogeous), widespread (temperate). Clusters close to *Fischerula* and is perhaps related to *Morchellaceae*. See Li (*Int. J. Pl. Sci.* 158: 189, 1997; ultrastr.), O'Donnell *et al.* (*Mycol.* 89: 48, 1997; phylogeny), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Leucinocybe**, see *Leucoinocybe*.
- Leucoagaricus** Locq. ex Singer (1948), Agaricaceae. Anamorph *Attamyces*. c. 90, widespread. The genus as presently circumscribed is paraphyletic. See Heinemann (*Fl. Illustr. Champ. Afr. Centr.* 2: 30, 1973; key 18 Afr. spp.), Johnson (*Mycol.* 91: 443, 1999), Vellinga (*Mycotaxon* 76: 429, 2000; type studies), Hausknecht & Pidlich-Aigner (*Öst. Z. Pilzk.* 13: 1, 2004; Austria), Consiglio & Contu (*Bollettino del Circolo Micologico 'Giovanni Carini'* 48: 16, 2004), Consiglio *et al.* (*Micologia e Vegetazione Mediterranea* 19: 131, 2004; Italy).
- Leucobolbitius** (J.E. Lange) Locq. (1952) nom. inval. = *Leucocoprinus* fide Kuyper (*in litt.*).
- Leucobolites** Beck (1923) = *Gyroporus* fide Kuyper (*in litt.*).
- Leucocarpia** Vězda (1969), Verrucariaceae (L). 1, Europe; Papua New Guinea. See Vězda (*Herzogia* 1: 188, 1969).
- Leucocarpopsis** G. Salisb. (1975) = *Verrucaria* Schrad. fide Purvis *et al.* (*Lichen Flora of Great Britain and Ireland*, 1992).
- Leucocintractia** M. Piepenbr., Begerow & Oberw. (1999), Anthracoideaceae. 4 (on *Cyperaceae*), widespread. See Pérez *et al.* (*IMI Descr. Fungi Bact.* 153, 2002), Piepenbring (*Caldasia* 24: 103, 2002; Colombia), Pérez & Minter (*IMI Descr. Fungi Bact.* 164, 2005).
- Leucoconiella** Bat., H. Maia & Peres (1960), Pezizomycotina. 1, Paraguay. See Batista *et al.* (*Broteria Sér. Ci. Nat.* 29: 130, 1960).
- Leucoconis** Theiss. & Syd. (1918), Pezizomycotina. 1, India.
- Leucoconius** Beck (1923) = *Gyroporus*.
- Leucocoprinnaceae** Jülich (1982) = Agaricaceae.
- Leucocoprinus** Pat. (1888), Agaricaceae. c. 40, widespread (esp. tropical; in greenhouses in temperate regions). See Johnson (*Mycol.* 91: 443, 1999; phylogeny), Hausknecht & Pidlich-Aigner (*Öst. Z. Pilzk.* 13: 1, 2004; Austria), Kumar & Manimohan (*Mycotaxon* 90: 393, 2004; India).
- Leucocortinarius** (J.E. Lange) Singer (1945), Tricholomataceae. 1, Europe.
- Leucocrea** Sacc. & P. Syd. ex Lindau (1900) = *Balzanina* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Leucocytospora** (Höhn.) Höhn. (1927) = *Cytospora* fide Petrak (*Annls mycol.* 19: 17, 1921), Adams *et al.* (*Mycol.* 94: 947, 2002; phylogeny, teleomorph), Adams *et al.* (*Stud. Mycol.* 52: 146 pp., 2005; phylogeny, morphology).
- Leucodecton** A. Massal. (1860), Thelotremataceae (L). 1, pantropical. See Thor (*Op. Bot.* 103, 1990), Frisch (*Biblthca Lichenol.* 92: 3, 2006; revision), Frisch *et al.* (*Biblthca Lichenol.* 92: 517, 2006; phylogeny).
- Leucodiaportha** M.E. Barr & Lar.N. Vassiljeva (2008), Diaporthaceae. 1, N. America; E. Asia. See Vasilyeva *et al.* (*Mycol.* 99: 916, 2007).
- Leucodochium** Syd. & P. Syd. (1917), anamorphic *Pezizomycotina*, Cpd.0eH.?. 1, Philippines.
- Leucofomes** Kotl. & Pouzar (1957) = *Rigidoporus* fide Pegler (*The polypores [Bull. BMS Suppl.]*, 1973).
- Leucogaster** R. Hesse (1882), Albatrellaceae. 20, widespread (north temperate). See Fogel (*CJB* 57: 1718, 1979), Francis & Bougher (*Australasian Mycologist* 21: 81, 2002).
- Leucogastraceae** Moreau ex Fogel (1979) = Albatrellaceae.
- Leucogastrales** = Boletales. See also under gasteromycetes.
- Leucogloea** R. Kirschner (2004), anamorphic *Atractiellales*. 1. See Kirschner (*Frontiers in Basidiomycote Mycology*: 177, 2004).
- Leucoglossum** S. Imai (1942), ? Geoglossaceae. 1, Japan. See Rifai (*Lloydia* 28: 113, 1965).
- Leucogomphidius** Kotl. & Pouzar (1972) = *Gomphidius*.
- Leucogramma** A. Massal. (1860) = *Hemithecium* fide Staiger (*Biblthca Lichenol.* 85, 2002).
- Leucogramma** G. Mey. (1825) nom. rej. prop. = *Graphina* fide Staiger (*Biblthca Lichenol.* 85, 2002).
- Leucographa** Nyl. (1857) nom. nud., Dothideomycetes (L).
- Leucogymnospora** Fink (1930), ? Ostropales (L). 1, Puerto Rico.
- Leucogyrophana** Pouzar (1958), Hygrophoropsidaceae. 13, widespread. See Ginns & Weresub (*Mem. N. Y. bot. Gdn* 28: 86, 1976; sclerotial spp.), Ginns (*CJB* 56: 1953, 1978; key), Jarosch & Besl (*Pl. Biol.* 3: 443, 2001).
- Leucogyroporus** Snell (1942) = *Tylopilus* fide Singer (*Farlowia* 2: 223, 1945).
- Leucoinocybe** Singer (1943), ? Tricholomataceae. 1, Europe.
- Leucolenzites** Falck (1909) = *Lenzites*.
- Leucoloma** Fuckel (1870) [non *Leucoloma* Brid. 1827] nom. cons., *Musci*] = *Octospora*.

- Leucomyces** Earle (1909) = *Amanita* Pers. fide Singer (*Agaric. mod. Tax.*, 1951).
- Leuconectria** Rossman, Samuels & Lowen (1993), Nectriaceae. Anamorph *Gliocephalotrichum*. 1 (from leaves and in soil), widespread. See Rehner & Samuels (*CJB* 73 Suppl. 1: S816, 1995; phylogeny), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Schoch *et al.* (*Stud. Mycol.* 45: 45, 2000), Rossman *et al.* (*Mycol.* 93: 100, 2001; phylogeny), Decock *et al.* (*Mycol.* 98: 488, 2006; French Guiana).
- Leuconeurospora** Malloch & Cain (1970), ? Pseudeurotiaceae. 2, Europe; Asia. See Udagawa in Subramanian (Ed.) (*Taxonomy of fungi* 1: 225, 1978), von Arx *et al.* (*Beih. Nova Hedwigia* 94, 1988; posn), Suh & Blackwell (*Mycol.* 91: 836, 1999; phylogeny), Sogonov *et al.* (*Mycol.* 97: 695, 2005; phylogeny).
- Leucopaxillaceae** Jülich (1982) nom. rej. = Tricholomataceae.
- Leucopaxillus** Boursier (1925), Tricholomataceae. c. 15, widespread (temperate; subtropical). See Singer & Smith (*Pap. Mich. Acad. Sci.* 28: 85, 1943; key 12 spp.), Singer & Smith (*Mycol.* 39: 725, 1947), Guzmán & Escalona (*Docums Mycol.* 33 no. 132: 37, 2004; *Leucopaxillus gracillimus* variation and distribution).
- Leucopenicillifer** G.R.W. Arnold (1971), anamorphic *Pezizomycotina*, Hso.0eH.15. 1 (on myxomycete), Russia. See Carmichael *et al.* (*Genera of Hyphomycetes*, 1980; ? = *Paecilomyces*).
- Leucopezis** Clem. (1909) ? = *Humaria* Fuckel fide Eckblad (*Nytt Mag. Bot.* 15: 1, 1968).
- Leucophellinus** Bondartsev & Singer (1944), Schizoporaceae. 1, Europe. See Parmasto (*Eesti NSV Tead. Akad. Toim. Biol. seer* 32: 269, 1983).
- Leucophlebs**, see *Leucophleps*.
- Leucophleps** Harkn. (1899), Albatrellaceae. 4, widespread (north temperate). See Fogel (*CJB* 57: 1718, 1979), Montecchi & Sarasini (*Funghi Ipogei d'Europa*: 714 pp., 2000).
- Leucopholiota** (Romagn.) O.K. Mill., T.J. Volk & Bessette (1996), Tricholomataceae. 1, USA. See Miller *et al.* (*Mycol.* 88: 138, 1996), Vellinga (*MR* 108: 354, 2004; posn.).
- Leucophomopsis** Höhn. (1917) = *Phomopsis* (Sacc.) Bubák. fide Clements & Shear (*Gen. Fung.*, 1931).
- Leucoporus** Qué. (1886) = *Polyporellus*.
- Leucopus** P. Kumm. (1871) = *Cortinarius* fide Donk (*Bull. Jard. Bot. Buitenzorg Sér.* 3 18: 271, 1949).
- Leucorhizon** Velen. (1925) = *Gastrosporium* fide Pilát (*Fl. ČSR B* 1: 227, 1958).
- Leucoscypha** Boud. (1885), Pyronemataceae. 10, widespread (temperate). See Svrček (*Česká Mykol.* 28: 129, 1974), Harmaja (*Karstenia* 17: 73, 1977), Yao & Spooner (*MR* 99: 1513, 1995; Brit. spp.), Benkert (*Z. Mykol.* 66: 181, 2000; typification), Wang & Zhong (*Fungal Science Taipei* 16: 17, 2001; China), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Leucosphaera** Arx, Mukerji & N. Singh (1978) [non *Leucosphaera* Gilg 1897, *Spermatophyta*] = *Leucosphaerina*.
- Leucosphaerina** Arx (1987), ? Bionectriaceae. Anamorphs *Acremonium*-like, *Sporothrix*. 1 (coprophilous), India; USA. See Malloch (*Stud. Mycol.* 31: 107, 1989), Suh & Blackwell (*Mycol.* 91: 836, 1999; phylogeny), Rossman *et al.* (*Mycol.* 93: 100, 2001; phylogeny).
- Leucosporidiaceae** Jülich (1982), Leucosporidiales. 3 gen., 8 spp.
- Lit.*: Joo (*Korean J. Mycol.* 19: 258, 1991), Suh & Sugiyama (*J. gen. appl. Microbiol.* Tokyo 39: 257, 1993), Statzell-Tallman & Fell in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 670, 1998), DePriest *et al.* (*CJB* 78: 1450, 2000), Sampaio *et al.* (*Mycol. Progr.* 2: 63, 2003).
- Leucosporidiales** J.P. Samp., M. Weiss & R. Bauer (2003). Microbotryomycetes. 1 fam., 3 gen., 8 spp. With colacosomes, teliospores, and white cultures. Fam.:
- Leucosporidiaceae**
- For *Lit.* see under fam.
- Leucosporidiella** Samp. (2003), anamorphic *Leucosporidiaceae*. 4, widespread. See Sampaio *et al.* (*Mycol. Progr.* 2: 63, 2003), Aime *et al.* (*Mycol.* 98: 896, 2006; phylogeny).
- Leucosporidium** Fell, Statzell, I.L. Hunter & Phaff (1970), Leucosporidiaceae. 3 (from sea water), Antarctica. See Yamada & Komagata (*J. gen. appl. Microbiol.* Tokyo 33: 456, 1987), Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 1351, 2000; mol. phylogeny), Sampaio *et al.* (*Mycol. Progr.* 2: 53, 2003), Sampaio (*Frontiers in Basidiomycote Mycology*: 49, 2004).
- Leucosporium** Corda (1833) nom. dub., anamorphic *Pezizomycotina*. See Holubová-Jechová (*Sydowia* 45: 97, 1993).
- leucosporous**, having spores white in the mass.
- Leucostoma** (Nitschke) Höhn. (1917), Valsaceae. Anamorph *Cytospora*. c. 13, widespread (temperate). The genus should probably be placed into synonymy with *Valsa*. See also IMI Descriptions of Fungi and Bacteria nos 1363-1635, 1999. See Kern (*Phytopath. Z.* 40: 303, 1961), Surve-Iyer *et al.* (*Mycol.* 87: 471, 1995; isozymes), Wang *et al.* (*Phytopathology* 88: 376, 1998; DNA), Adams *et al.* (*Mycol.* 94: 947, 2002; phylogeny, paraphyly), Adams *et al.* (*Stud. Mycol.* 52: 146 pp., 2005; phylogeny, paraphyly), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Leucotelium** Tranzschel (1935), Uropyxidaceae. 3 (on *Ranunculaceae* (I); on *Prunus* (II, III) (on *Rosaceae*)), Eurasia (temperate). See Savile (*CJB* 67: 2983, 1989), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003; syn. of *Sorataea*), Helfer (*Nova Hedwigia* 81: 325, 2005; Europ. spp.).
- Leucothallia** Trevis. (1853) = *Sphaerotheca* Lév. fide Braun (*SA* 7: 57, 1988).
- Leucothecium** Arx & Samson (1973), Gymnoascaceae. 2, Netherlands. See Valldosera *et al.* (*MR* 95: 243, 1991).
- Leucothyridium** Speg. (1909) = *Cucurbitaria* fide Petrak & Sydow (*Annl. mycol.* 32: 1, 1934).
- Leucovibrisea** (A. Sánchez) Korf (1990), Vibriseaceae. 1, USA. See Korf (*Mycosystema* 3: 19, 1990).
- Leuliisinea** Matsush. (1985), anamorphic *Pezizomycotina*, Hsy.1eH/1eP.19. 1, Taiwan. See Matsushima (*Matsush. Mycol. Mem.* 4: 11, 1985).
- Léveillé** (Joseph-Henri; 1796-1870; France). A Parisian medic; Dr med. (1824). Introduced the terms basidium and cystidium; produced an early account of the mycota of large parts of eastern and southeast Europe; early work on powdery mildews. Most collections and papers destroyed during the Franco-Prussian war (1870-1871), but some types in K, L and [mostly] PC. *Publs. Recherches sur l'hyménium des champignons. Annales des Sciences Naturelles Botanique, Série 2* (1837); *Observations médicales et énumérations des plantes recueillis en Tauride*. In

- A. Demidoff [ed.], *Voyage dans la Russie Meridionale et la Crimée, par la Hongrie, la Valachie et la Moldavie* (1842); Organisation et disposition méthodique des espèces qui composent le genre *Erysiphe*. *Annales des Sciences Naturelles Botanique*, Série 3 (1851); *Iconographie des Champignons de Paulet* (1855). Biogs, obits etc. Grummann (1974: 286); Stafleu & Cowan (*TL-2* 2: 965, 1979).
- Leveillea** Fr. (1849) [non *Leveillea* Decne. 1839, *Algae*] ? = *Phylacia* fide Læssøe (*SA* 13: 43, 1994).
- Leveillella** Theiss. & Syd. (1915), *Asterinaceae*. 1, Chile. See Eriksson (*SA* 7: 78, 1988).
- Leveillina** Theiss. & Syd. (1915), *Dothideomycetes*. 2, Africa; S. America.
- Leveillinopsis** F. Stevens (1924) = *Coccostromopsis* fide Hyde & Cannon (*Mycol. Pap.* 175, 1999).
- Leveillula** G. Arnaud (1921), *Erysiphaceae*. Anamorph *Oidiopsis*. 23, widespread. See Durrieu & Rostam (*Cryptog. Mycol.* 5: 279, 1985), Braun (*Beih. Nova Hedwigia* 89, 1987; key), Gelyuta & Simonian (*Biol. Zh. Armenii* 39: 20, 1987; subgen. divis.), Palti (*Bot. Rev.* 54: 423, 1988; monogr.), Cook *et al.* (*MR* 101: 975, 1997), Takamatsu *et al.* (*Mycoscience* 39: 441, 1998; phylogeny), Saenz & Taylor (*CJB* 77: 150, 1999; phylogeny), Khodaparast *et al.* (*MR* 105: 909, 2001; phylogeny), Takamatsu (*Mycoscience* 45: 147, 2004; phylogeny), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Khodaparast *et al.* (*MR* 111: 673, 2007; on monocots), Takamatsu *et al.* (*MR* 112: 299, 2008; phylogeny).
- Leveillulaceae** V.P. Gelyuta (1988) = *Erysiphaceae*.
- Levieuxia** Fr. (1848) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- levigate**, see *laevigate*.
- Levispora** Routien (1957) = *Pseudeurotium* fide Malloch (*in litt.*).
- Lewia** M.E. Barr & E.G. Simmons (1986), *Pleosporaceae*. Anamorph *Alternaria*. 17, widespread. See Simmons (*Mycotaxon* 25: 287, 1986), Bottalico & Logrieco (*Mycotoxins in Agriculture and Food Safety*: 65, 1998; toxigenic spp.), Dong *et al.* (*MR* 102: 151, 1998; DNA), Hoog & Horré (*Mycoses* 45: 259, 2002; from humans), Simmons (*Mycotaxon* 83: 127, 2002; morphology, anamorphs), Berbee *et al.* (*MR* 107: 169, 2003; mating types), Kwasna & Kosiak (*MR* 107: 371, 2003; on *Avena*, key), Kwasna *et al.* (*Mycol.* 98: 662, 2006; on *Hordeum*), Simmons (*CBS Diversity Ser.* 6, 2007; revision, nomenclator).
- Liaoningnema** S.L. Zheng & W. Zhang (1986), Fossil Fungi. 1, China.
- Libartania** Nag Raj (1979), anamorphic *Helotiales*, St.≡ eH.10. 3, widespread. See Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993), Lee & Crous (*Sydowia* 55: 115, 2003).
- Libellus** Lloyd (1913) [non *Libellus* Cleve 1873, *Algae*] = *Hymenogloea* fide Singer (*Agaric. mod. Tax.*, 1951).
- Libertella** Desm. (1830), anamorphic *Xylariales*, St.0fH.10. 20, widespread (temperate). Primarily used for anamorphs of *Diatrypaceae*. See Ju & Rogers (*Mycotaxon* 73: 343, 1999), Mostert *et al.* (*Mycol.* 93: 146, 2001; on *Vitis*), Acero *et al.* (*Mycol.* 96: 249, 2004; phylogeny).
- Libertiella** Speg. & Roum. (1880), anamorphic *Pezizomycotina*, St.0eH.15. 5 (on *Peltigera*), Europe. See Hawksworth (*Bull. Br. Mus. nat. hist. Bot.* 9: 30, 1981).
- Libertina** Höhn. (1920) = *Phomopsis* (Sacc.) Bubák. fide Sutton (*TBMS* 50: 355, 1967).
- liberty cap**, basidioma of the hallucinogenic *Psilocybe semilanceata*.
- Licentia** Pilát (1940) = *Lopharia* fide Donk (*Taxon* 5: 69, 1956).
- Lichen** L. (1753) nom. rej. ≡ *Parmelia*.
- lichen** (pl. lichens; pronounced 'lie'ken') [Lat. *lichen*, from Gk λειχην, tree moss] (cen (Welsh), Flechten (Germ.), gil-i-sang (Persian), huidmos and korsmos (Afrikaans), jäkälä (Finnish), kerpés (Lith.), korstmos (Dutch), lav (Danish, Norweg., Swed.), lichène (Ital.), ligen (Afrikaans), liquen and liquen (Portug., Span., S. Am.), lišaj (Croat.), lišejník (Bohem., Czech. Slovak), liszaj and porost (Pol.), mareru (Kikuyu), лишaj (Serb.), лишай (Russian), лишей (Bulg.), ragu (Old English), フイケン *tii* (Jap.), 582.29 (Universal Decimal Classification)), one of the Lichens (q.v.); (in Medicine), any of various eruptive skin diseases. - **acids**, see Metabolic products; - **alga**, phycobiont (q.v.); photobiont (q.v.); - **biont interaction** see Ahmadjian (*in* Reisser, *Algae and symbiosis*: 675, 1992); - **desert**, the area in a town or around an air pollution source from which all lichens, or at least all foliose and fruticose lichens are absent (obsol.); see Air pollution; - **icolous**, inhabiting lichens; - **iform**, having the form of a lichen; - **iverous**, lichen-eating; - **oglyph**, a centuries-old picture made by Canadian Indians by scraping lichens off the surface of a large vertical rock face; - **oid**, resembling a lichen; - **ologist**, one engaged in the pursuit of lichenology; - **ology**, the scientific study of lichens; - **products**, - **substances**, see Metabolic products.
- Lichenagaricus** P. Micheli (1729) nom. inval. = *Xylaria* Hill ex Schrank fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- lichenen** (**lichenin**), an I+ red linear polymer of β-d-glucose with 1,3 and 1,4 linkages in the ratio 3:2; **iso-lichenan** (isolichenin), an isomer of lichenan, is I+ lilac or lavender. These carbohydrates occur in the walls of the hyphae of many lichen-forming fungi; lichenan tends to occur in higher concentrations and its presence/absence is taxonomically significant (Common, *Mycotaxon* 41: 67, 1991). See amylomycan, Iodine.
- Lichenes** (obsol.). Name of a class for all lichen-forming fungi used when these were regarded as quite separate from *Fungi*; *Mycophycophyta*. - **imperfecti** (obsol.), lichen-forming anamorphic fungi; *Deuterolichenes* (q.v.), often used inclusive of lichen-forming fungi in which the sporocarps are unknown and the position is uncertain.
- Lichenicolous fungi**. Fungi dwelling on or in lichens as parasites (pathogens), commensals (see also parasymbiont) or saprobes; partly gall-inducing. In the ninth edn of this *Dictionary*, it was estimated that about 300 gen. and 1000 spp. of obligately lichenicolous fungi were known; many of the genera being exclusively lichenicolous. Common saprobic moulds are very scarce on lichens with depsides or depsidones, but a wide range of non-obligate species can be recovered by isolation (Petrini *et al.*, *Mycol.* 82: 441, 1990; Prillinger *et al.*, *Syst. Appl. Microbiol.* 20: 572, 1997).
- Ascomycota*, *Agaricomycetes* and anamorphic fungi all include obligately lichenicolous spp. Some lichenicolous fungi can take over the algae from other lichens and form new thalli (Hawksworth, *Bot. J. Linn. Soc.* 96: 3, 1988).

Many groups are undergoing a critical re-appraisal in what is proving to be one of the most unexplored of all ecological niches occupied by fungi. Some may affect the host chemistry or produce separate novel metabolites (Feige *et al.*, *Cryptog. Bot.* 3: 101, 1993; Hawksworth *et al.*, *Bibl. Lich.* 53: 101, 1993). Cell wall degrading enzymes are found to be active in culture depending on lichen metabolites of a possible host lichen (Torzelli & Lawrey, *Mycol.* 87: 841, 1995). Host-parasite interfaces of some lichenicolous fungi in the *Dacampiaceae* have been investigated (Rios & Grube, *MR* 104: 1348, 2000), as has genetic variation in *Marchandiomyces corallinus* (Molina *et al.*, *Mycol.* 97: 454, 2005).

Lit.: General: Clauzade *et al.* (*Bull. Soc. linn. Provence, num.-spéc.* 1, 1989; keys 682 spp.; amendments in *Bull. Ass. Fr. lichén.* 16(2): 71, 1991), Diederich (*Bibl. Lich.* 61, 1996; basidiomycetes), Diederich & Christiansen (*Lichenologist* 26: 47, 1994; basidiomycetes), Grummann (*Bot. Jb.* 80: 101, 1960; galls), Hafellner (*Herzogia* 6: 289, 299, 7: 145, 163, 343, 353, 1982-87, *Nova Hedw.* 48: 357, 1989), Hawksworth (*Bull. Br. Mus. nat. Hist., Bot.* 6: 183, 1979; hyphomycetes, *Bull. Br. Mus. nat. Hist., Bot.* 9: 1, 1981; coelomycetes, *TBMS* 74: 363, 1980; on *Peltigera*, *J. Hattori bot. Lab.* 52: 357, 1982; review biol., *J. Hattori bot. Lab.* 52: 323, 1982; coevolution), Keissler (*Beih. bot. Zbl.* 50: 380, 1933), Matzer (*Mycol. Pap.* 171, 1996; on foliicolous lichens), Lawrey & Diederich (*Bryologist* 106: 80, 2003; biodiversity, evolution and interactions), Rambold & Triebel (*Bibl. Lich.* 48, 1992; inter-lecanoralean associations), Triebel (*Bibl. Lich.* 35, 1989; on lecideoid spp.), Vouaux (*BSMF* 28: 177, 29: 33, 399, 30: 135, 281, 1912-14; keys, descr., monogr.), Zopf (*Hedwigia* 35: 312, 1896; host index).

Regional: **Europe**, Keissler (*Rabenh. Krypt.-Fl.* 8, 1930). **Austria**, Hafellner (*Herzogia* 10: 1, 1994; *Mitt. Naturwiss. Vereins Steiermark* 125: 73, 1996; *Carinthia II* 187/107: 457, 1998). **Belgium**, Diederich *et al.* (*Dumortiera* 42: 17, 1988). **British Isles**, Hawksworth (*Kew Bull.* 30: 183, 1975, *Notes R. bot. Gdn Edinb.* 36: 181, 1978, 38: 165, 1980, 40: 375, 1982, 43: 497, 1986, 46: 391, 1990, *Lichenologist* 15: 1, 1983; key 218 spp., 26: 337, 1994). **Denmark**, Alstrup (*Graphis Scripta* 5: 60, 1993). **France**, Olivier (*Bull. internat. géogr. Bot.* 15-17, 1905-07), Roux [*et al.*] (*Bull. Mus. Hist. nat. Marseille* 36: 19, 1976; 37: 83, 1977, *Bull. Soc. linn. Provence* 36: 195, 1984, 41: 117, 1990, 43: 81, 1992), see also Spain, Portugal (Etayo & Diederich; Navarro-Rosinés & Roux). **Greenland**, Alstrup & Hawksworth (*Meddr Grønl., Biosci.* 31, 1990; keys 124 spp.), Hansen & Alstrup (*Graphis Scripta* 7: 33, 1995). **Luxembourg**, Diederich (*Lejennia* 119: 1, 1986, *Mycotaxon* 37: 297, 1990). **Norway**, Santesson (*The lichens and lichenicolous fungi of Norway and Sweden*, 1993; checklist), Ihlen (*Graphis Scripta* 7: 17, 1995; *Lichenologist* 30: 27, 1998). **Papua New Guinea**, Aptroot *et al.* (*Bibl. Lich.* 64: 1997). **Poland**, Faltynowicz (*Polish Bot. Stud.* 6, 1993; checklist). **Portugal**, see Spain. **Russia**, Zhurbenko & Santesson (*Herzogia* 12: 147, 1997). **Sardinia**, Nimis & Poelt (*Studia Geobot.* 7 (Suppl.), 1987). **Spain (Canary Islands)**, Santesson (*Svensk bot. Tidskr.* 54: 499, 1960), Hafellner & Sancho (*Herzogia* 8: 363, 1990), Calatayud *et al.* (*Mycotaxon* 55: 363, 1995), Calatayud & Barreno (*Flechten*

Follmann: 397, 1995), Hafellner (*Flechten Follmann*: 427, 1995), Cologne (*Herzogia* 11: 133, 1995; *Linzer Biol. Beitr.* 27: 489, 1995; *Fritschiana* 5: 1, 1995; *Bull. Soc. Nat. Luxemb.* 97: 93, 1996; *Mycotaxon* 60: 415, 1996; *Lichenologist* 30: 103, 1998)), Etayo & Diederich (*Flechten Follmann*: 205, 1995), Navarro-Rosinés & Roux (*Mycotaxon* 53: 161, 1995), Etayo & Calatayud (*Ann. Naturhist. Mus. Wien B* 100: 677, 1998), Matinez & Hafellner (*Mycotaxon* 69: 271, 1998). **Sweden**, Santesson (*The lichens and lichenicolous fungi of Norway and Sweden*, 1993; checklist), Ihlen (*Graphis Scripta* 7: 17, 1995; *Lichenologist* 30: 27, 1998). **former Czechoslovakia**, Vězda (*Česká Myk.* 17: 149, 1960; 23: 104, 1969; 24: 220, 1970). **Middle East**, Wasser & Nero (*Lichen-forming, lichenicolous, and allied fungi of Israel*, 2005). **North America**, Esslinger & Egan (*Bryologist* 98: 467, 1995), Triebel *et al.* (*Mycotaxon* 42: 263, 1991; 58 spp.), Zhurbenko *et al.* (*Evansia* 12: 92, 1995), Alstrup & Cole (*Bryologist* 101: 221, 1998). **South America**, Etayo (*Bibliotheca lichenologica* 84: 1, 2002; Colombia). Also often included in fungus and/or lichen catalogues or mycotas. See also Internet. See also Geographical distribution, Lichenicolous lichens, Lichens.

Lichenicolous lichens. Lichens which grow on (or in) other lichens, either as commensals or parasites; 4-biont symbioses (see symbiosis). Each fungal partner in such associations has an independent algal or cyanobacterial partner, whereas no additional photosynthetic partner occurs in the obligately lichenicolous fungi (q.v.). The algae of the lichenicolous lichens occur either inside the host in e.g. *Buellia pulverulenta* on *Physconia distorta* (Hafellner & Poelt, *Phyton* 20: 129, 1980) or as discrete thalli on its surface as in *Caloplaca epithallina* on 13 host lichens (Poelt, *Bot. Jahrb.* 167: 457, 1985). Parasitic spp. are known esp. in *Acarospora*, *Diploschistes*, *Rhizocarpon* (Poelt, *Mitt. bot. StSamml., Münch.* 29: 515, 1990), and *Verrucaria*. See also Poelt & Döbbeler (*Planta* 46: 467, 1956), Rambold & Triebel (*Bibl. Lich.* 48, 1992; inter-lecanoralean assoc.).

Lichenobactridium Diederich & Etayo (1995), anamorphic *Pezizomycotina*, Hso.???. 1, France. See Etayo & Diederich (*Flechten Follmann Contributions to Lichenology in Honour of Gerhard Follmann*: 212, 1995).

Lichenochora Hafellner (1989) nom. cons. prop., ? Phyllachorales. 25 (lichenicolous), widespread (esp. temperate). See Hafellner (*Nova Hedwigia* 48: 357, 1992), Hoffmann & Hafellner (*Bibliotheca Lichenol.* 77: 1, 2000), Hoffmann *et al.* (*Taxon* 55: 802, 2006; nomencl.).

Lichenocodium Petr. & Syd. (1927), anamorphic *Pezizomycotina*, Cpd.0eP.19. 20 (on lichens), widespread. See Hawksworth (*Persoonia* 9: 159, 1977), Hawksworth (*Bull. Br. Mus. nat. hist. Bot.* 9: 33, 1981), Christiansen (*Graphis Scripta* 5: 18, 1993; on *Lecanora*), Cole & Hawksworth (*Lichenologist* 36: 1, 2004; Pacific NW, key).

Lichenodiplis Dyko & D. Hawksw. (1979), anamorphic *Pezizomycotina*, Cpd.1eP.19. 9 (on lichens), Europe; Asia. See Hawksworth (*Bull. Br. Mus. nat. hist. Bot.* 9: 37, 1981), Berger & Diederich (*Herzogia* 12: 35, 1996).

Lichenodiplisiella S. Kondratyuk & I. Kudratov (2002), anamorphic *Pezizomycotina*, C?..?.. 1, Tadzhikistan. See Kondratyuk *et al.* (*Polish Botanical*

- Journal* 47: 1, 2002).
- Lichenohendersonia** Calat. & Etayo (2001), anamorphic *Pezizomycotina*. 3, Spain. See Calatayud & Etayo (*CJB* 79: 225, 2001).
- Lichenoides** Hoffm. (1789) = *Anaptychia*.
- Lichenometry**. Technique for study of exposure age of rock surfaces based on the size/diameter (proportional to age) of lichen thalli. Pioneered by Beschel in the 1950s (see Raasch (Ed.), *Geology of the arctic* 2: 1044, 1961) and now used extensively by glaciologists but also applicable to the minimum dating of many stone and other surfaces, and so of value in archaeology. The technique is potentially more precise than radio-carbon dating for exposures less than 500 years old. See Innes (Lichenometry [*Prog. phys. Geogr.* 9: 187], 1985; in Galun, *CRC Handbook of lichenology* 3: 75, 1988), Luckman (*Can. J. Earth Sci.* 14: 1804, 1977; Alberta), Matthews (*Norsk geogr. Tidsskr.* 29: 97, 1975; Jotunheimen), Solomina *et al.* (*Arctic, Antarctic and Alpine Res.* 35: 129, 2003), Webber & Andrews (*Arctic Alpine Res.* 5: 293, 1973; review, bibliogr.).
- A critical review of the technique is provided by Worsley (in Goudie *et al.*, *Geomorphological techniques*: 302, 1981) and a size-frequency approach addressing some criticisms of the technique has been developed by Winchester & Harrison (*Earth surface processes & landforms* 19: 137, 1994). See Ecology, Growth rates.
- Lichenomphalia** Redhead, Lutzoni, Moncalvo & Vilgalys (2002), *Hygrophoraceae*. 8, widespread. See Redhead & Kuyper (*Mycotaxon* 31: 221, 1978), Redhead & Kuyper (*Arctic Alpine Mycology* 2: 319, 1987), Lutzoni & Vilgalys (*CJB* 73: S649, 1995; phylogeny), Lutzoni (*Syst. Biol.* 46: 373, 1997; phylogeny), Moncalvo *et al.* (*Syst. Biol.* 49: 278, 2000; phylogeny), Redhead *et al.* (*Mycotaxon* 83: 38, 2002), Delannoy & Eyssartier (*BSMF* 120: 403, 2004; *Lichenomphalia* in Svalbard).
- Lichenomyces** Trevis. (1853) = *Plectocarpon* fide Hawksworth & Galloway (*Lichenologist* 16: 85, 1984).
- Lichenopeltella** Höhn. (1919), *Microthyriaceae*. c. 20 (some on lichens), widespread. See Santesson (*SA* 9: 15, 1990; nomencl.), Spooner & Kirk (*MR* 94: 223, 1990; as *Micropeltopsis*), Hariharan *et al.* (*Lichenologist* 28: 294, 1996; India spp.), Earland-Bennett & Hawksworth (*Lichenologist* 31: 575, 1999; on *Verrucaria*), Cole & Hawksworth (*Mycotaxon* 83: 391, 2002; on *Heterodermia*).
- Lichenopeziza** Zuck. (1884), *Pezizomycotina* (?L). 1, Europe.
- Lichenophoma** Keissl. (1911) nom. dub., anamorphic *Pezizomycotina*, Cpd.0eH.?. 1 (on lichens), Europe. See Hawksworth (*Bull. Br. Mus. nat. hist. Bot.* 9: 77, 1981).
- Lichenopsis** Schwein. (1832) = *Stictis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Lichenopuccinia** D. Hawksw. & Hafellner (1984), anamorphic *Pezizomycotina*, Hsp. = eH.1. 1 (on lichens, esp. *Parmelia*), Austria; British Isles. See Hawksworth & Hafellner (*Nova Hedwigia Beih.* 79: 373, 1984).
- Lichenopyrenis** Calat., Sanz & Aptroot (2001), *Pleomassariaceae*. 1 (lichenicolous), Spain. See Calatayud *et al.* (*MR* 105: 634, 2001).
- Lichenosphaeria** Bornet (1873) ? = *Didymella* fide Henssen (*Symb. bot. upsal.* 18 no. 1, 1963).
- Lichenostella** Calat. & Etayo (1999), anamorphic *Pezizomycotina*. 1 (lichenicolous), Colombia. See Calatayud & Etayo (*Lichenologist* 31: 597, 1999).
- Lichenosticta** Zopf (1898), anamorphic *Pezizomycotina*, Cpd.0eH.15. 1 (on lichens, esp. *Cladonia*), widespread (north temperate). See Hawksworth (*Bull. Br. Mus. nat. hist. Bot.* 9: 38, 1981).
- Lichenostigma** Hafellner (1983), *Lichenotheliaceae*. 2 (on lichens), widespread. See Thor (*Lichenologist* 17: 269, 1985), Hafellner & Calatayud (*Mycotaxon* 72: 107, 1999), Calatayud *et al.* (*MR* 106: 1230, 2002; key), Ihlen (*Lichenologist* 36: 183, 2004; Scandinavia), Vondrák & Šoun (*Lichenologist* 39: 211, 2007; review).
- Lichenothelia** D. Hawksw. (1981), *Lichenotheliaceae*. 20, widespread. See Henssen (*Bibliotheca Lichenol.* 25: 257, 1987).
- Lichenotheliaceae** Henssen (1986), ? *Dothideomycetes* (inc. sed.). 2 gen. (+ 1 syn.), 22 spp.
- Lit.*: Henssen (*Bibliotheca Lichenol.* 25: 257, 1987), Navarro-Rosinés & Hafellner (*Mycotaxon* 57: 211, 1996), Hafellner & Calatayud (*Mycotaxon* 72: 107, 1999).
- Lichenothrix** Henssen (1964) = *Pyrenothrix* fide Eriksson (*Op. Bot.* 60, 1981).
- Lichens**. A lichen is a stable self-supporting association of a fungus (mycobiont) and an alga or cyanobacterium (photobiont). More precisely, a lichen is an ecologically obligate, stable mutualism between an exhabitant fungal partner and an inhabitant population of extracellularly located unicellular or filamentous algal or cyanobacterial cells (Hawksworth & Honegger, in Williams (Eds) (*Plant galls*: 77, 1994). Many other definitions have been proposed (Hawksworth, *Bot. J. Linn. Soc.* 96: 3, 1988; review), and Ahmadjian (*The lichen symbiosis*, edn 2, 1993) stresses the formation of a 'thallus or lichenized stroma that may contain unique secondary compounds' as the key feature. The partners may have coevolved (Ahmadjian, *Ann. N.Y. Acad. Sci.* 503: 307, 1987; Hawksworth, in Pirozynski & Hawksworth (Eds), *Coevolution of fungi with plants and animals*: 125, 1988).
- Lichens are a biological and not a systematic group, and are unique in that in many (but not all) cases the resulting life form and behaviour differ markedly from that of the isolated components. In most lichens the fungal partners, which do not occur free-living (except in some facultatively lichenized fungi), appear to be responsible for the overall form of the thallus and its fruiting bodies (ascomata), but there is an interplay between both components to produce the final form (see below), and a wide range of biological interactions is involved. These may involve four, five or even more partners (Hawksworth, 1988; review).
- Fungal partners**: Around 20% of all *Fungi* and 40% of all *Ascomycota* are lichen-forming. Most recent estimates of global diversity suggest that between 17500 and 20000 species are known, with a further 1500 lichenicolous fungi (Feuerer & Hawksworth, *Biodiv. Conserv.* 16: 85, 2007; Galloway, *Biodiv. Conserv.* 1: 312, 1992, Lawrey & Diederich, *Bryol.* 106: 80, 2003; Nash & Egan, *Bibl. Lich.* 30: 11, 1988; Sipman & Aptroot, *MR* 105: 1433, 2001). Lichens are polyphyletic in origin, as established beyond doubt by molecular methods (Gargas *et al.*, *Science* 269: 1492, 1995); Hibbett *et al.*, *MR* 111: 509,

2007). The fungi of most species belong to the *Ascomycota* (q.v.), but only four orders are exclusively lichen-forming. Lichenization also occurs in a few *Basidiomycota* (e.g. *Dictyonema*, *Multiclavula*, *Lichenomphalia*), and also anamorphic fungi (e.g. *Blarneya*, *Cystocoleus*; see Vobis & Hawksworth, in Cole & Kendrick (Eds), *The biology of conidial fungi* 1: 245, 1981; review). However, while many families are exclusively lichen-forming, a mixture of lichen-forming and non-lichen-forming (and also sometimes lichenicolous) species can occur within the same family or even genus (e.g. *Arthonia*, *Arthothelium*, *Mycomicrothelia*, *Toninia*). What is or is not regarded as a 'lichen' is partly a matter of history; for example, *Orbilina*, and *Pezizella* are not usually studied by lichenologists, while some taxa generally regarded as the preserve of lichenologists do not form lichens (e.g. *Arthopyrenia*, *Chaenothecopsis*, *Leptorhaphis*, *Stenocybe*). The existence of genera crossing biological boundaries, and of species which may be viewed as components of primitive lichens (Kohlmeyer & Kohlmeyer, *Marine mycology*, 1979) or facultatively lichen-forming, makes it clear that the lichen method of nutrition (q.v.) is at various stages of evolution in different groups; evolving to be more strongly lichen-forming in some (e.g. some *Leotiomycetes*, *Agaricales*) and less strongly lichen-forming in others (e.g. non-lichen-forming *Arthoniales* and *Lecanorales*). Axenic cultures of the fungal partner can be obtained from ascospores and thallus fragments; Crittenden *et al.* (*New Phytol.* 130: 267, 1995) had success with 493 spp. (42%) of 1183 attempted. The cultures are generally slow-growing, have little organized structure, and do not produce ascomata (although some form conidiomata).

Algal and cyanobacterial partners: The number of photosynthetic partners involved in lichen formation is relatively small; only 40 genera are represented, 25 algae and 15 cyanobacteria (see Ahmadjian, *Phycologia* 6: 128, 1967, identification; Ahmadjian, 1993; Hildreth & Ahmadjian, *Lichenologist* 13: 65, 1981, keys *Trebouxia* spp.; Honegger, *Exper. Phycol.* 1: 40, 1990; Tschermak-Woess, in Galun, *CRC Handbook of lichenology* 1: 29, 1988). Most belong to genera which are also free-living both in the cyanobacteria (e.g. *Calothrix*, *Gloeocapsa*, *Nostoc*, *Scytonema*, *Stigonema*) and the green algae (*Cephaleuros*, *Coccomyxa*, *Myremecia*, *Trentepohlia*). Only *Trebouxia* (incl. *Pseudotrebouxia*) appears to be primarily lichen-forming, with doubt cast on its free occurrence in nature (Ahmadjian, 1993; Tschermak-Woess, 1988). The same species, but often as different strains, may occur with a very wide range of lichen-forming fungal genera. In addition more than one strain of a single alga (or species of an algal genus) can be involved in the formation of a single lichen thallus. However, the systematics of the algal and cyanobacterial partners of lichens is currently inadequate to make more definite assertions as to specificity. However, in some lichen-forming fungi (e.g. *Lobaria*, *Placopsis*, *Psoroma*, *Stereocaulon*) with an algal partner, cyanobacteria also occur in 'cephalodia' (q.v.) which may, according to the species, be warts on the upper or lower surface or circumscribed areas within the thallus. In some cases cephalodia can be separated and persist as independent lichens (e.g. *Dendroscocaulon*); occasionally, two species with different types of algae previously regarded as dis-

tinct have been found joined together as a composite ('chimeroid') thallus showing these 'photomorphs' (q.v.; phycosymbiodemes, photosymbiodeme, phycotypes) are the result of interactions between a single mycobiont and distinct photobionts (Armaleo & Clerc, *Exp. Mycol.* 15: 1, 1991; James & Henssen, in Brown *et al.*, 1976: 27; Stöcker-Wörgötter & Türk, *Crypt. Bot.* 4: 300, 1994; Tønsberg & Holtan-Hartwig, *Nordic Jl Bot.* 3: 681, 1983), White & James, *Lichenologist* 20: 103, 1988).

Nomenclature: Lichens do not have independent scientific names; the fungal and photosynthetic partners each have separate names, and names given to lichens are considered as referring to the fungal partner alone (see Nomenclature). The classification of 'lichens' therefore has to be completely integrated into the system of *Fungi*. The names of lichen-forming fungi have one other special provision in the Code, exemption from the provisions for the naming of pleomorphic fungi. These fungi are covered by the *Index of Fungi* from vol. 5(4), 1982 onwards. Current nomenclatural practice is consistent with the recognition of lichens as a nutritional rather than a taxonomic group.

Synthesis: Although the bionts can be separated and cultured, resynthesis under laboratory conditions is difficult. Some success has been achieved by lowering the nutrient supply and modifying the moisture requirements, features which suggest that lichens behave as two organisms united in adversity. Synthesis was first achieved experimentally by Stahl in 1877 (repeated by Ahmadjian & Heikkilä, *Lichenologist* 4: 259, 1970), and has now also been carried out in *Dermatocarpon*, *Usnea* and *Xanthoria* (Ahmadjian, 1993). Novel syntheses have also been attempted; Ahmadjian *et al.* (*Mycol.* 72: 73, 1980) found that *Cladonia cristatella* could be re-synthesized with 13 different *Trebouxia* isolates, but none of 10 '*Pseudotrebouxia*' isolates or free-living *Pleurastrum*; squamules, pycnidia and short podetia with immature hymenia were obtained and the metabolic products (q.v.) were identical in all cases (Ahmadjian, *The lichen symbiosis*, edn 2, 1993; in Cook (Ed.), *Cellular interactions with symbiosis and parasitism*: 3, 1980; *Progress Phycol. Res.* 1: 179, 1982). Techniques for growing lichens as tissue cultures with intermixed fungi and algae have been developed for about 200 spp. since 1981 (Yamamoto *et al.*, *Bryologist* 96: 383, 1993).

Structure: The algae or cyanobacteria are either distributed at random, often in a gelatinous matrix, throughout the thallus (**homoiomorous**; unlayered; unstratified), or in a compact layer below the upper or outer cortex (**heteromorous**; layered; stratified). There are a few **filamentous** lichens (*Coenogonium*, *Cystocoleus*, *Racodium*) in which the filamentous form of the alga predominates; in the majority, the fungus forms the outer structure and gives the lichen its shape. Six life-form categories are generally recognized (Fig. 21): shrub- or beard- like (**fruticose**), leaf-like (**foliose**), scale-like (**squamulose**; **placodioid** if rosette-like in surface view with only the tips free), crust-like (**crustose**, **crustaceous**), **filamentous** (see above), and **leprose** (powdery, loose and often powdery aggregations of algal cells entwined with hyphae and with no cortex). Fruticose thalli are the most complex and largest; these may be erect or pendulous, hair- or strap-like and are often richly

branched. They have a radial structure arranged around a central cavity (e.g. *Bryoria*) or a tough axial strand (*Usnea*), and are attached to the substratum by small disc-like holdfasts or clusters of rhizoids. Some *Usnea* spp. on trees attain a length of 10 m. In foliose and crustose thalli the structure is essentially dorsoventral and growth most pronounced at the circumference; the former have a well-developed lower cortex and are attached to the substratum by puckering of the underside (*Hypogymnia*), a fine felted tomentum (*Lobaria*), or by coarse bundles of compacted hyphae or rhizines (*Parmelia*). Crustose lichens may be more or less immersed in the substratum and, like squamules, lack a lower cortex.

The surface of crustose species is often characteristically cracked or warted, and may be bounded by a pale or black marginal **prothallus** which contains no photobiont cells. The gelatinous homoiomerous lichens (*Collema*, *Placynthium*) also occur in similar life forms. Any particular life-form is not necessarily confined to a genus, family, or order (e.g. all except the filamentous life-form occur in *Teloschistales*). In a few genera, such as *Cladonia*, *Pilophorus* and *Stereocaulon*, there is a combination of different growth forms: in many species of *Cladonia*, the basal part of the thallus is squamulose, from which arise fruticose, hollow, simple, or branched structures (podetia; q.v.), often also bearing squamules, the apices of which are either pointed (subulate) or bear terminal cups (**scyphi**) on which are borne the ascocarps. In *Stereocaulon* the basal, peltate, or coralloid phyllocladia give rise to simple or branched pseudopodetia (see podetia), also more or less also covered in phyllocladia. The pseudopodetia bear lateral or terminal ascocarps.

A few genera have additional thalline structures, such as aeration pores in the form of **cyphellae** (*Sticta*) and pseudocyphellae (*Punctelia*, *Pseudocyphellaria*); marginal eye-lash-like cilia occur in *Heterodermia* and in some species of *Physcia* and *Parmotrema*. See Beltmann (*Bibl. Lich.* 11, 1978; Parmeliaceae), Hannemann (*Bibl. Lich.* 1, 1973; attachment organs), Henssen & Jahns (1973), Jahns (*in* Galun, *CRC Handbook of lichenology* 1: 95, 1988), Ozenda (*Handb. Pflanzenanatomie* 6 (9), 1963).

Reproduction: Asexual or vegetative reproduction of lichens involving both partners (dual propagules) may be achieved by a wide range of methods (Fig. 22), including: (1) simple fragmentation, (2) development of delimited or widespread areas of cortical breakdown (**soralia**) which contain minute powdery propagules (**soredia**), and (3) the development of numerous small, simple, or branched-coralloid, corticate papillae (**isidia**). These methods involve the dissemination of the united bionts. The position, shape, and sometimes the colour of the soralia and isidia is often diagnostic and is usually accompanied by a marked suppression of ascomatal development (see Phylogeny).

A number of species also develop innate, flask-shaped **pycnidial conidiomata** in which numerous, often characteristically shaped conidia develop. Although conidia of some species germinate in culture their functional role is not fully understood and may, in some species at least, be sexual. Only the mycobiont reproduces sexually, a process culminating in the development of ascomata. The nature of the ascomata depends on the order to which the fungal partner be-

longs. However, the ascomata are mainly perennial with serial development of the asci. Two main apothecial types are often distinguished: **lecanorine** with a thalline exciple (containing algae and generally the same colour as the main thallus); and **lecideine** only with a true exciple (lacking algae and usually differing in colour from the thallus). In some asexually reproducing species ascomata can be absent or very rare (and then often with few or no well-formed ascospores); see also species pairs.

Establishment: Where dual propagules are the means of dispersal, locating a compatible partner does not present difficulties. However, where several dual propagules of the same or sometimes different lichens start to grow close together they can become intermixed and form interspecific or even intergeneric **mechanical hybrids** (see hybrid); e.g. *Physcia adscendens* + *P. tenella* (Schuster *et al.*, *Lichenologist* 13: 247, 1985), *P. tenella* + *Xanthoria parietina* (Ott, *Bibl. Lich.* 25: 81, 1987). The extent to which 'individual' lichen thalli represent the product of a single propagule and belong to one genotype merits investigation.

Where ascospores are the dispersal agent, various strategies for establishment are documented: the ascospore may land on and re-shape an already growing algal or cyanobacterial colony (e.g. *Collema*), invade an established lichen killing the fungal partner and taking over the algae (e.g. *Diploschistes*), land near and out-compete the fungal partner in a dual propagule derived from another lichen, or persist in a loose unstructured association with other algae until a truly compatible algal species arrives (e.g. *Xanthoria*; Ott, *Nordic Jl Bot.* 7: 219, 1987). See Spore discharge and dispersal.

Interactions between the bionts: In the early stages of synthesis, the partners can be bound by a common sheath (Ahmadjian *et al.*, *Science* 200: 1062, 1978); similar ultrastructural-level patterns on the surfaces of both partners can enable them to mesh together (Honegger *et al.*, *Lichenologist* 16: 111, 1984). The actual nature of the cell-to-cell contact varies in different groups; these range from wall-to-wall apposition to a variety of kinds of intraparietal haustoria (see Honegger, *New Phytol.* 103: 785, 1986; see haustorium. Intracellular haustoria completely penetrating the walls of healthy algal cells are unusual, but the extent of penetration may vary even within a single thallus (Galun *et al.*, *J. Microscopie* 9: 801, 1970). Dead algal cells occurring in thalli may be used, leading to suggestions that 'controlled parasitism' may more accurately explain the relationship than 'mutualism' (see above, Ahmadjian, 1993). The fungus obtains from the alga growth substances (thiamine, biotin), and products of its photosynthesis, including simple sugars and polyalcohols. Cyanobacterial partners, whether the main photobiont or in cephalodia, fix atmospheric nitrogen which is passed to the fungus. Some green algae involved may be distinguished from non-lichenized relatives by accelerated leakage of sugars across their cell walls in the presence of a compatible fungus.

Whole-thallus physiology: See Kershaw (*Physiological ecology of lichens*, 1985), Vincente *et al.* (Eds) (*Surface physiology of lichens*, 1985), Brown (Ed.) (*Lichen physiology and cell biology*, 1985), Galun (Ed.), 1985), Nutrition, Physiology.

Chemistry: See Chemotaxonomy, chromatogra-

phy, Metabolic products, Microcrystal tests, Pigments.

Economics: See Air pollution, Antibiotics, Biodegradation, Bioindication, Dyeing, Edible fungi, Insects and fungi, lichenometry, Medical uses of fungi and lichens, RIEC. See also Llano (*Bot. Rev.* 10 (1), 1944), Richardson (*The vanishing lichens*, 1975; in Galun, *CRC Handbook of lichenology* 3: 93, 1988), Seaward (Ed.) (*Lichen ecology*, 1977).

Lit.: General: Ahmadjian (*The lichen symbiosis*, edn 2, 1993), Ahmadjian & Hale (Eds) (*The lichens*, 1974), Bates & Farmer (Eds) (*Bryophytes and lichens in a changing environment*, 1992), Brown *et al.* (Eds) (*Lichenology: progress and problems*, 1978), Dalby *et al.* (Eds) (*Horizons in lichenology* [*Bot. J. Linn. Soc.* 96], 1988), Galloway (*Tropical Lichens*, 1991), Filho *et al.* (*Biologia de liquens*, 2006; in Portuguese), Galun (Ed.) (*Handbook of lichenology*, 3 vols, 1988), Gilbert (*Lichens*, 2000), Hale (*The biology of lichens*, 1983), Hawksworth (*Crypt. Bot.* 4: 117, 1994; advances 1972-92), Hawksworth & Hill (*The lichen-forming fungi*, 1984), Henssen & Jahns (*Lichenes*, 1973), Lawrey (*Biology of lichenized fungi*, 1984), Lücking (*Foliicolous Lichens*, 1992), Nash (*Lichen Biology*, 2008), Nimis *et al.* (*Monitoring with Lichens. Monitoring Lichens*, 2002), Purvis (*Lichens*, 2000; basic review), Smith (*Lichens*, 1921 [reprint 1975]; history), StClair & Seaward (*Biodeterioration of Stone Surfaces*, 2004; lichens as weathering agents), Thor *et al.* (*Contributions to Lichen Taxonomy and Biogeography*, 2004), Zahlbruckner (*Naturl. Pflanzenfam.* 8: 61, 1926; keys gen.).

Regional: Hawksworth & Ahti (*Lichenologist* 22: 1, 1990; 1390 refs. by continent and country); the following list is restricted to major modern works, esp. of value in identification. **Africa, East**, Swinscow & Krug (*Macrolichens of East Africa*, 1988). **Antarctica**, Øvstedal & Smith (*Lichens of Antarctica and South Georgia*, 2001), Rédon (*Liquenes Antárticos*, 1985). **Austria**, Türk & Poelt (*Bibliographie de Flechten. Österreich*, 1993). **Australia**: *Flora of Australia* 54 (1992 ongoing), McCarthy (*Catalogue of Australian lichens*, 2003), Rogers (*The genera of Australian lichens (lichenized fungi)*, 1980). **Brazil**, Cáceres (*Corticolous, Crustose and Microfoliose Lichens of Northeast Brazil*, 2007). **British Isles**, Dobson (*Lichens: An Illustrated Guide to the British and Irish Species* edn 5, 2005), Purvis *et al.* (*The lichen flora of Great Britain and Ireland*, 1992; keys 1700 spp.; *Bull. Br. lichen. Soc.* 72 (Suppl.), 1993; checklist). **Canada**, Brodo (*Lichens of the Ottawa region*, edn 2, 1988), Goward *et al.* (*The lichens of British Columbia, Illustrated keys*, 1994); see also N. America. **China**, Wei (*An enumeration of lichens in China*, 1991), Zhao *et al.* (*Prodromus Lichenum Sinicorum*, 1982). **Costa Rica**: Sipman & Umana (*Costa Rica Lichens*, 2002). **Czech Republic**, Vežda & Liska (*Catalogue of Lichens of the Czech Republic*, 1999). **Estonia**, Trass & Randlane (*Eesti suur-samblikud*, 1994). **Europe**, Clauzade & Roux (*Bull. Soc. Bot. Centre-Ouest, n.s.* 7:1, 1985), Jahns (*Farne, Moose, Flechten Mittel-, Norde- und Westeuropas*, 1980), Poelt (*Bestimmungschlüssel europäischer Flechten*, 1969), Poelt & Vězda (*Bibl. Lich.* 9: 1, 1977; 16: 1, 1981). **France**, Ozenda & Clauzade (*Les Lichens. Étude biologique et flore illustrée*, 1970). **Germany**, Wirth (*Die Flechten Baden-Württembergs*, edn 2, 2 vols, 1995; keys 1500 spp., 555 col. pl.). **Greenland**:

Hansen & Anderson (*Greenland Lichens*, 1995). **Hungary**, Verseghy (*Magyarország zuzmó flórájának Kézikönyve*, 1994). **Iberian peninsula**, Llimona & Hladun (*Checklist of the Lichens and Lichenicolous Fungi of the Iberian Peninsula and Balearic Islands*, 2001). **India**, Awasthi (*J. Hattori Bot. Lab.* 65: 207, 1988; macrolichens; *Bibl. Lich.* 40, 1991; microlichens), Singh & Sinha (*Lichen flora of Nagaland*, 1994; keys, descr.). **Israel**, Wasser & Eviatar (*Lichen-forming, Lichenicolous and Allied Fungi of Israel*, 2005). **Italy**, Nimis (*The lichens of Italy: an annotated catalogue*, 1993), Nimis & Martellos (*Keys to the Lichens of Italy – Terricolous Species*, 2004). **Japan**, Yoshimura (*Lichen flora of Japan in colour*, 1974), Kurokawa (*Checklist of Japanese Lichens*, 2003). **Morocco**, Egea (*Catalogue of Lichenized and Lichenicolous Fungi of Morocco*, 1996). **Netherlands**, Aptroot & van Herk (*Veldgids Korstmossen*, 1994), Brand *et al.* (*Weten. Med. KNNV* 118, 1988; checklist). **N. America**, Brodo *et al.* (*Lichens of North America*, 2001), Egan (*Bryologist* 90: 77, 1987), Hale (*How to know the lichens*, edn 2, 1979), Nash *et al.* (*Lichen Flora of the Greater Sonoran Desert Region*, 2 vols, 2002/2004), Thomson (*American Arctic Lichens. I. The Macrolichens*, 1984; II. *The Microlichens*, 1997), Vitt *et al.* (*Mosses, lichens and ferns of northwest North America*, 1988). **New Zealand**, Galloway (*Flora of New Zealand lichens* ed 2, 2008). **Norway**, Krog *et al.* (*Lavflora. Norske busk- og bladiav*, 1980), Tønsberg (*Sommerfeltia* 14: 1, 1992; keys 128 corticolous spp.). **Papua New Guinea**, Aptroot *et al.* (*Lichens and Lichenicolous Fungi from New Guinea*, 1997), Streimann (*Catalogue of the Lichens of Papua New Guinea and Irian Jaya*, 1986). **Poland**, Nowak & Tobolewski (*Porosty Polskie*, 1975), Fałtynowicz (*Lichens, Lichenicolous and Allied Fungi of Poland*, 2003). **Russia**, Abramov (Ed.) (*Opredéltel' lichainikov SSSR*, 5 vols, 1971-78), Andreev *et al.* (*Handbook of the Lichens of Russia* vol. 8, 2003). **Scandinavia**, Santesson *et al.* (*Lichen-forming and Lichenicolous Fungi of Fennoscandia*, 2004; checklist), *Nordic Lichen Flora*; vol. 1 (ed. Ahti *et al.*, 1999; calicioid spp.), 2 (ed. Foucard *et al.*, 2002; *Physciaceae*), 3 (ed. Ahti *et al.*, 2007; cyanolichens). **Saudi Arabia**, Abu-zinada *et al.* (*Arab Gulf J. Sci. Res., s.p.* 2: 1, 1986). **S.E. Asia**, Aguirre-Hudson & Wolseley (*J. Hattori Bot. Lab.* 76: 313, 1994; bibliogr.). **Spain**: Llimona (*História natural des Països Catalans* 5, *Fongsi liquens*, 1991). **Sweden**, Foucard (*Svensk skorplavs flora*, 1990), Moberg & Holmåsen (*Lavar. Enfälthandbok*, edn 2, 1984), Santesson (*The lichens and lichenicolous fungi of Sweden and Norway*, 1993). **Ukraine**, Oxner (*Flora lichainik[i]v Ukraïni*, 1, 1956; 2(1), 1968; 2(2), 1993), Kondratyuk *et al.* (*Second Checklist of Lichen-forming, Lichenicolous and Allied Fungi of Ukraine*, 1998). **USA**, Hale & Cole (*Lichens of California*, 1988); see also N. America. **Venezuela**, López Figueiras (*Censo de macrolíquenes Venezolanos*, 1986).

See also Ascomycota, Lichenicolous fungi, Literature, and under individual subjects.

Lichina C. Agardh (1817) nom. cons., Lichinaceae (L). 7, widespread (temperate). See Henssen (*Symb. bot. upsal.* 18 no. 1, 1963), Henssen (*Lichenologist* 4: 88, 1969), Henssen (*Nova Hedwigia* 15: 543, 1969), Janson *et al.* (*New Phytol.* 124: 149, 1993; ultrastr.), Schultz *et al.* (*Pl. Biol.* 3: 116, 2001; phylogeny),

- Schultz & Büdel (*Lichenologist* 34: 39, 2002; key), Prieto *et al.* (*MR* 112: 381, 2008; phylogeny, chemistry).
- Lichinaceae** Nyl. (1854), Lichinales (L). 47 gen. (+ 65 syn.), 307 spp.
- Lit.*: Henssen & Dobelmann (*Bibliotheca Lichenol.* 25: 103, 1987), Henssen & Jørgensen (*Lichenologist* 22: 137, 1990), Moreno & Egea (*Acta Bot. Malac.* 15: 19, 1990), Moreno & Egea (*Biología y Taxonomía de la Familia Lichinaceae, con Especial Referencia a las Especies del S.E. Español y Norte de África*: 87 pp., 1991), Moreno & Egea (*Acta Bot. Barcinon.* 41: 1, 1992; Iberia, N. Afr., keys 14 spp., gen. concepts), Moreno & Egea (*Bull. Soc. linn. Provence* 45: 291, 1994), Kantvilas & Jørgensen (*Muelleria* 11: 45, 1998), Jørgensen & Henssen (*Bryologist* 102: 22, 1999), Schultz *et al.* (*Pl. Biol.* 2: 482, 2000), Lutzoni *et al.* (*Nature Lond.* 411: 937, 2001), Schultz *et al.* (*Pl. Biol.* 3: 116, 2001), Wedin *et al.* (*MR* 109: 159, 2005), Jørgensen (*Nordic Lichen Flora* 3: Cyanolichens: 46, 2007), Prieto *et al.* (*MR* 112: 381, 2008; phylogeny, chemistry).
- Lichinales** Henssen & Büdel (1986), (L). Lichinomycetes. 3 fam., 53 gen., 350 spp. Thallus crustose, fruticose or foliose, sometimes peltate, often gelatinous. Ascomata eventually apothecial but initially $\pm$ perithecial, often formed from pycnidia, opening by a pore, $\pm$ sessile or immersed; peridium often not well-defined. Interascal tissue varied; hymenium often J+. Asci thin-walled, without separable wall layers, without well-defined apical structures, usually with a J+ outer gelatinized layer; sometimes evanescent, sometimes polysporous. Ascospores usually hyaline, aseptate. Anamorphs pycnidial. Lichenized with cyanobacteria, widespr. Fams:
- (1) **Gloeohoppiaceae**
 - (2) **Lichinaceae**
 - (3) **Peltulaceae**
- Lit.*: Moreno & Egea (*Biología Taxonomía de la Familia Lichinaceae*, 1991), Henssen (*Symb. bot. ups. 18*(1), 1963, *Lichenologist* 27: 261, 1995).
- Lichinella** Nyl. (1873), Lichinaceae (L). 11, widespread. See Moreno & Egea (*Cryptog. Bryol.-Lichénol.* 13: 237, 1992; key 7 spp. Spain & N. Afr.), Schultz *et al.* (*Pl. Biol.* 3: 116, 2001; phylogeny), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key), Schultz (*Bryologist* 108: 567, 2005; N America).
- Lichingoldia** D. Hawksw. & Poelt (1986) nom. rej. = *Woessia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Lichiniza** Nyl. (1881) = *Porocyphus* fide Henssen (*Symb. bot. ups. 18* no. 1, 1963).
- Lichinodium** Nyl. (1875), Lichinaceae (L). 2, Europe. See Henssen (*Symb. bot. ups. 18* no. 1, 1963), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key).
- Lichinomyces** E.A. Thomas ex Cif. & Tomas. (1939) nom. inval. = *Lichina* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Lichinomycetes** Reeb, Lutzoni & Cl. Roux (2004), Pezizomycotina. 1 ord., 3 fam., 53 gen., 350 spp. Ord.:
- Lichinales**
- For *Lit.* see fam.
- Lichtheimia** Vuill. (1903) = *Absidia* fide Hesselstine (*Mycol.* 47: 344, 1955).
- Licipenicillium**, see *Lysipenicillium*.
- Licopolia** Sacc., Syd. & P. Syd. (1900), Dothideomycetes. 2, Brazil; Kenya.
- Licrostroma** P.A. Lemke (1964), Corticiaceae. Anamorph *Michenera*. 1, N. America; Japan. See Lemke (*CJB* 42: 762, 1964).
- Licrostromataceae** Jülich (1982) = Corticiaceae.
- Lidophia** J. Walker & B. Sutton (1974), Dothideomycetes. Anamorph *Dilophospora*. 1, Germany. See Walker (*Mycotaxon* 11: 38, 1980).
- Liebermannia** Y.Y. Sokolova, C.E. Lange & J.R. Fuxa (2006), Microsporidia. 2. See Sokolova *et al.* (*J. Invert. Path.* 91: 168, 2006).
- Liesgang phenomenon**, see zonation.
- life history (life-cycle)** (in fungi), the stage or series of stages (frequently characterized by different spore states, see States of fungi) between one spore form and the development of the same spore form again. Cf. sex.
- ligative hyphae**, Pouzar's term for binding hyphae; see hyphal analysis.
- Light and fungi**. Spore germination, growth, pathogenicity, sporocarp development, sporulation, spore discharge, and movement in fungi may all be influenced by light, and fungi with photoreceptors have been reported. See Alvarez *et al.* (Light converts endosymbiotic fungus to pathogen, influencing seedling survival and host tree recruitment. *Nature precedings*, <http://precedings.nature.com/documents/1908/version/1>), Carlisle (*Ann. Rev. Pl. Physiol.* 16: 175, 1965; photobiology of fungi), Kritsky *et al.* (*Molecular Biology* 39: 514, 2005), Marsh *et al.* (*Pl. Dis. Reprtr Suppl.* 261: 251, 1959; guide to lit.). Cf. coolplate, luminescent fungi, photo-, zonation.
- Ligiella** J.A. Sáenz (1980), Phallaceae. 1, Costa Rica. See Sáenz (*Mycol.* 72: 338, 1980).
- ligneous (lignose)**, wood-like.
- lignicolous**, living on or in wood.
- Ligniella** Naumov (1926) = *Discula* fide Robak (*Sydowia* 6: 378, 1952).
- Lignicola** Höhnk (1955), Halosphaeriaceae. 2 (marine), widespread. See Jones (*CJB* 74 Suppl. 1: S790, 1995; ultrastr.), Spatafora *et al.* (*Am. J. Bot.* 85: 1569, 1998; phylogenetic analysis), Kong *et al.* (*MR* 104: 35, 2000; DNA), Pang *et al.* (*Mycol. Progr.* 2: 29, 2003; polyphyly), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- lignituber**, see papillae.
- Lignoscripta** B.D. Ryan (2004), Agyriaceae (L). 1, USA. See Nash *et al.* (*Lichen Flora of the Greater Sonoran Desert Region* 2: 350, 2004).
- Lignosus** Lloyd ex Torrend (1920), Polyporaceae. 5, widespread. See Ryvarden & Johansen (*Prelim. Polyp. Fl. E. Afr.*: 405, 1980), Douanla-Meli & Langer (*Mycotaxon* 86: 389, 2003; Cameroon).
- ligulate (liguliform)**, flat and narrow; strap-like in form; lorate.
- Lilaceophlebia** (Parmasto) Spirin & Zmitr. (2004), Meruliaceae. 1, widespread. See Spirin & Zmitrovich (*Nov. sist. Niz. Rast.* 37: 177, 2004).
- Lillicoa** Sherwood (1977), Stictidaceae. 1, N. America. See Sherwood (*Mycotaxon* 5: 57, 1977).
- Lilliputeana** Sérus. (1989) nom. inval. = *Scoliciosporum* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Lilliputia** Boud. & Pat. (1900) = *Roumegueriella* fide Malloch & Cain (*CJB* 50: 61, 1972), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Limacella** Earle (1909), Amanitaceae. c. 20, widespread. See Smith (*Pap. Mich. Acad. Sci.* 30: 125,

- 1944; key), Yang & Chou (*Mycotaxon* 83: 77, 2002; Taiwan), Bhatt *et al.* (*Mycotaxon* 88: 249, 2003; India).
- Limacinia** Neger (1895) nom. dub., Fungi. See Hughes (*Mycol.* 68: 693, 1976) but see, Reynolds (*Mycotaxon* 23: 153, 1985).
- Limaciniaseta** D.R. Reynolds (1998), Capnodiaceae. 1, USA. See Reynolds (*Madroño* 45: 250, 1998).
- Limaciniella** J.M. Mend. (1925) = *Actinocymbe* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Limaciniopsis** J.M. Mend. (1925) nom. dub., Capnodiaceae. 1, Hawaii. See von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Limacinula** (Sacc. & D. Sacc.) Höhn. (1909) = *Limacinula* Höhn.
- Limacinula** Höhn. (1907), Coccodiniaceae. 6, widespread (tropical). See Reynolds (*Mycol.* 63: 1173, 1973; key), Reynolds (*Mycotaxon* 27: 377, 1986; phylogeny), Reynolds & Gilbert (*Aust. Syst. Bot.* 18: 265, 2005; Australia), Reynolds & Gilbert (*Cryptog. Mycol.* 27: 249, 2006; Panama).
- Limacinus** (Quél.) Marchand (1896) ? = *Hygrophorus* fide Kuyper (*in litt.*).
- Limacium** (Fr.) P. Kumm. (1871) = *Hygrophorus* fide Singer (*Agaric. mod. Tax.*, 1951).
- Limacospora** Jørg. Koch & E.B.G. Jones (1995), Halosphaeriaceae. 1 (marine). See Jones *et al.* (*CJB* 73: 1010, 1995).
- Limbalba** Nieuwl. (1916) = *Wainioa*.
- limbate** (1) edged with another colour; (2) (of a volva), adnate to base of stipe and having a narrow, free, membranous margin (Bas, 1969).
- Limboria** Ach. (1815) nom. conf., Dothideomycetes.
- Limnaiomyces** Thaxt. (1900), Laboulbeniaceae. 3, widespread. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- Limnomyces** Lohammar (1953) nom. dub., Fungi. 'phycomycetes'.
- Limnoperdaceae** G.A. Escobar (1976), Agaricales. 1 gen., 1 spp.
Lit.: Escobar & McCabe (*Mycotaxon* 9: 48, 1979).
- Limnoperdon** G.A. Escobar (1976), Limnoperdaceae. 1, USA; Japan; S. Africa; Europe. See Escobar & McCabe (*Mycotaxon* 9: 48, 1979; gastroid rel. *Cyphellaceae*), Webster *et al.* (*South African Journal of Botany* 59: 519, 1993; South Africa).
- limoniform**, lemon-like in form.
- Limonomyces** Stalpers & Loer. (1982), Corticiaceae. 2, Europe; N. America. See Stalpers & Loerakker (*CJB* 60: 533, 1982).
- Lindau** (Gustav; 1866-1923; Germany). Student of Schwendener (q.v.), Berlin (1888); working with Brefeld (q.v.), Münster (1888-1890); Member of staff (1892-1899) then Keeper (1899-1902) then Professor (1902-1923), Royal Botanical Museum and Botanic Garden, Berlin. Organizer of the series *Kryptogamen-Flora der Mark Brandenburg*; with P. Sydow (q.v.) produced a comprehensive bibliography of mycological literature up to 1910. *Publs. Fungi Imperfecti: Hyphomycetes. Rabenhorst's Kryptogamen-Flora* 2 vols (1904-1910); *Pflanzliche Parasiten. Sorauer's Handbuch der Pflanzenkrankheiten* (1905-1908); *Hemiasci. Kryptogamen-Flora der Mark Brandenburg* (1906); *Hilfsbuch für das Sammeln parasitischer Pilze* (1901); *Hilfsbuch für das Sammeln der Ascomyceten mit Berücksichtigung der Nährpflanzen Deutschlands, Österreich-Ungarns, Belgiens, der Schweiz und der Niederlande* (1903); (with P. Sydow) *Thesaurus Litteraturae Mycologicae* 5 vols (1908-1918) [these volumes are freely available online; see Internet: catalogues & thesauri]. *Biogs, obits etc.* Grumann (1974: 29); Loesener (*Bericht der Deutschen Botanischen Gesellschaft* 41: (93), 1923); Stafleu & Cowan (*TL-2* 3: 23, 1981).
- Lindauella** Rehm (1900), ? Phyllachorales. 1 (from living grass leaves), S. America. Affinities uncertain. See Sherwood (*Mycotaxon* 5: 1, 1977).
- Lindauomyces** Koord. (1907) = *Arthrobotryum* Ces. fide Clements & Shear (*Gen. Fung.*, 1931).
- Lindauopsis** Zahlbr. (1907) = *Caloplaca* fide Reidl (*Sydowia* 28: 166, 1976).
- Lindavia** Nieuwl. (1916) [non *Lindavia* (F. Schütt) De Toni & Forti 1900, *Algae*] = *Scopularia*.
- Linderia** G. Cunn. (1931) [non *Lindera* Thunb. 1783, *Lauraceae*] = *Linderiella*.
- Linderiella** G. Cunn. (1942) = *Clathrus* fide Dring (*Kew Bull.* 35: 12, 1980).
- Linderina** Raper & Fennell (1952), Kickxellaceae. 2, widespread. See Benjamin (*Aliso* 4: 321, 1959), Chang (*TBMS* 50: 312, 1967), Young (*Ann. Bot.* 33: 211, 1969), Young (*TBMS* 54: 15, 1970), Young (*TBMS* 55: 29, 1970; ultrastr.), Benny & Aldrich (*CJB* 53: 2325, 1975; ultrastr. spore ontogeny), McKeown *et al.* (*MR* 100: 821, 1996; ultrastr.), Konova *et al.* (*Microbiology* 74: 99, 2005; fatty acids).
- Linderomyces** Singer (1947) = *Gloeocantharellus* fide Petersen (*The genera Gomphus and Gloeocantharellus in North America*, 1972).
- Lindquistia** Subram. & Chandrash. (1977), anamorphic *Poronia*, Hsy.0eH.6. 1, widespread. See Subramanian & Chandrashekara (*Boln Soc. argent. Bot.* 17: 150, 1977), Rogers & Læssøe (*Mycotaxon* 44: 435, 1992), Rogers *et al.* (*Mycotaxon* 67: 61, 1998).
- Lindquistomyces** Aramb., E. Müll. & Gamundí (1982), Xylariales. 1 (from leaves of *Nothofagus*), Argentina. See Arambarri *et al.* (*Sydowia* 35: 6, 1982).
- Lindra** I.M. Wilson (1956), Lulworthiaceae. Anamorph *Anguillospora*. 4 (marine), Europe. See Nakagiri (*TMSJ* 25: 377, 1985), Yusoff *et al.* (*Cryptog. Bot.* 5: 307, 1995; ultrastr.), Spatafora *et al.* (*Am. J. Bot.* 85: 1569, 1998; phylogenetic analysis), Kohlmeyer *et al.* (*Mycol.* 92: 453, 2000; morphology, DNA), Campbell *et al.* (*MR* 109: 556, 2005; phylogeny), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Lindroth**, see Liro.
- Lindrothia** Syd. (1922) = *Puccinia* fide Arthur (*Manual Rusts US & Canada*, 1934).
- Lindsay** (William Lauder; 1829-1880; Scotland). Graduated in medicine, University (1852); resident physician, Murray's Royal Institution for the Insane, Perth (1854-1879). A proponent of non-restraint treatments, he studied the practices of psychiatric hospitals in other countries, and mental aspects of animals (*Mind in the Lower Animals* 2 vols, 1879); he regarded natural history as therapeutic and popularized lichenology in particular; a polymath with a rigorous scientific approach he studied dyeing and chemical variation within lichens, and opened up little explored areas of science, including the diversity of lichenicolous fungi and conidiomata in lichens; visited Otago, New Zealand (1861), thereafter publishing profusely not only on lichens and other fungi but also mineralogy and plants from that country (e.g. *Contributions to New Zealand Botany*, 1868) and

even colonialism. Collections now in E; many new taxa based on specimens loaned from K (now in BM). *Publs. A Popular History of British Lichens* (1856); *Memoirs on the spermagones and pycnides of lichens. Transactions of the Royal Society of Edinburgh* (1859) [macrolichens]; *Observations on new lichenicolous microfungi. Transactions of the Royal Society of Edinburgh* (1869); *Transactions of the Linnean Society London* (1872) [crustose lichens]. *Biogs, obits etc.* Anon. (*Proceedings of the Royal Society of Edinburgh* 1881-1882: 736, 1882); Grummann (1974: 376); Hawksworth & Seaward (*Lichenology in the British Isles 1568-1975*, 1977); Stafleu & Cowan (*TL-2* 3: 63, 1981).

Lindtneria Pilát (1938), Stephanosporaceae. 8, widespread. See Hjortstam (*Mycotaxon* 28: 19, 1987; key), Larsen (*Mycotaxon* 75: 131, 2000; new sp.).

Lindtneriaceae Jülich (1982) = Corticiaceae.

line (as a measure of length), 2.1167 mm ($\frac{1}{12}$ inch); **Paris** - (Parisier Linie, P.L.), 2.2558 mm; **Paris inch**, 27.9 mm (fide Mason, *Mycol. Pap.* 3: 24, 1933); 'p.p.' and 'p.p.p.' (parts per Paris inch) are abbreviations used by Corda.

linear, long and narrow.

Linearistroma Höhn. (1910), Clavicipitaceae. Anamorph *Ephelis*. 1 (on grasses), Brazil; India. See Phelps *et al.* (*Mycotaxon* 48: 165, 1993).

Lineolata Kohlm. & Volkm.-Kohlm. (1990), Dothideomycetes. 1 (marine), pantropical. See Kohlmeyer & Volkmann-Kohlmeyer (*MR* 94: 687, 1990).

lineolate, marked with lines.

Lineostroma H.J. Swart (1988), ? Venturiaceae. 1, Australia. See Swart (*TBMS* 91: 453, 1988).

linguiform, see lingulate.

lingulate, tongue-like in form.

Linhartia Sacc. & P. Syd. (1902) = Psorotheciopsis fide Lücking (*Cryptog. Mycol.* 20: 193, 1999), Henssen & Lücking (*Ann. bot. fenn.* 39: 273, 2002).

Link (Johann Heinrich Friedrich; 1767-1851; Germany). Born at Hildesheim, and educated there and in Göttingen [obtaining medical degree there in 1789]; Professor, Rostock (1792-1811); Professor of Botany, Breslau (1811-1815); Professor of Botany and Director of the Botanic Garden and Royal Herbarium, Berlin (1815-1851). He provided early accounts of a range of important fungal genera. *Publs. Observationes in Ordines Plantarum Naturales* 1 (1809) and 2 (1815); *Hyphomycetes* (1824) and *Gymnomycetes* (1825) in Linné, *Species Plantarum* edn 4 [by Willdenow] 6; *Handbuch zur Erkennung der Gewächse* (1831-1833) [Fungi 3: 274-486; = Willdenow, *Grundriss der Kräuterkunde*. 3]. *Biogs, obits etc.* Grummann (1974: 29); Stafleu & Cowan (*TL-2* 3: 65, 1981).

Linkiella Syd. (1921) = Puccinia fide Arthur (*Manual Rusts US & Canada*, 1934).

Linkomyces Golovin (1958) = Erysiphe fide Braun (*Nova Hedwigia* 34: 689, 1981).

Linkosia A. Hern. Gut. & B. Sutton (1997), anamorphic *Pezizomycotina*, Hso.?.?. 2, Cuba. See Hernández-Gutiérrez & Sutton (*MR* 101: 208, 1997), Wu & Zhuang (*Fungal Diversity Res. Ser.* 15, 2005), Shenoy *et al.* (*MR* 110: 916, 2006; phylogeny, polyphyly).

Linnaeus (Carl; 1707-1778; Carl von Linné; L.; Sweden). Professor of Medicine and Botany at the University of Uppsala (1741-1778). The father of modern taxonomy. Introduced the binomial system of

biological nomenclature, but classified fungi as members of the plant kingdom. In *Species Plantarum* (1753), he drew extensively on work of Dillenius (*Historia Muscorum*, 1742) for treatment of lichen-forming fungi, and of Micheli (1729, q.v.) for other fungi, but recognized only about 170 fungal species. Among generic names used were *Agaricus*, *Clathrus*, *Hydnum*, *Mucor*, *Phallus* and *Tremella*; all lichen-forming fungi were placed in the genus *Lichen* (80 species.) except for some inadvertently placed in *Mucor* and *Tremella*. The enormous influence of this work confirmed a tradition in life sciences to treat fungi as plants. *Species Plantarum* is the nomenclatural starting point for plants and, because of that tradition, fungal names are still governed by the botanical code of nomenclature. This continues to affect development of mycology as a separate discipline. His last pupil was Acharius (q.v.). Collections and personal library are at the Linnean Society of London (LINN).

Biogs, obits etc. Blunt (*The Compleat Naturalist*, 1971); Jørgensen *et al.* (*Botanical Journal of the Linnean Society* 115: 261, 1994) [typification of 109 names of lichen-forming fungi]; Grummann (1974: 477); Ramsbottom (*Proceedings of the Linnean Society of London* 151: 280, 1941) [Linnaeus' contribution to mycology]; Stafleu (*Linnaeus and the Linnaeans*, 1971); Stafleu & Cowan (*TL-2* 3: 71, 1981); Stearn (*in* Linnaeus, *Species plantarum*, 2 vols, 1753) [reprint 1957, biography, reference collections, history of work, etc.]; Uggla (*Linnaeus*, 1957).

Linobolus Syd. & P. Syd. (1917) ? = Tubeufia fide von Arx & Müller (*Stud. Mycol.* 9, 1975).

Linocarpon Syd. & P. Syd. (1917), Sordariomycetidae. Anamorph *Phialophora*-like. c. 42 (mainly on *Palmaceae*), widespread (tropical). See Hyde (*Sydowia* 44: 32, 1992; key), Hyde (*J. Linn. Soc. Bot.* 123: 109, 1997), Dulymamode *et al.* (*MR* 102: 1331, 1998; Mauritius), Poonyth *et al.* (*Bot. Mar.* 43: 213, 2000; ultrastr.), Thongkantha *et al.* (*Mycol.* 95: 360, 2003; key), Yanna & Ho (*MR* 107: 1305, 2003; ultrastr.), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).

Linochora Höhn. (1910), anamorphic *Phyllachora*, St.0fH.?. 5, widespread (esp. tropical). See Cannon (*Mycol. Pap.* 163: 302 pp., 1991).

Linochorella Syd. & P. Syd. (1912), anamorphic *Pezizomycotina*, St.=eH.?. 1, S. Africa.

Linodochium Höhn. (1909), anamorphic *Pezizomycotina*, Hsp.0fH.10. 2, Europe; N. America. See Dyko & Sutton (*CJB* 57: 370, 1979), Dulymamode *et al.* (*Mycotaxon* 73: 313, 1999).

Linopeltis I. Hino & Katum. (1961), Schizothyriaceae. 1, Japan. See Hino & Katumoto (*J. Jap. Bot.* 36: 99, 1961).

Linopodium Earle (1909) = *Mycena* fide Singer (*Agaric. mod. Tax.*, 1951).

Linospora Fuckel (1870), Diaporthales. Anamorph *Depazea*. 4, Europe; N. America. See Barr (*Mycol. Mem.* 7, 1978), Walker (*Mycotaxon* 11: 1, 1980), Monod (*Beih. Sydowia* 9: 1, 1983), Zhang & Blackwell (*Mycol.* 93: 355, 2001; phylogeny).

Linosporeidea R. Keller (1895), Fossil Fungi (? perithecia) ? Fungi. 1 (Miocene), Switzerland.

Linostoma Höhn. (1918) [non *Linostoma* Wall. 1831, *Thymelaeaceae*] = *Ophiostoma*.

Linostomella Petr. (1925) ? = *Endoxyla* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Linotexis Syd. & P. Syd. (1917) = *Parenglerula* fide Deighton (*Mycol. Pap.* 78, 1960), Müller & von Arx

- (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- lipids**, esters of higher aliphatic alcohols (e.g. oils, fats, waxes); constituents of fungi (see Weete & Weber, *Lipid biochemistry of fungi and other organisms*, 1980).
- lipochroic**, see colour.
- Lipocystis** Cummins (1937), Raveneliaceae. 1 (on *Mimosa* (Leguminosae)), West Indies.
- Lipomyces** Lodder & Kreger-van Rij (1952), Lipomycetaceae. 13 (in soil), N. America; Europe. See Nieuwdorp *et al.* (*Antonie van Leeuwenhoek* 40: 241, 1974; key), Smith *et al.* (*Int. J. Syst. Bacteriol.* 34: 80, 1984; ultrastr.), Smith *et al.* (*Antonie van Leeuwenhoek* 68: 75, 1995), Smith *et al.* (*Antonie van Leeuwenhoek* 68: 177, 1995; DNA), Gouliamova *et al.* (*Antonie van Leeuwenhoek* 74: 283, 1998), Smith *et al.* in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 174, 1998), van der Walt *et al.* (*Syst. Appl. Microbiol.* 22: 229, 1999), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny), Thanh (*Int. J. Syst. Evol. Microbiol.* 56: 2009, 2006; Vietnam), Kurtzman *et al.* (*FEMS Yeast Res.* 7: 1027, 2007; phylogeny), Müller *et al.* (*Can. J. Microbiol.* 53: 509, 2007; cycloheximide tolerance).
- Lipomycetaceae** E.K. Novák & Zsolt (1961), Saccharomycetales. 3 gen. (+ 4 syn.), 20 spp.
Lit.: Hoog *et al.* (*Stud. Mycol.* 29: 131 pp., 1986), van der Walt *et al.* (*Syst. Appl. Microbiol.* 9: 115, 1987), Cottrell & Kock (*Syst. Appl. Microbiol.* 12: 291, 1989), Weijman & van der Walt (*Stud. Mycol.* 31: 193, 1989; cell wall carbohydrates), Kurtzman & Liu (*Curr. Microbiol.* 21: 387, 1990), Kock *et al.* (*Antonie van Leeuwenhoek* 62: 251, 1992; phylogeny gen.), Weijman & van der Walt (*Antonie van Leeuwenhoek* 62: 247, 1992; review), Lomascolo *et al.* (*Can. J. Microbiol.* 40: 724, 1994), Jansen van Rensburg *et al.* (*Syst. Appl. Microbiol.* 18: 410, 1995; lipids, DNA), Yamada & Nogawa (*Bull. Fac. Agric. Shizuoka Univ.* 45: 31, 1995), Gouliamova *et al.* (*Antonie van Leeuwenhoek* 74: 283, 1998), Kurtzman in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 111, 1998), Smith in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 248, 1998), Walt *et al.* (*Syst. Appl. Microbiol.* 22: 229, 1999), Smith *et al.* (*S. Afr. J. Sci.* 96: 247, 2000), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Lipospora** Arthur (1921) = *Tranzschelia* fide Arthur (*Manual Rusts US & Canada*, 1934).
- lipsanenchyma**, primordial tissue of a basidioma, other than the universal veil, covering the hymenium (Reijnders, 1963; Singer, 1962: 29).
- lipstick mould**, *Sporendonema purpurascens*, an invader of mushroom beds.
- liquid nitrogen**, see Genetic resource collections.
- Lirasporis** R. Potonié & Sah (1960), Fossil Fungi ? Fungi. 1 (Miocene), India.
- lirella**, a long, narrow apothecium as in *Graphis* and *Hysterium*.
- Lirellodisca** Aptroot (1998), Patellariaceae (L.). 1, Papua New Guinea. See Aptroot & Iperen (*Nova Hedwigia* 67: 485, 1998).
- Liro** [also 'Lindroth', his step-father's name under which he published up to 1906 when he took the Finnish name Liro] (Johan Ivar; 1872-1943; Finland). First Professor of Plant Biology and Plant Pathology, Helsinki University (1922-1943). A founder of the Vanamo Society (1896). Noted for more than 250 publications on taxonomic mycology and plant pathology, especially on fungi of Finland. *Publs.* *Die Ustilagineen Finnlands* 2 vols (1924, 1938). *Biogs, obits etc.* Grumann (1974: 620); Jamalainen (*Archivum Societatis Zoologicae Botanicae Fennicae 'Vanamo'* 3, 1949) [biography, bibliography]; Stafleu & Cowan (*TL-2* 3: 62, 1981).
- Liroa** Cif. (1933), Microbotryaceae. 1 (on *Polygonum*), Asia; Indonesia. See Kamat & Viswanathan (*Mycopathologia* 26: 289, 1965), Vánky (*Illustrated genera of smut fungi*, 1987), Piepenbring (*Fungal Science* 17: 55, 2002; morphology).
- Lirula** Darker (1967), Rhytismataceae. 7, widespread. See Darker (*CJB* 45: 1420, 1967), Gernandt *et al.* (*Mycol.* 93: 915, 2001; phylogeny), Guo *et al.* (*MR* 107: 680, 2003; endophytes), Kaneko (*Mycoscience* 44: 335, 2003; Japan), Ortiz-García *et al.* (*Mycol.* 95: 846, 2003; phylogeny).
- Lisea** Sacc. (1877) = *Gibberella* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Lisiella** (Cooke & Masee) Sacc. (1891) = *Gibberella* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Lister** (Arthur, 1830-1908; England). A London wine merchant; amateur mycologist only in retirement (1887 onwards). Working through collections in the British Museum (Natural History), Royal Botanic Gardens, Kew and of de Bary (q.v.) in Strassburg, produced many early papers on, and a definitive monograph of the *Mycetozoa*, jointly with his daughter, G. Lister (q.v.); Fellow of the Royal Society (1898); President of the British Mycological Society (1906). *Publs.* *A monograph of the Mycetozoa* (1894) [edn 3, 1925]. *Biogs, obits etc.* Grumann (1974: 377); Hawker (*TBMS* 35: 177, 1952) [portrait]; Lister (*Proceedings of the Royal Society B* 88: i, 1915); Stafleu & Cowan (*TL-2* 3: 118, 120, 1981).
- Lister** (Gulielma, 1860-1949; England). Daughter of A. Lister (q.v.); *de facto* honorary curator of the *Mycetozoa* collections, British Museum (Natural History) London. An eminent English amateur naturalist, noted for her many publications on the *Mycetozoa* and for her artwork, illustrating not only *Mycetozoa* but also various plants; twice President of the British Mycological Society (1912, 1932); the seventy-four manuscript notebooks she produced with her father were bequeathed to the British Mycological Society and are kept in the British Museum (Natural History) London. *Publs.* *A monograph of the Mycetozoa* edn 3 (1925). *Biogs, obits etc.* Ainsworth (*TBMS* 35: 188, 1952) [notebooks]; Ainsworth & Balfour-Browne (*Nature* 188 (4748): 362, 1960); Grumann (1974: 377); Hawker (*TBMS* 35: 177, 1952); Stafleu & Cowan (*TL-2* 3: 118, 120, 1981); Wakefield (*TBMS* 33: 165, 1950) [portrait].
- Listeromyces** Penz. & Sacc. (1901), anamorphic *Pezizomycotina*, Hsp.≡ eP.1. 1, Java; Hawaii. See Goos (*Mycol.* 63: 213, 1971).
- Literature**. Mycological literature is vast. In the ninth edn of this *Dictionary*, it was estimated that there are not fewer than 500000 books and papers, with an annual output of c. 5000 items distributed through not less than 3500 publications, approximately half in English. The rate of output of paper publications has not diminished, and electronic publication on-line has grown exponentially since the previous edition.
- Most literature is ephemeral, but systematic literature is longer-lived and must be readily available (the valid publication of fungal names dates from 1753,

see Nomenclature). Much of the literature up to 1930 is listed in compilations by Lindau & Sydow (1908-18) and Ciferri (1957-60), see below [freely available on-line through *Cyberliber* (q.v.)]. Current systematic literature is covered in *Bibliography of Systematic Mycology* (1946-; twice-yearly, indexed to genus). In addition to new work, an increasing amount of archival systematic literature can be found freely available on-line in various digital and downloadable formats. Internet search engines such as Google, and major international resources such as the CAB ABSTRACTS database are now an essential tool in any mycological studies.

Frequent use has been made here of the general works listed below. These are referred to by author and year or part, e.g. Buller (5), Clements & Shear (1931). In addition, literature is given under the names of genera and higher ranks, and special topics (e.g. Geographical distribution, Industrial mycology, Lichens, Macromycetes, Nomenclature, Physiology, Plant pathogenic fungi).

General Textbooks.

Ainsworth, G.C. & Sussman, A.S. (Eds), *The fungi, an advanced treatise*, 1 (The fungal cell), 1965; 2 (The fungal organism), 1966; 3 (The fungal population), 1968; (& Sparrow, F.K.) 4A and 4B (A taxonomic review), 1973.

Alexopoulos, C.J., *Introductory mycology*, edn 4 (& Mims, Blackwell), 1996; edn 3 (& Mims), 1979; edn 2, 1962 [Germ. transl., *Einführung in die Mykologie*, by Farr, 1965]; edn 1, 1952.

Arx, J.A. von, *Pilzkunde*, 1967; edn 3, 1976.

Arx, J.A. von, *The genera of fungi sporulating in pure culture*, 1970; edn 3, 1981 [keys, c. 850 gen.].

Burnett, J.H., *Fundamentals of mycology*, edn 2, 1976; edn 1, 1968.

Cannon, P.F. & Kirk, P.M., *Fungal families of the world*, 2007.

Carlile, M.J. & Watkinson, S.C. *The fungi*, 1994.

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Deshmukh, S.K. & Rai, M.K. (Eds), *Biodiversity of fungi: their role in human life*, 2005.

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Новому Сучтемамуку Хузууу Растений [*Novitates Systematicae Plantarum non Vascularum*] (St Petersburg, Russia), 1964-. [incl. fungi]
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litho- (prefix), pertaining to rocks.
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Lithogyalideopsis Lücking, Sérus. & Vězda (2005), *Gomphillaceae* (L). 1, widespread. See Lücking *et al.* (*Lichenologist* 37: 165, 2005), Lücking *et al.* (*Lichenologist* 38: 131, 2006).
Lithomyces Viala & Marsais (1930) = *Melanospora* Corda fide Udagawa & Cain (*CJB* 47: 1915, 1969).
lithophyte, a plant living on rocks; see saxicolous.
lithophytic, the habit of a lithophyte (q.v.).
Lithopolyporales R.K. Kar, N. Sharma, A. Agarwal & R. Kar (2003), *Fossil Fungi*, *Polyporaceae*. 1, India. See Kar *et al.* (*Curr. Sci.* 85: 37, 2003).
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Lithothelium Müll. Arg. (1885), *Pyrenulaceae* (L). 30, widespread (tropical). See Singh (*Curr. Sci.* 55: 198, 1986), Aptroot (*Biblthca Lichenol.* 44, 1991), McCarthy (*Lichenologist* 28: 290, 1996), Harada (*Bryologist* 100: 204, 1997), McCarthy (*Australasian Lichenology* 49: 7, 2001; Christmas Island), Aptroot (*Lichenologist* 38: 541, 2006; China, Thailand, key), Aptroot *et al.* (*Biblthca Lichenol.* 97, 2008; Costa Rica).
lithotroph, utilizing rocks as nourishment.
Lithouncinula N. Sharma, R.K. Kar, A. Agarwal & R.

- Kar (2005), Fossil Fungi. 1 (Maastrichtian).
- litmus**, a water-soluble mixture of amphoteric dyes obtained from depside-containing lichens, esp. *Roccella montagnei*; the mixture has the property of changing colour at different pH levels, and is widely used as an indicator of acidity. See dyeing.
- Litschauerella** Oberw. (1966), Hydnodontaceae. 4, widespread. See Eriksson & Ryvarden (*Bot. Notiser* 130: 461, 1977).
- Litschauerellaceae** Jülich (1982) = Schizoporaceae.
- Litschaueria** Petr. (1923) = Helminthosphaeria fide Samuels *et al.* (*Mycol.* 89: 141, 1997).
- Littispora** J. Campb., J.L. Anderson & Shearer (2003) = Saagaromyces fide Campbell *et al.* (*Mycol.* 95: 547, 2003), Pang & Jones (*Nova Hedwigia* 78: 269, 2004).
- littoral**, growing on sea or lake shores.
- Lituaria** Riess (1853) = Helicoma fide Linder (*Ann. Mo. bot. Gdn* 16: 298, 1929).
- lituate**, forked, and having the points turned out a little.
- liverwort**, sometimes used in common names for large foliose lichens, e.g. ash-coloured ground liverwort (*Peltigera canina*).
- Livia** Velen. (1947), Helotiales. 1, Europe.
- Lizonia** (Ces. & De Not.) De Not. (1864), Pseudoperisporiaceae. 1, Europe. See Hansford (*Mycol. Pap.* 15, 1946), Barr (*Mycotaxon* 64: 149, 1997), Döbbeler (*Nova Hedwigia* 76: 1, 2003).
- Lizoniella** Henn. ex Sacc. & D. Sacc. (1905) = Microcyclus fide Barr (*Mycotaxon* 39: 43, 1990).
- Llanoa** C.W. Dodge (1968) = Umbilicaria fide Wei & Jiang (*Mycosystema* 2: 135, 1989).
- Llanolichen** Tomas. & Cif. (1952) = Placynthium fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Llanomyces** Cif. & Tomas. (1953) = Llanolichen.
- Llimonaea** Egea & Torrente (1991), Arthoniales (L). 2, Europe; N. Africa. See Egea & Torrente (*Mycotaxon* 53: 63, 1995), Grube (*Bryologist* 101: 377, 1998), Sparrius (*Biblhca Lichenol.* 89: 141 pp., 2004), Tehler & Irestedt (*Cladistics* 23: 432, 2007), van den Boom & Brand (*Lichenologist* 39: 309, 2007; Europe, key).
- Llimoniella** Hafellner & Nav.-Ros. (1993), Helotiales. 10 (lichenicolous), Europe. See Hafellner & Navarro-Rosinés (*Herzogia* 9: 769, 1993), Kümmerling *et al.* (*Biblhca Lichenol.* 53: 147, 1993), Diederich & Etayo (*Lichenologist* 32: 423, 2000), Kondratyuk *et al.* (*Mycol. Balcanica* 3: 95, 2006; on *Caloplaca*).
- Lloyd** (Curtis Gates; 1859-1926; USA). A businessman and amateur mycologist. Noted for his studies on the *Gasteromycetes*, *Xylariaceae* etc. Founded, with his brothers, the Lloyd Library and Museum, Cincinnati (see *Lloydia* 27: 141, 1964); he poked fun at 'name changers' by marking comments with the icon of a small smiling buddha-like figure and by making certain taxonomic and nomenclatural proposals under the name of a hypothetical 'Professor N.J. McGinty'; such proposals are generally attributed to Lloyd without comment, perhaps wrongly (Donk, *Reinwardtia* 1: 205, 1951); these robust and interesting views led some, particularly nomenclaturalists, to consider him eccentric. Collections in **BPI** (*Mycol.* 24: 247, 1932). *Publs. Mycological Notes* 7 vols (1898-1925) [in these privately produced volumes he published results of his mycological investigations; the volumes were indexed, *Bulletin of the Lloyd Library* 32 (mycological series 7): 64 pp., 1932; the new names proposed by Lloyd were indexed by Stevenson & Cash, *Bulletin of the Lloyd Library* 35 (mycological series 8): 209 pp., 1936]. *Biogs, obits etc.* Fitzpatrick (*Mycol.* 19: 153, 1927, portrait), Simons (*John Uri Lloyd, His life and works, 1849-1936, with a history of the Lloyd Library*, 1972); Stafleu & Cowan (*TL-2* 3: 123, 1981).
- Lloydella** Bres. (1901) = Lopharia fide Donk (*Taxon* 5: 69, 1956).
- Lloydellopsis** Pouzar (1959) = Amylostereum.
- Lloydia** C.H. Chow (1935) [non *Lloydia* Salisb. 1812, *Liliaceae*] = Sinolloydia fide Dring (*Kew Bull.* 35: 68, 1980).
- LN**, liquid nitrogen; see Genetic resource collections.
- LO-analysis** (L, lux [light]; O, obscuritas [darkness]). A method introduced by Erdtman (see *An introduction to pollen analysis*, 1943; edn 2, 1954) for pollen, and used by Payak (*Nature* 184: 738, 1959, *Mycopath.* 16: 70, 1962, *Recent advances in palynology*: 27, 1964) for fungus spores, by which different types of surface ornamentation may be distinguished microscopically by the differences in appearance of the spore surface at upper and lower focus. See ornamentation, Fig. 20.
- Lobaca** Vězda (1983) nom. inval. = Fellhanera fide Vězda (*Folia geobot. phytotax.* 21: 199, 1986).
- Lobaria** (Schreb.) Hoffm. (1796), Lobariaceae (L). c. 67, widespread. See Hale (*Bryologist* 60: 35, 1957), Hakulinen (*Ann. bot. fenn.* 1: 202, 1964), Jordan (*Bryologist* 73: 669, 1970; internal cephalodia), Yoshimura (*J. Hattori bot. Lab.* 34: 231, 1971), Jordan (*Bryologist* 76: 225, 1973; N. Am. spp.), Wei *et al.* (*Acta Mycol. Sin. Suppl.* 1: 363, 1989; 17 spp. China), Burgaz & Martínez (*Botanica Complutensis* 23: 59, 1999; Iberian peninsula), Zoller *et al.* (*Mol. Ecol.* 8: 2049, 1999; genetic diversity), Thomas *et al.* (*Biblhca Lichenol.* 82: 123, 2001; phylogeny), Haltingbäck (*Svensk bot. Tidskr.* 97: 26, 2002; conservation), Stenroos *et al.* (*CJB* 81: 232, 2003; photobiology), Wiklund & Wedin (*Cladistics* 19: 419, 2003; phylogeny), Miadlikowska & Lutzoni (*Am. J. Bot.* 91: 449, 2004; phylogeny), Sipman (*Biblhca Lichenol.* 88: 573, 2004; New Guinea), Walser *et al.* (*Heredity* 93: 322, 2004; recombination), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Lobariaceae** Chevall. (1826), Peltigerales (L). 7 gen. (+ 21 syn.), 370 spp.
- Lit.*: Yoshimura & Hurutani (*Bull. Kochi Gakuen Coll.* 18: 345, 1987; SEM), Galloway (*Bull. Br. Mus. nat. Hist. Bot.* 17: 1, 1988), Galloway (*Symbiosis* 11: 327, 1991), Galloway *et al.* (*Fl. criptog. Tierra del Fuego* 13, 1995), Galloway *et al.* (*Fl. criptog. Tierra del Fuego* 13: 78 pp., 1995), Galloway (*Trop. Bryol.* 15: 117, 1998), Sillet & Goward (*Lichenogr. Thomsoniana North American Lichenology in Honor of John W. Thomson*: 377, 1998), Zoller *et al.* (*Mol. Ecol.* 8: 2049, 1999), McDonald *et al.* (*Bryologist* 106: 61, 2003), Stenroos *et al.* (*CJB* 81: 232, 2003), Walser *et al.* (*Fungal Genetics Biol.* 40: 72, 2003), Wiklund & Wedin (*Cladistics* 19: 419, 2003), Miadlikowska & Lutzoni (*Am. J. Bot.* 91: 449, 2004), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny), Jørgensen & Tønsberg (*Nordic Lichen Flora* 3: Cyanolichens: 77, 2007).
- Lobariella** Yoshim. (2002), Lobariaceae. 3, widespread. See Nash *et al.* (*Lichen Flora of the Greater Sonoran Desert Region* 1: 270, 2002), Miadlikowska

- et al.* (*Mycol.* **98**: 1088, 2006; phylogeny).
- Lobarina** Nyl. ex Cromb. (1894), Lobariaceae (L). 1, temperate. See Yoshimura in Marcelli & Ahti (Eds) (*Recollecting Edvard August Vainio*: 85, 1998), Stenroos *et al.* (*CJB* **81**: 232, 2003; photobionts).
- Lobariomyces** E.A. Thomas (1939) nom. inval. = *Lobaria*.
- lobate**, lobed.
- Lobatopedis** P.M. Kirk (1979), anamorphic *Pezizomycotina*, Hso.≡ eP.3. 3, Europe; E. Africa. See Kirk (*TBMS* **73**: 75, 1979), Treigienė & Markovskaja (*Botanica Lithuanica* **9**: 285, 2003; Lithuania).
- Lobiolataceae** C. Agardh (1821) = *Peltigeraceae*.
- Lobiona** H. Kilius & Gotth. Schneid. (1978) = *Toninia* fide Timdal (*Op. Bot.* **110**, 1991).
- Loboa** Cif., P.C. Azevedo, Campos & Carneiro (1956) = *Paracoccidioides* fide Taborda *et al.* (*J. Clin. Microbiol.* **37**: 2031, 1999; synonymy with *Paracoccidioides*).
- Lobodirina** Follmann (1967) = *Roccellina* fide Tehler (*Op. Bot.* **70**, 1983).
- Lobomyces** Borelli (1968) nom. inval. = *Lacazia* fide Grigoriu *et al.* (*Medical Mycol.*, 1987), Taborda *et al.* (*J. Clin. Microbiol.* **37**: 2031, 1999).
- lobomycosis**, keloidal blastomycosis caused by *Lacazia loboi*.
- Loborhiza** A.M. Hanson (1944), Chytridiaceae. 1 (on *Volvox*), USA.
- Lobosporangium** M. Blackw. & Benny (2004), Mortierellaceae. 1, Mexico; USA. See Malloch (*Mycol.* **59**: 326, 1967), Ranzoni (*Mycol.* **60**: 356, 1968), Benny & Blackwell (*Mycol.* **96**: 144, 2004), White *et al.* (*Mycol.* **98**: 872, 2006; phylogeny).
- Lobothallia** (Clauzade & Cl. Roux) Hafellner (1991), Megasporaceae (L). 4, widespread (northern hemisphere). See Hafellner (*Acta Bot. Malac.* **16**: 138, 1991), Lumbsch (*Bryologist* **100**: 180, 1997; ontogeny), Schmitt *et al.* (*J. Hattori bot. Lab.* **100**: 753, 2006; phylogeny).
- Lobularia** Velen. (1934), ? Helotiales. 1, former Czechoslovakia.
- lobulate**, having small lobes.
- Lobulicium** K.H. Larss. & Hjortstam (1982), Atheliaceae. 1, Europe. See Larsson & Hjortstam (*Mycotaxon* **14**: 69, 1982).
- Locelliderma** Tehon (1935) = *Hypoderma* De Not. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Locellina** Gillet (1876) nom. dub. ? = *Cortinarius* fide Kuyper (*in litt.*).
- Lockerbia** K.D. Hyde (1994), Sordariomycetes. 1, Australia. See Hyde (*Prodr. fl. neomarch.* **46**: 23, 1994).
- locule (loculus)**, a cavity, esp. one in a stroma.
- Loculistroma** F. Patt. & Charles (1910), Hypocreales. 1 (on *Phyllostachys*), China. Type material is lost; possibly a synonym of *Aciculisporium*. See Rossman *et al.* (*Stud. Mycol.* **42**: 248 pp., 1999).
- Loculoascomycetes** Ainsw. (1966) (syn. *Ascoloculares*, *Bitunicatae*). This taxon was first proposed by Luttrell (*Mycol.* **47**: 511, 1955), as a subclass for *Ascomycota* with fissitunicately discharging asci, producing ascospores which are generally septate, and borne in unwallled locules (pseudothecia) in ascotromatic ascomata with an ascolocular ontogeny. Orders commonly recognized included the *Myriangiales* (asci globose), *Pleosporales* (asci clavate; pseudoparaphyses present), *Hysteriales* (ascocarp opening by a longitudinal split), *Dothideales* (asci clavate; pseudoparaphyses absent), *Capnodiales* (sooty-moulds; q.v.) and *Microthyriales* (ascomata shield-shaped). This class is not accepted in this edition of the *Dictionary*.
- See Barr (*Prodromus to class Loculoascomycetes*, 1987), Lumbsch & Huhndorf (*MR* **111**: 1064, 2007).
- Loculohypoxylon** M.E. Barr (1976), Dothideomycetes. 1, N. America. See Barr (*Mycotaxon* **3**: 326, 1976), Barr (*Mycotaxon* **82**: 373, 2002; poss. affinities with *Teichospora*).
- Loculomycetes**. Class introduced by Gorovii (*Dopov. Akad. Nauk. ukr. RSR B* 1977(8): 742) for *Zerovae-mycetes* (q.v.), an agaric similar to *Coprinus* but in which the gills are replaced by spherical multiloculate structures containing spores; each chamber contains one **loculospore**. Considered to be a new type of sexual sporulation in fungi.
- loculospore**, a spore of *Loculomycetes*, q.v.
- Loculotuber** Trappe, Parlade & I.F. Alvarez (1993), ? Tuberaceae. 1, Europe (southern); N. Africa. See Alvarez *et al.* (*Mycol.* **84**: 926, 1993), Læssøe & Hansen (*MR* **111**: 1075, 2007; phylogeny).
- Lodderomyces** Van der Walt (1966), Saccharomycetales. Anamorph *Candida*. 1, USA; S. Africa. Utilizes higher alkanes. See James *et al.* (*Lett. Appl. Microbiol.* **19**: 308, 1994), Kurtzman in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 254, 1998), Fitzpatrick *et al.* (*BMC Evolutionary Biology* **6**: 99, 2006; phylogeny), Suh *et al.* (*Mycol.* **98**: 1006, 2006; phylogeny).
- Loflammia** Vězda (1986), Ectolechiaceae (L). 4 (on leaves), widespread (tropical). See Vězda (*Folia geobot. phytotax.* **21**: 211, 1986), Aptroot *et al.* (*Mycotaxon* **88**: 41, 2003; China, Taiwan).
- Loflammiosis** Lücking & Kalb (2000), Ectolechiaceae (L). 1, Brazil. See Lücking & Kalb (*Bot Jahrb. Syst.* **122**: 1, 2000; Brazil).
- Logilvia** Vězda (1986), Ectolechiaceae (L). 1 (on leaves), widespread (tropical). See Vězda (*Folia geobot. phytotax.* **21**: 211, 1986).
- Lohwagia** Petr. (1942), ? Phyllachoraceae. 3 (from living leaves and stems), C. & S. America. See von Arx & Müller (*Beitr. Kryptfl. Schweiz* **11** no. 1, 1954).
- Lohwagiella** Petr. (1970) = *Niesslia* fide Samuels & Barr (*CJB* **75**: 2165, 1998).
- Lojkania** Rehm (1905), Fenestellaceae. 10, widespread (temperate). See Barr (*Mycotaxon* **20**: 1, 1984), Yuan & Barr (*Sydowia* **46**: 338, 1995; key 4 spp. China), Lumbsch & Lindemuth (*MR* **105**: 901, 2001; phylogeny), Chen & Hsieh (*Fungal Science Taipei* **18**: 119, 2003; Taiwan).
- Loliomyces** Maire (1937), anamorphic *Pezizomycotina*. 1, Morocco.
- Lolium endophyte**. see endophyte.
- Lollipopaia** Inderbitzin (2001), Diaporthales. 1, Thailand. See Inderbitzin & Berbee (*CJB* **79**: 1100, 2001), Pinruan *et al.* (*Mycol.* **96**: 1163, 2004; phylogeny).
- Loma** Morrison & Sprague (1981), Microsporidia. 11.
- Lomaantha** Subram. (1954), anamorphic *Pezizomycotina*, Hso.≡ eP.1. 1, India. See Subramanian (*J. Indian bot. Soc.* **33**: 31, 1954), Wu & Zhuang (*Fungal Diversity Res. Ser.* **15**, 2005).
- Lomachashaka** Subram. (1956), anamorphic *Pezizomycotina*, Hsp.0eH/1eP.15. 4, W. Africa; India. See Nag Raj (*Mycotaxon* **53**: 311, 1995).

- lomasome**, a vesicle derived from an intracytoplasmic membrane (Marchant *et al.*, *New Phytol.* **66**: 623, 1967). Cf. plasmalemmasome.
- Lomatia** (Fr.) P. Karst. (1889) [non *Lomatia* R. Br. 1810, *Proteaceae*] = *Lomatina*.
- Lomatina** P. Karst. (1892) = *Cytidia* fide Cooke (*Beih. Sydowia* **4**: 1, 1961).
- Lomentospora** Hennebert & B.G. Desai (1974) = *Scedosporium* fide Hennebert & Desai (*Mycotaxon* **1**: 45, 1974), Lennon *et al.* (*J. Clin. Microbiol.* **32**: 2413, 1994).
- Lonchospermella** Speg. (1908) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* **141**, 1977).
- Longevity**. The life-span of an individual fungus in nature is difficult to ascertain. Mycorrhizal and other soil-dwelling fungi whose mycelia radiate out for huge distances may in general live longer than other groups; it has been claimed that an 'individual' *Armillaria bulbosa* thallus in Michigan weighs in excess of 10,000 kg, occupies 15 ha, and has been genetically stable for over 1,500 yrs (Smith *et al.*, *Nature* **356**: 428, 1992; see critique by Brasier, *Nature* **356**: 382, 1992). The oldest viable fungi known were isolated from the inner portions of Greenland glacier ice cores, including glacial ice estimated as 140,000 yrs old (Ma *et al.*, *Mycol.* **92**: 286, 2000). Some crustose lichens have been claimed to be older than 1,500 yrs, and 3,700 yrs has been presumed for a *Rhizocarpon geographicum* thallus in Alaska (Denton & Karlén, *Arctic Alp. Res.* **5**: 347, 1973). However, the tendency of individuals of some lichen species to coalesce into larger thalli makes such conclusions suspect. Studies on historical surfaces do, however, leave no doubt that some crustose lichens can live several centuries, e.g. a 620 yr *Aspicilia calcarea* thallus in Oxfordshire (Winchester, *Bot. J. Linn. Soc.* **96**: 57, 1988). In contrast, some lichens may exist for a few months or be seasonal (Poelt & Vězda, *Bibl. Lich.* **38**: 377, 1990). Fungal spores, sclerotia and other vegetative structures may retain their viability under natural conditions for periods of minutes or up to 50 years or more. With freeze drying or liquid nitrogen preservation, lyophilization and other culture collection techniques, they may retain viability in the laboratory for a period which, barring accidents and radiation-induced mutations, may be theoretically without limit. See Sussman (*in* Ainsworth & Sussman (Eds), *The Fungi* **3**: 447, 1968; review, refs.), Ellis & Roberson (*Mycol.* **60**: 399, 1968; lyophilized cultures), Hwang *et al.* (*Mycol.* **68**: 377, 1976; at ultra low temp.). See also Fairy rings, Genetic resource collections, Lichenometry, Record fungi.
- Longia** Syd. (1921) = *Haploravenelia* fide Dietel (*Nat. Pflanzenfam.* **6**, 1928).
- Longia** Zeller (1943) = *Longula*.
- longicollous**, having long beaks or necks.
- longiseptum**, see septum.
- Longoa** Curzi (1927) = *Togninia* fide Eriksson (*SA* **5**: 139, 1986), Mostert *et al.* (*Mycol.* **95**: 646, 2003).
- longuinose**, see lanate.
- Longula** Zeller (1945) = *Agaricus* L. fide Harding (*Mycol.* **49**: 273, 1957), Vellinga (*MR* **108**: 354, 2004; basidioma gasteroid) See also.
- Lopacidia** Kalb (1984), *Lecideaceae* (L). **2**, S. America. See Kalb (*Lichenes Neotropici* Fascicle VIII (nos 301-350) **8**: 2, 1984).
- Lopadiaceae** Hafellner (1984) = *Ectolechiaceae*.
- Lopadiomyces** Cif. & Tomas. (1953) nom. illegit. = *Lopadium*.
- Lopadiopsidomyces** Cif. & Tomas. (1953) = *Lopadiopsis*.
- Lopadiopsis** Vain. (1896) = *Gyalectidium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Lopadium** Körb. (1855) nom. cons., ? *Ectolechiaceae* (L). **c. 50**, widespread. See Santesson (*Symb. bot. ups. sal.* **12** no. 1: 1, 1952), Patwardhan & Makhija (*Indian J. Bot.* **4**: 20, 1981; 10 spp.).
- Lopadostoma** (Nitschke) Traverso (1906), *Xylariaceae*. Anamorph *Libertella*-like. **6**, Europe. See Eriksson (*Svensk bot. Tidskr.* **60**: 315, 1966), Rappaz (*Mycol. Helv.* **7**: 99, 1995), Granmo & Petrini (*Mycol. Helv.* **8**: 43, 1996).
- Lopezaria** Kalb & Hafellner (1990), *Ramalinaceae* (L). **1**, S. America. See Kalb & Hafellner (*Lichenes Neotropici* Fascicle XI (nos 451-475): **2**, 1990), Miadlikowska *et al.* (*Mycol.* **98**: 1088, 2006; phylogeny).
- Lopharia** Kalchbr. & MacOwan (1881), *Polyporaceae*. **13**, widespread. See Hjortstam & Ryvarden (*Syn. Fung.* **4**: 19, 1990; key), Boidin & Gilles (*BSMF* **118**: 91, 2002).
- Lophariaceae** Boidin, Mugnier & Canales (1998) = *Phanerochaetaceae*.
- Lophiaceae** H. Zogg ex Arx & E. Müll. (1975) = *Mytiliniaceae*.
- Lophidiopsis** Berl. (1890) = *Lophiostoma* fide von Arx & Müller (*Stud. Mycol.* **9**, 1975).
- Lophidium** P. Karst. (1873) [non *Lophidium* Rich. 1792, *Schizaeaceae*] = *Lophium* fide Zogg (*Beitr. Kryptfl. Schweiz* **11** no. 3, 1962).
- Lophidium** Sacc. (1878) = *Platystomum*.
- Lophiella** Sacc. (1878), *Lophiostomataceae*. **1**, Europe. See Parbery (*Aust. J. Bot.* **15**: 271, 1967).
- Lophionema** Sacc. (1883), *Lophiostomataceae*. **2 or 3**, widespread. See Chesters & Bell (*Mycol. Pap.* **120**, 1970).
- Lophiosphaera** Trevis. (1877) = *Lophiostoma* fide von Arx & Müller (*Stud. Mycol.* **9**, 1975).
- Lophiosphaerella** Hara (1948), ? *Dothideomycetes*. **1**, Asia.
- Lophiostoma** Ces. & De Not. (1863) nom. cons., *Lophiostomataceae*. Anamorph *Pleurophomopsis*-like. **83**, widespread. See Chesters & Bell (*Mycol. Pap.* **120**, 1970; key **23** spp.), Leuchtmann (*Sydowia* **38**: 158, 1986; anamorph), Holm & Holm (*Symb. bot. ups. sal.* **28** no. 2: 1, 1988; keys **28** spp.), Hyde & Aptroot (*Nova Hedwigia* **66**: 489, 1998; tropical freshwater spp.), Hyde *et al.* (*Nova Hedwigia* **70**: 143, 2000; on palms), Liew *et al.* (*Mol. Phylogen. Evol.* **16**: 392, 2000; phylogeny), Hyde *et al.* (*Fungal Diversity Res. Ser.* **7**: 93, 2002; marine taxa), Liew *et al.* (*Mycol.* **94**: 803, 2002; phylogeny), Tanaka & Harada (*Mycoscience* **44**: 85, 2003; Japan), Schoch *et al.* (*Mycol.* **98**: 1041, 2006; phylogeny), Kodsueb *et al.* (*Botanical Journal of the Linnean Society* **155**: 283, 2007; descr.).
- Lophiostomataceae** Sacc. (1883), *Pleosporales*. **15** gen. (+ 13 syn.), **138** spp. Paraphyletic as currently circumscribed.
- Lit.*: Chesters & Bell (*Mycol. Pap.* **120**, 1970), Holm (*Windahlia* **16**: 49, 1986), Kohlmeyer (*CJB* **64**: 3036, 1986), Holm & Holm (*Symb. bot. ups. sal.* **28**: 50 pp., 1988), Holm & Holm (*Symb. bot. ups. sal.* **28** no. 2, 1988; keys **28** spp.), Barr (*N. Amer. Fl. ser.* **2** **13**: 129 pp., 1990), Barr (*Mycotaxon* **45**: 191, 1992), Yuan & Zhao (*Symbiosis* **46**: 112, 1994; China), Ber-

- bee (*Mol. Biol. Evol.* 13: 462, 1996), Checa (*Mycotaxon* 63: 467, 1997; Iberian spp.), Aptroot (*Nova Hedwigia* 66: 89, 1998), Hyde *et al.* (*Nova Hedwigia* 70: 143, 2000), Liew *et al.* (*Mol. Phylogen. Evol.* 16: 392, 2000), Liew *et al.* (*Mycol.* 94: 803, 2002), Eriksson & Hawksworth (*Mycol.* 95: 426, 2003), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny), Wang *et al.* (*MR* 111: 1268, 2007; phylogeny).
- Lophiotrema** Sacc. (1878), Lophiostomataceae. 12, widespread. See Holm & Holm (*Symb. bot. upsal.* 28 no. 2, 1988), Tanaka & Harada (*Mycoscience* 44: 115, 2003; Japan), Tang *et al.* (*Persoonia* 18: 265, 2003; Hong Kong).
- Lophiotricha** Richon (1885) = *Lophiostoma* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Lophium** Fr. (1823), Mytiliniaceae. Anamorph *Papulaspora*-like. 4 (on conifers), Europe; America. See Zogg (*Beitr. Kryptfl. Schweiz* 11 no. 3, 1962), Vasil'eva (*Mikol. Fitopatol.* 35: 15, 2001; Russia), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Lophoderma** Chevall. (1822) nom. rej. prop. ≡ *Hypoderma* DC.
- Lophodermella** Höhn. (1917), Rhytismataceae. 9, widespread. See Millar in Peterson (*Recent Research in Conifer Needle Diseases*: 45, 1986), Minter (*Mycopathologia* 121: 51, 1993).
- Lophodermellina** Höhn. (1917) = *Lophodermium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Johnston (*Mycol. Pap.* 176: 239 pp., 2001).
- Lophodermina** Höhn. (1917) = *Lophodermium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Johnston (*Mycol. Pap.* 176: 239 pp., 2001).
- Lophodermium** Chevall. (1826) nom. cons., Rhytismataceae. Anamorph *Leptostroma*. 145, widespread. *L. seditiosum* (needle cast of *Pinus sylvestris*. See Darker (*Contr. Arnold Arbor.* 1: 65, 1932), Tehon (*Ill. biol. Monogr.* 13, 1935), Darker (*CJB* 45: 1399, 1967), Morgan-Jones & Hulton (*Mycol.* 71: 1043, 1979; ontogeny), Minter (*Mycol. Pap.* 147, 1981; monogr. 16 spp. on pines, key), Cannon & Minter (*Taxon* 30: 572, 1983; gen. nomencl.), Johnston (*N.Z. Jl Bot.* 27: 243, 1989; key 21 spp.), Gernandt *et al.* (*Mycol.* 93: 915, 2001; phylogeny), Johnston (*Aust. Syst. Bot.* 14: 377, 2001; Australasia), Johnston (*Mycol. Pap.* 176, 2001; spp. on monocots), Ortiz-García *et al.* (*Mycol.* 95: 846, 2003; on pines), Hou *et al.* (*CJB* 83: 37, 2005; on *Juniperus*, China), Lin *et al.* (*Mycosystema* 24: 1, 2005; China), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Lophodermopsis** Speg. (1910) nom. dub., Pezizomycotina. See Petrak & Sydow (*Annls mycol.* 34: 29, 1936).
- Lophodiscella** Tehon (1933) = *Colletotrichum* fide Sutton (*Mycol. Pap.* 141, 1977).
- Lopholeptosphaeria** Sousa da Câmara (1932) nom. dub., Dothideomycetes. No spp. Included.
- Lophomerum** Ouell. & Magasi (1966), Rhytismataceae. 6, widespread. See Johnston (*Mycotaxon* 33: 423, 1988; gen. concept).
- Lophophacidium** Lagerb. (1949), Phacidiaceae. Anamorph *Apostrasseria*. 2, widespread (north temperate). See Corlett & Shoemaker (*CJB* 62: 1836, 1984).
- Lophophyton** Matr. & Dassonv. (1899) = *Trichophyton* fide Carmichael *et al.* (*Genera of Hyphomycetes*, 1980).
- Lophothelium** Stirt. (1887) = *Polycoccum* fide Hawksworth (*Notes R. bot. Gdn Edinb.* 36: 181, 1978).
- Lophotrichaceae** Seth (1971) = Microascaceae.
- lophotrichous (lophotrichate)**, having several flagella at one or both ends.
- Lophotrichus** R.K. Benj. (1949), Microascaceae. Anamorph *Humicola*-like. 4 (coprophilous), widespread. See von Arx *et al.* (*Beih. Nova Hedwigia* 94, 1988; key), Lee & Hanlin (*Mycol.* 91: 434, 1999; DNA).
- Loramyces** W. Weston (1929), Loramycetaceae. Anamorph *Anguillospora*-like. 2, USA; Europe. See Ingold & Chapman (*TBMS* 35: 268, 1952), Digby & Goos (*Mycol.* 79: 821, 1988; posn), Gernandt *et al.* (*Mycol.* 93: 915, 2001; phylogeny), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006; phylogeny, links with *Mollisia*).
- Loramycetaceae** Dennis ex Digby & Goos (1988), Helotiales. 1 gen., 2 spp. Perhaps the most appropriate placement for *Mollisia* and its relatives.
Lit.: Digby & Goos (*Mycol.* 79: 821, 1987), Gernandt *et al.* (*Mycol.* 93: 915, 2001), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006).
- Loranitschkia** Lar.N. Vassiljeva (1990), Nitschiaceae. 1 (from wood), Sakhalin. See Vasil'eva (*Mikol. Fitopatol.* 24: 207, 1990).
- Loranthomyces** Höhn. (1909) = *Actinopeltis* fide Spooner & Kirk (*MR* 94: 223, 1990).
- lorate**, like a narrow band; strap-like in form; ligulate.
- Loratospora** Kohlm. & Volkm.-Kohlm. (1993), Planistromellaceae. 1, USA. See Kohlmeyer & Volkmann-Kohlmeyer (*SA* 12: 7, 1993), Barr (*Mycotaxon* 60: 433, 1996).
- lorchel (false morel, lorel)**, the ascoma of *Gyromitra esculenta*, which is poisonous; see gyromitrin.
- lorel**, see lorchel.
- Loreleia** Redhead, Moncalvo, Vilgalys & Lutzoni (2002), Agaricomycetes. 3, Europe; N. America. *Hymenochaetales* or *Agaricales* (*Rickenella* clade). See Redhead *et al.* (*Mycotaxon* 82: 162, 2002).
- Loricella** Velen. (1934), Helotiales. 2, former Czechoslovakia.
- Loten** Adans. (1763) nom. dub., ? Pezizomycotina.
- lotic**, habitat running water (streams). Cf. lentic.
- Loweomyces** (Kotl. & Pouzar) Jülich (1982), Meruliaceae. 2, widespread. See Jülich (*Persoonia* 11: 424, 1982).
- Loweoporus** J.E. Wright (1976) = *Perenniporia* fide Decock (*in litt.*) See, Ryvarden & Eriksson (*Prelim. Polyp. Fl. E. Afr.*: 410, 1980).
- lower fungi**, *Chytridiomycota*, *Hyphochytriomycota*, *Mycetozoa*, *Oomycota*, *Plasmodiophoromycota* and *Zygomycota*. See also phycomycetes.
- Loxophyllum** Klotzsch (1831) [non *Loxophyllum* Blume 1826, *Scrophulariaceae*] = *Cyclomyces* fide Saccardo (*Syll. fung.* 5: 1, 1887).
- Loxospora** A. Massal. (1852), Sarrameanaceae (L). c. 5, widespread. See Staiger & Kalb (*Biblthca Lichenol.* 59: 3, 1995), Kantvilas (*Herzogia* 14: 35, 2000; S hemisphere), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Nelsen *et al.* (*Lichenologist* 38: 251, 2006; Costa Rica), Lumbsch *et al.* (*Lichenologist* 39: 509, 2007; Australia), Lumbsch *et al.* (*Nova Hedwigia* 86: 105, 2008; phylogeny, chemistry).
- Loxosporaceae** Kalb & Staiger (1995) = Sarrameanaceae. See Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Lumbsch *et al.* (*Nova Hedwigia* 86: 105, 2008; phylogeny, chemistry).

- Loxosporopsis** Henssen (1995), Pertusariaceae (L). 1, USA. See Brodo & Henssen (*Biblthca Lichenol.* 58: 27, 1995), Schmitt & Lumbsch (*Mol. Phylogen. Evol.* 33: 43, 2004; chemistry, phylogeny), Lumbsch *et al.* (*Biol. J. Linn. Soc.* 89: 615, 2006; evolution, chemistry), Schmitt *et al.* (*J. Hattori bot. Lab.* 100: 753, 2006; phylogeny).
- LPS**, Instituto de Botánica C. Spegazzini (q.v.; La Plata, Argentina); founded 1935; a part of the Museo de La Plata.
- LSD**, see lysergic acid.
- Luciotrichus** R. Galán & Raitv. (1995), Pyronemataceae. 1, Spain. See Galán & Raitviir (*Czech Mycol.* 47: 271, 1995).
- Ludovicia** Trevis. (1857) [non *Ludovicia* Coss. 1856, *Leguminosae*] = *Baeomyces* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Ludwigiella** Petr. (1922) = *Selenophoma* fide Sutton (*Mycol. Pap.* 141, 1977).
- Ludwigomyces** Kirschst. (1939), Pezizomycotina. 1, Europe.
- Lueckingia** Aptroot & Umaña (2006), ? Ramalinaceae (L). 1, Costa Rica. See Aptroot *et al.* (*J. Hattori bot. Lab.* 100: 617, 2006).
- Luellia** K.H. Larss. & Hjortstam (1974), Hydnodontaceae. 3, Europe; N. America. See Larsson & Hjortstam (*Svensk bot. Tidskr.* 68: 59, 1974).
- Lulesia** Singer (1970), Tricholomataceae. 3, tropical. See Singer (*Fl. Neotrop. Monogr.* 3: 16, 1970), Lechner *et al.* (*Fungal Diversity* 21: 131, 2006; Argentina).
- Lulwoana** Kohlm., Volkm.-Kohlm., J. Campb., Spatafora & Gräfenhan (2005), Lulworthiaceae. Anamorph *Zalerion*. 1, Japan. See Campbell *et al.* (*MR* 109: 562, 2005).
- Lulwoidea** Kohlm., Volkm.-Kohlm., J. Campb., Spatafora & Gräfenhan (2005), Lulworthiaceae. 1, Denmark; Japan. See Campbell *et al.* (*MR* 109: 564, 2005).
- Lulworthia** G.K. Sutherl. (1916), Lulworthiaceae. 10 (marine), widespread. See Nakagiri (*TMSJ* 25: 377, 1985), Yusoff *et al.* (*Cryptog. Bot.* 5: 307, 1995; ultrastr.), Spatafora *et al.* (*Am. J. Bot.* 85: 1569, 1998; phylogenetic analysis), Kohlmeyer *et al.* (*Mycol.* 92: 453, 2000; morphology, DNA), Campbell (*Mycol.* 97: 549, 2005; nomencl.), Campbell *et al.* (*MR* 109: 556, 2005; phylogeny), Descals (*MR* 109: 545, 2005; phylogeny), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Lulworthiaceae** Kohlm., Spatafora & Volkm.-Kohlm. (2000), Lulworthiales. 7 gen. (+ 1 syn.), 27 spp.
Lit.: Nakagiri (*Trans. Mycol. Soc. Japan* 25: 377, 1984), Kohlmeyer & Volkmann-Kohlmeyer (*Mycol.* 81: 289, 1989), Yusoff *et al.* (*Cryptog. bot.* 5: 307, 1995), Spatafora *et al.* (*Am. J. Bot.* 85: 1569, 1998), Kohlmeyer *et al.* (*Mycol.* 92: 453, 2000), Campbell *et al.* (*Fungal Diversity Res. Ser.* 7: 15, 2002), Zuccaro *et al.* (*MR* 107: 1451, 2003), Inderbitzin *et al.* (*MR* 108: 737, 2004), Campbell *et al.* (*MR* 109: 556, 2005), Tang *et al.* (*Ant. v. Leeuwenh.* 91: 327, 2007).
- Lulworthiales** Kohlm., Spatafora & Volkm.-Kohlm. (2000). Spathulosporomycetidae. 3 fam., 11 gen., 40 spp. Fams:
 (1) **Hispidicarpomycetaceae**
 (2) **Lulworthiaceae**
 (3) **Spathulosporaceae**
 The *Hispidicarpomycetaceae* may also belong here, but molecular data are inadequate at present.
- Lit.*: Kohlmeyer *et al.* (*Mycol.* 92: 453, 2000; morphol., DNA), Kohlmeyer & Kohlmeyer (*Marine Mycology*, 1979), Nakagiri (*TMSJ* 25: 377, 1984; morphol.), Spatafora *et al.* (*Am. J. Bot.* 85: 1569, 1998; DNA).
- lumen**, the central cavity of a cell or other structure.
- Luminescent fungi**. Some fungi (40 listed by Wassink, 1979), such as species of *Panus* and *Pleurotus*, *Clitocybe illudens* (also mycelium; see Carey, *Mycol.* 66: 951, 1974), *Armillaria mellea* (mycelium in wood exposed to air), and *Xylaria hypoxylon* (mycelium) and certain bacteria, give out light, sometimes causing the attacked wood or leaves to become luminous. See Berliner (*Mycol.* 53: 84, 1962), Buller (*Researches* 3, 6), Calleja & Reynolds (*TBMS* 55: 149, 1970), Corner (*Mycol.* 42: 423, 1950; *TBMS* 37: 256, 1954), Glawe & Solberg (*Mycol.* 81: 296, 1989; early records), Murrill (*Mycol.* 7: 131, 1915), Ramsbottom (*Mushrooms and toadstools*, 1953), Wassink (*Meded. Landbouwhogeschool Wageningen* 79 (5), 1979; review, incl. physiol. basis).
- lunate**, like a new moon; crescentic (Fig. 23.9).
- Lundquistia** Vánky (2001) = *Sporisorium* fide Cunningham *et al.* (*Mycol. Balcanica* 2: 95, 2005).
- lungwort**, the lichen *Lobaria pulmonaria* from its external resemblance to a human lung; lung lichen; lungs of oak. Formerly used in folk-lore as a cure for pulmonary diseases.
- Lunospora** Frandsen (1943) = *Pseudoseptoria* fide Sutton (*Mycol. Pap.* 141, 1977).
- Lunulospora** Ingold (1942), anamorphic *Pezizomycotina*, Hso.0fH.11. 1 (aquatic), widespread.
- lupinosis**, a mycotoxicosis of sheep, caused by *Phoma leptostromiformis*; see van Warmelo & Marasas (*Mycol.* 64: 316, 1972); teleomorph *Diaporthe* (q.v.).
- luteoskyrin**, a carcinogenic toxin of *Penicillium islandicum*; a cause of hepatitis (yellow rice disease) in man. See also islandicin; cf. skyrin.
- luteous**, yellow.
- Luttrell** (Everett Stanley, 1916-1988; USA). PhD, Duke University (1940); Mycologist and plant pathologist, Georgia Experiment Station (1942-1944, 1949-1966); University of Georgia (1966-1986) where he was later D.W. Brooks Distinguished Professor of Plant Pathology. His *Taxonomy of Pyrenomycetes* (1951) was a major advance in ascomycete systematics, linking the bitunicate ascus to ascolocular ontogeny the importance of which had been stressed by Nannfeldt (q.v.). *Publs.* Loculoascomycetes. in Ainsworth, Sparrow & Sussman [eds] *The Fungi* 4A: 133 (1973) [the first critical keys to all non-lichen-forming loculoascomycete genera]; also detailed accounts of many *Helminthosporium*-like fungi and plant pathogenic ascomycetes. *Biogs, obits etc.* Hanlin & Garrett (*Phytopathology* 78: 1388, 1988) [portrait]; Hanlin & Mims (*Mycol.* 82: 9, 1990) [bibliography, portrait]; Glenn (*Inoculum* 45: 1, 1998) [portrait].
- Luttrellia** Khokhr. & Gornostaï (1978) nom. rej. = *Exserohilum* fide Kirk (*in litt.*).
- Luttrellia** Shearer (1978), Halosphaeriaceae. 4 (marine), USA. See Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 34: 1, 1991), Ferrer & Shearer (*Mycol.* 99: 144, 2007; freshwater spp.).
- Lutypha** Khurana, K.S. Thind & Berthier (1977), Typhulaceae. 1, India. See Khurana *et al.* (*TBMS* 68: 480, 1977).
- Lutziomyces** O.M. Fonseca (1939) = *Paracoccidioides*.

- Luxuriomyces** R.F. Castañeda (1988) = *Diplococcium* fide Sutton (*in litt.*).
- Luykenia** Trevis. (1860) = *Thelenella* fide Mayrhofer & Poelt (*Herzogia* 7: 13, 1985), Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Luzfridiella** R.F. Castañeda & W.B. Kendr. (1991), anamorphic *Pezizomycotina*, Hsy.1eP.24/27. 1, Cuba. See Castañeda Ruiz & Kendrick (*Univ. Waterloo Biol. Ser.* 35: 69, 1991).
- Lycogalopsis** E. Fisch. (1886), Agaricaceae. 1, widespread (tropical). See Martin (*Lilloa* 4: 69, 1939).
- lycomarasmin**, a dipeptide wilt toxin from *Fusarium bulbigenum* f.sp. *lycopersici* (Gäumann *et al.*, *Phytopath. Z.* 16: 257, 1950, 30: 87, 1957); **lycomarasmic acid** is a derivative (Gäumann & Naef-Roth, *Phytopath. Z.* 34: 426, 1959). Cf. fusaric acid.
- Lycoperdaceae** Chevall. (1826) = Agaricaceae.
- Lycoperdales** = Agaricales.
- Lycoperdastrum** Haller ex Kuntze (1891) = *Elaphomyces* fide Dodge (*Ann. Myc.* 27: 145, 1929).
- Lycoperdastrum** P. Micheli (1729) nom. inval. = *Scleroderma* fide Stalpers (*in litt.*).
- Lycoperdellon** Torrend (1913) = *Ostracoderma* fide Hennebert (*Persoonia* 7: 200, 1973).
- Lycoperdites** Poinar (2001), Fossil fungi. 1.
- Lycoperdodes** Haller ex Kuntze (1891) = *Pisolithus* fide Fischer (*Nat. Pflanzenfam.* 5b: viii, 1938).
- Lycoperdoides**, see *Lycoperdodes*.
- Lycoperdon** Pers. (1801), Agaricaceae. c. 50, widespread. The common Puff Balls. See Kreisel (*Khumbu Himal. [Ergebn. Forsch. Unternehm. Nepal Himalaya]* 6: 32, 1969; key spp. pedicellate spores), Ponce de Leon (*Fieldiana, Bot.* 32: 109, 1970; key (as *Vascellum*)), Smith (*Bull. mens. Soc. linn. Lyon Num. Spéc.* 43: 407, 1974; N. Am. (as *Vascellum*)), Demoulin (*Mycotaxon* 3: 275, 1976; key spp. peridial spherocysts), Demoulin (*Revista Biol.* 12: 65, 1983; key S. Eur.), Homrich & Wright (*CJB* 66: 1285, 1988; S. Am. (as *Vascellum*)), Kreisel (*Blyttia* 51: 125, 1993; key (as *Vascellum*)), Kreisel & Calonge (*Mycotaxon* 48: 13, 1993; as *Bovistella*), Kasuya (*Mycoscience* 45: 298, 2004; Japan), Baseia (*Mycotaxon* 91: 81, 2005; Brazil), Blaschke (*Mycologia Bavarica* 7: 21, 2005; as *Bovistella*), Larsson & Jeppson (*MR* 112: 4, 2008; phylogeny).
- Lycoperdopsis** Henn. (1899), Agaricaceae. 1, Asia (tropical). See Pegler & Young (*MR* 98: 904, 1994).
- Lylea** Morgan-Jones (1975), anamorphic *Pezizomycotina*, Hso.≡ eP.3. 3, widespread (esp. north temperate). See Holubová-Jechová (*Folia geobot. phytotax.* 13: 437, 1978), Chang (*Bot. Bull. Acad. sin. Taipei* 40: 247, 1999).
- lymabiont**, an organism only found in sewage.
- lymaphile**, an organism commonly found in sewage (Cooke, *Sydowia, Beih.* 1, 1957).
- lymaphobe**, an organism never found in sewage (Cooke, *Sydowia, Beih.* 1, 1957).
- lymaxene**, an organism rarely found in sewage (Cooke, *Sydowia, Beih.* 1, 1957).
- Lymphocystidium** Weiser (1943), ? Fungi. 1, Europe. or Protozoa. See Weiser (*Zool. Anzeiger* 142: 200, 1943).
- Lyoathelia** Hjortstam & Ryvarden (2004), ? Atheliaceae. 1, Canada. See Hjortstam & Ryvarden (*Syn. Fung.* 18: 10, 2004).
- lyocystidium**, see *cystidium*.
- Lyomices**, see *Lyomyces* P. Karst. (1881).
- Lyomyces** P. Karst. (1881) nom. rej. = *Hyphoderma* Wallr. fide Donk (*Taxon* 5: 69, 1956).
- Lyomyces** P. Karst. (1882) = *Laeticorticium* fide Donk (*Persoonia* 3: 199, 1964).
- Lyonella** Syd. (1925), *Pezizomycotina*. 1, Hawaii.
- Lyonomyces** T.N. Taylor, Hass & W. Remy (1993), Fossil Fungi. 1 (Devonian), British Isles. See Taylor *et al.* (*Mycol.* 84: 906 and fig. 19, 1992).
- lyophilization**, freeze-drying, a technique used to preserve fungal cultures in a state of suspended animation. See Genetic resource collections.
- Lyophyllaceae** Jülich (1982), Agaricales. 8 gen. (+ 6 syn.), 157 spp.
- Lyophyllopsis** Sathe & J.T. Daniel (1981), ? *Lyophyllaceae*. 1, India. See Sathe & Daniel (*Maharashtra Assoc. Cult. Sci. Monogr.* 1: 87, 1980).
- Lyophyllum** P. Karst. (1881) nom. cons. prop., *Lyophyllaceae*. c. 40, widespread (north temperate). See Clemençon (*Mycotaxon* 15: 67, 1982; staining spp.), Consiglio & Contu (*Rivista di Micologia* 45: 99, 2002; Italy), Hofstetter *et al.* (*MR* 106: 1043, 2002; phylogeny), Kalamees (*Folia cryptog. Estonica* 40: 15, 2003; Nordic spp.), Consiglio & Contu (*Micologia e Vegetazione Mediterranea* 20: 143, 2005; European collybioid spp.).
- Lyomma** Bat. & H. Maia (1965), anamorphic *Pyrenulales*, St.0fH.? (L). 3, widespread (tropical). See Aptroot *et al.* (*Bibliotheca Lichenol.* 64, 1997), Lücking *et al.* (*Lichenologist* 30: 121, 1998), Lücking & Kalb (*Bot. Jb.* 122: 1, 2000; Brazil, key).
- Lyrommothea** Bat. & T. Herrera (1972) nom. inval. = *Lyomma* fide Aptroot (*in litt.*), Lücking *et al.* (*Lichenologist* 30: 121, 1998).
- lysergic acid**, and derivatives, some of which are hallucinogenic (e.g. lysergic acid diethylamide; LSD) occur in *Claviceps sclerotia* and are the cause of paspalum staggers (q.v.); see also hallucinogenic fungi.
- lysigenous**, formed by the breaking down of cells. Cf. schizogenous.
- Lysipenicillium** Bref. (1908) = *Roumegueriella* fide Malloch & Cain (*CJB* 50: 61, 1972), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- lysis** (1) dissolution of a cell, e.g. by a lysin, see antigen; (2) (of conidial liberation), secession by the dissolution of the wall of the adjacent cell; cf. fission, fracture.
- Lysospora** Arthur (1906) = *Puccinia* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- Lysotheca** Cif. (1962), anamorphic *Pezizomycotina*, Cpd.0fH.?. 1 (on *Balladynella*), Dominican Republic. See Ciferri (*Atti Ist. bot. Univ. Lab. crittog. Pavia sér.* 5 19: 112, 1962).
- Lysuraceae** Corda (1842) = *Phallaceae*.
- Lysurus** Fr. (1823), *Phallaceae*. 5, widespread (esp. tropical). See Kasuya (*Nippon Kingakukai Kaiho* 45: 39, 2004; Japan).
- M**, Botanischen Staatssammlung München (Munich, Germany); founded 1813; funded by the State of Bavaria; see Hertel & Schreiber (*Mitt. Bot. StSamml., Münch.* 28: 81, 1988; history, collectors index).
- MA**, see *Media*.
- Maasoglossum** K.S. Thind & R. Sharma (1985), ? *Geoglossaceae*. 1, Himalaya. See Thind & Sharma (*Kavaka* 12: 37, 1985).
- Macabuna** Buriticá & J.F. Hennen (1994), anamorphic *Phakopsoraceae*. 11, widespread. Anamorph name for (II). See Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003; syn. of *Calidion*).
- macaedium**, see *mazaedium*.

- Macalpinia** Arthur (1906) = *Uromycladium* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- Macalpinomyces** Langdon & Full. (1977), ? Ustilaginaceae. 44 (on *Poaceae*), widespread. See Vánky (*Mycotaxon* 59: 115, 1996; monogr.), Vánky (*Mycotaxon* 62: 128, 1997; emend.), Vánky (*Mycotaxon* 69: 112, 1998; key), Shivas & Vánky (*Mycol. Balcanica* 2: 101, 2005; Austral.), Vánky (*Mycotaxon* 95: 1, 2006).
- Macbridella** Seaver (1909) = *Byssosphaeria* fide Samuels (*CJB* 51: 1275, 1973), Barr (*Mycotaxon* 20, 1984).
- Maccagnia** Mattir. (1922), ? Hydnangiaceae. 1, Italy.
- Macentina** Vězda (1973) = *Psoroglaena* fide Aptroot (*in litt.*), Coppins & Vězda (*Lichenologist* 9: 47, 1977), Orange (*Lichenologist* 23: 15, 1991; key), Matzer (*Mycol. Pap.* 171: 202, 1996), Aragón & Sarrión (*Nova Hedwigia* 77: 169, 2003; Spain).
- Macilvainea** Nieuwl. (1916) = *Drudeola* fide Sutton (*Mycol. Pap.* 141, 1977).
- Mackenzia** Yanna & K.D. Hyde (2002), anamorphic *Pezizomycotina*, H??.?. 1, Australia. See Yanna & Hyde (*Aust. Syst. Bot.* 15: 757, 2002).
- Mackintoshia** Pacioni & Sharp (2000), Cortinariaceae. 1, Zimbabwe. See Pacioni & Sharp (*Mycotaxon* 75: 225, 2000), Verbeken & Walley (Boll. Gruppo Micol. 'G. Bresadola' 46: 87, 2003).
- Macmillanina** Kuntze (1898) = *Disculina* fide Sutton (*Mycol. Pap.* 141, 1977).
- Macowania** Kalchbr. ex Berk. (1876) [non *Macowania* Oliv. 1870, *Compositae*] = *Macowanites*.
- Macowaniella** Doidge (1921), Asterinaceae. 2, S. Africa.
- Macowanites** Kalchbr. (1882) = *Russula*.
- Macraea** Subram. (1953) [non *Macraea* Lindl. 1828, *Geraniaceae*] = *Prathigada*.
- macro-** (prefix), long, but commonly used in the sense of mega- (q.v.).
- Macroallantina** Speer (1987), anamorphic *Delpinoina*, St.0eH.1. 1, France. See Speer (*BSMF* 103: 14, 1987).
- Macrobasis** Starbäck (1893) = *Leptosphaeria* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Macrobiotophthora** Reukauf (1912), Ancylistaceae. 2, Germany; Australia. See Reukauf (*Centralbl. Bakt. Abt. Orig.* 63: 390, 1912), McCulloch (*TBMS* 68: 173, 1977), Tucker (*Mycotaxon* 13: 481, 1981; emend., key).
- macrocephalic**, see septum.
- Macrochytrium** Minden (1902), ? Chytridiaceae. 1, Europe; N. America.
- macroconidium** (1) the larger, and generally more diagnostic conidium of a fungus which has microconidia (and sometimes also mesoconidia) in addition; (2) (infrequent), a long large conidium.
- Macrocybe** Pegler & Lodge (1998), Tricholomataceae. 7, widespread (tropics). See Pegler *et al.* (*Mycol.* 90: 496, 1998), Stijve (*AMK Mededelingen*: 93, 2004).
- macrocyclic**, see *Pucciniales* and Table 5.
- macrocyst**, see cyst.
- Macrocytidia** Joss. (1934), Marasmiaceae. 5, widespread. See Capellano (*BSMF* 92: 221, 1971; basidiospore structure), Kühner (*Hyménomycètes agaricoïdes*: 428, 1980), Anderson *et al.* (*Mycologist* 15: 132, 2001).
- Macrocytidiaceae** Kühner (1979) = Marasmiaceae.
- Macrocytis** R. Heim (1931) [non *Macrocytis* C. Agardh 1820, *Algae*] = *Macrocytidia*.
- Macrodendrophoma** T. Johnson (1904) nom. inval., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Macroderma** Höhn. (1917), Rhytismataceae. 2, N. America; Brazil.
- Macrodiaporthe** Petr. (1920), Melanconidaceae. Anamorph *Melanconium*. 2, Europe; N. America. See Barr (*Mycol. Mem.* 7, 1978).
- Macrodictya** A. Massal. (1852) = *Lasallia*.
- Macrodiplis** Clem. & Shear (1931) = *Macrodiplodiosis*.
- Macrodiplodia** Sacc. (1884), anamorphic *Pezizomycotina*, C?1eP?. 2, Europe. See Sutton (*Mycol. Pap.* 141, 1977).
- Macrodiplodina** Petr. (1962) = *Ascochyta* fide Punithalingam (*Mycol. Pap.* 142, 1979).
- Macrodiplodiopsis** Petr. (1922), anamorphic *Pezizomycotina*, St. = -#eP.19. 1, Europe; N. America. See Glawe (*Mycol.* 77: 880, 1985).
- macrofungi**, see *Macromycetes*.
- macrogonidium**, a large gonidium (obsol.); megagonidium (obsol.).
- Macrohilum** H.J. Swart (1988), anamorphic *Diaporthales*, Cpd.1eP.19. 1, Australasia. See Swart (*TBMS* 90: 288, 1988), Crous *et al.* (*Stud. Mycol.* 55: 53, 2006; phylogeny).
- Macrohyporia** I. Johans. & Ryvarden (1979), Polyporaceae. 3, widespread (tropical). See Johansen & Ryvarden (*TBMS* 72: 192, 1979).
- Macrolepiota** Singer (1948), Agaricaceae. c. 30, widespread. *M. procera*, the edible parasol mushroom. See Heinemann (*Bull. Jard. bot. nat. Belg.* 39: 201, 1969; key 11 Congo spp.), Pegler (*Kew Bull. Addit. Ser.* 6, 1977; E. Afr. spp.), Candusso & Lanzoni (*Leptota s.l.*, 1990; key Europ. spp.), Johnson (*Mycol.* 91: 443, 1998; phylogeny), Johnson & Vilgalys (*Mycol.* 90: 971, 1998; phylogeny), Vellinga (*Aust. Syst. Bot.* 16: 361, 2003; Australia), Vellinga (*Coolia* 46: 177, 2003; The Netherlands), Vellinga *et al.* (*Mycol.* 95: 442, 2003; phylogeny and taxonomy), Hausknecht & Pidlich-Aigner (*Öst. Z. Pilzk.* 13: 1, 2004; Austria), Vellinga (*MR* 108: 354, 2004; phylogeny).
- macrolichen**, one of the larger lichens of squamulose, foliose, or fruticose habit incl. spp. *Cladonia*, *Parmelia*, *Usnea*, etc.
- Macrometrula** Donk & Singer (1948), Psathyrellaceae. 1 (in glasshouse), British Isles (introduced).
- Macromycetes**. Fungi having large (macroscopic) sporocarps; larger fungi. This is an arbitrary division of the fungi which includes most (but far from all) basidiomycetes (mushrooms, puffballs, stinkhorns, toadstools etc.), and a small number of other fungi, mostly ascomycetes (cup fungi, cyttarias, morels, truffles etc.). Although in popular use, it is not always advantageous to apply the term: in conservation, for example, the result is that those working for ascomycete conservation tend to be deprived of their flagship species. Because of the interest shown by amateur mycologists, mycophagists, and others in macrofungi there are for many countries popular or semi-popular texts covering macromycetes. These works, which are appearing for an increasing number of countries, are frequently of a high mycological standard and are useful both to amateur and professional mycologists. They include:
- Regional: Africa.** General, Ryvarden *et al.* (*An introduction to the larger fungi of south central Africa*,

1994), Zoberi (*Tropical macrofungi*, 1972). **Benin**, De Kessel *et al.* (*Guide des champignons comestibles du Bénin*, 2002). **Burundi**, Buyck (*Ubwoba: les champignons comestibles de l'ouest de Burundi*, 1994). **Malawi**, Morris (*Common mushrooms of Malawi*, 1987; *Checklist of the macrofungi of Malawi* [*Kirkia* 13: 323, 1990]). **Morocco**, Malençon & Bertault (*Flore des champignons supérieures du Maroc*, 2 vols, 1975). **Tanzania**, Härkönen *et al.* (*Tanzanian mushrooms: edible, harmful and other fungi*, 2003). **Asia**. **China**, Pfister (*Champignons du Tonkin*, 1985), Yuan & Sun (*中國蕈菌原色圖集* [*Coloured atlas of mushrooms (macrofungi) in China*, in Chinese], 2007). **Japan**, Imazeki *et al.* (*Fungi of Japan* [in Japanese], 1998). **South Korea**, Kim & Kim (*Illustrated Korean mushrooms* [in Korean], 1990), Park & lee (*Korean mushrooms* [in Korean], 1999). **Sri Lanka**, Pegler (*Kew Bull. Addn. Ser.* 12, 1986). **Australasia**. **Australia**, Aberdeen (*Introduction to the mushrooms. of Queensland*, 1979; *Field companion to Australian fungi*, 1985; *A field guide to Australian fungi*, 2005), Shepherd & Totterdell (*Mushrooms and toadstools of Australia*, 1988), Young (*Common Australian fungi*, 1982), Young *et al.* (*A field guide to the fungi of Australia*, 2005). **New Zealand**, Taylor (*Mushrooms and toadstools in New Zealand*, 1970). **Caribbean**. **Dominican Republic**, Perdomo *et al.* (*Hongos comestibles de la República Dominicana, guía de Campo*, 2007). **Central America**. **Costa Rica**, Halling & Mueller (*Common mushrooms of the Talamanca mountains, Costa Rica*, 2005), Mata (*Macrohongos de Costa Rica* vol. 1, 1999), Mata *et al.* (*Macrohongos de Costa Rica* vol. 2, 2003). **Europe**. **General**, Hansen & Knudsen (*Nordic macromycetes*, 2 vols, 1992-3; Scandinavia only), Gams (*Kleine Kryptogamenflora Band IIa, Julich, Nichtblatterpilze, Gallertpilze und Bauchpilze*, Band IIb2, Lange (*Guía de campo de los hongos de Europa*, 1981), Moser, *Phycomyceten und Ascomyceten*, 1963, Bd IIb1, Moser, *Rohrlinge und Blatterpilze*, edn 5, 1983 [English edn, Phillips, 1978]), Pegler *et al.* (*Fungi of Europe*, 1993), Peter (*Das grosse Pilzbuch. Eine Pilzkunde Mitteleuropas*, 1964), *Fungi Europaei*, 1 Cappelli, *Agaricus*, 1984, 2 Alessio, *Boletus*, 1985, suppl. 1991, 3 Riva, *Tricholoma*, 1988, 4 Candusso & Lanzoni, *Lepiota*, 1990, 5 Noordeloos, *Entoloma*, 1992). **British Isles**, Buczacki (*Fungi of Britain and Europe*, 1989), Hofmann (*Field guide to mushrooms and other fungi of Britain and Europe*, 2006), Pegler (*Field guide to mushrooms and toadstools of Britain and Europe*, 1990), Wakefield & Dennis (*Common British fungi*, 1950; edn 2, 1981), Watling (*Identification of larger fungi*, 1973), see also Holden, *Guide to the literature for the identification of British fungi*, edn 4, 1982. **Bulgaria**, Sechanov ([*Fungi of Bulgaria*] edn 2, 1957). **Czech Republic**, Papoušek (*Velký fotoatlas hub* [in Czech], 2004). **Denmark**, Lange (*Illustreret svampeflora*, 1961 [also English, French and German versions]; *Soppflora*, 1991). **France**, Costantin & Dufour (*Nouvelle flore des champignons*, 1891 [and later editions]), Rolland (*Atlas des champignons de France, Suisse et Belgique*, 1910), Heim (*Les champignons d'Europe*, 2 vols, 1957 [edn 2 (1 vol.), 1969]), Maublanc (*Les champignons comestibles et veneneux de France*, edn 6 [by Viennot-Bourgin], 2 vols, 1971), Romagnesi (*Petit atlas des champignons*, 3 vols, 1962-63; *Nouvelle atlas des champignons*, 4

vols, edn 2, 1970), Marchand (*Champignons de Nord et du Midi*, 9 vols, 1972-86), Moreau (*Larousse des champignons*, 1978; *Guide des champignons comestibles et vénéneux*, 1984). **former Czechoslovakia**, Pilát (*Nase Houby*, 1952 [English transl., *Mushrooms*, 1954]; *Houby Ceskoslovenska*, 1969; spp. grouped ecologically). **Germany**, Ricken (*Die Blatterpilze (Agaricaceae) Deutschlands*, 1915), Gerhardt (*Pilze*, 2 vols, 1984-5), Hennig (*Taschenbuch fur Pilzefreunde*, 1964 [Aufl. 2, 1966]), Michael & Hennig (*Handbuch fur Pilzfreunde*, 6 vols, 1964-75 [and later edns by Kreisel]), Kreisel (Ed.) (*Pilzflora der DDR*, 1987). **Greece**, Diamandis (*Τα μανιτάρια της Ελλάδος* [*Fungi of Greece*, in Greek], 1992, edn 2 expected late 2008), Pantidou (*Mushrooms in the forests of Greece*, 1991). **Italy**, Cetto (*Enzyklopadie der Pilze*, 4 vols, 1987-8), Goidanich & Govi (*Funghi e ambiente*, 1982), Pacioni (*I funghi nostrani*, 1980), Venturella (*Funghi di Sicilia*, 1997). **Netherlands**, Arnolds *et al.* (*List of fungi in the Netherlands*, 1989), Arnolds & Veerkamp (*Gids voor de paddestoelen in het meetnet*, 1999), Bas *et al.* (*Flora Agaricina Neerlandica*, 1988-). **Spain**, Calonge (*Setas (Hongos), guía ilustrada*, 1990), Calonge & Reche (*Las setas de la Comunidad de Madrid*, 1991), Llamas Frade & Terrón Alfonso (*Guía de hongos de la península Ibérica*, 2005). **Sweden**, Cortin (*Svamp-plockarens handbok*, 1942), Nilsson & Persson (*Svampar i naturen*, 2 vols, 1977), Ryman & Holmåsén (*Svampar*, 1984). **Switzerland**, Breitenbach & Kranzlin (*Fungi of Switzerland 1 Ascomycetes*, 1981, 2 Non-gilled fungi, 1986, 3 Boletes and agarics, 1991 [English, French and German edns]), Cléménçon (*Les quatre saisons des champignons*, 2 vols, 1980). **Middle East**. **Israel**, Wasser (*Edible and poisonous mushrooms of Israel*, 1995). **N. America**. **General**, Phillips (*Mushrooms of North America*, 1991). **Canada**, Barron (*Mushrooms of Ontario and eastern Canada*, 1999), Groves (*Edible and poisonous mushrooms of Canada*, 1979), Pomerleau (*Mushrooms of eastern Canada and the United States*, 1951; *Flore des champignons de Quebec*, 1980), Schalkwijk-Barendsen (*Mushrooms of western Canada*, 1991). **Mexico**, Blanco *et al.*, in Vega & Bousquets (Eds) (*Hongos Macroscopicos*, 1993). **USA**, Atkinson (*Studies of American fungi: mushrooms, edible, poisonous, etc.*, 1903 [reprint 1961], Christensen (*Common fleshy fungi*, 1946 [edn 3, 1965]), Krieger (*The mushroom handbook*, edn 2, 1936 [reprint 1967]), Lincoff (*Audubon field guide to North American mushrooms*, 1981), Metzler & Metzler (*Texas mushrooms*, 1992), Miller (*Mushrooms of North America*, 1974), Phillips (*Mushrooms of North America*, 1991), Smith (*The mushroom hunter's field guide*, 1958 [edn 3, 1980], *Field guide to western mushrooms*, 1975), States (*Mushrooms and truffles of the south-west*, 1990). **South America**. **Argentina**, Gamundí & Horak (*Hongos de los bosques Andino=Patagónicos*, 1993). **Chile**, Furci & Nascimento (*Fungi austral, guía de campo de los hongos más vistosos de Chile*, 2007). **Colombia**, Franco *et al.* (*Setas de Colombia, Agaricales, Boletales y otros hongos, guía de campo*, 2000).

Coloured plates. The following are important series of coloured reference plates (mostly of agarics but other groups sometimes included): Fries (*Icones selectae Hymenomycetum*, 1867-84), Cooke (*Illustrations of British fungi (Hymenomycetes)*, 8 vols,

- 1881-1891; index, *TBMS* 20: 33, 1935), Konrad & Maublanc (*Icones selectae fungorum*, 6 vols, 1924-36), *BSMF* 41- (1925-) includes supplementary coloured plates constituting an Atlas), Bresadola (*Iconographia mycologica*, 28 vols, 1927-60; vol. 2 by Gilbert, + 3 suppl.), Cetto (*Der Grosse Pilzführer*, 3 vols, 1979), Dahncke & Dahncke (*700 Pilze in Farbfotos*, 1980), Lange (*Flora agaricina danica*, 5 vols, 1935-41), Romagnesi (*Nouvelle atlas des champignons*, 4 vols, edn 2, 1970), Reid *et al.* (*Fungorum rariorum icones coloratae*, 1966-), Phillips (*Mushrooms and other fungi of Great Britain and Europe*, 1981), Moser & Jülich (*Coloured atlas of Basidiomycetes*, 1986-). See further Bolton, Boudier, Bulliard, Greville and Sowerby. See also Watling & Watling (*A literature guide for identifying mushrooms*, 1980; by fam., gen. and geogr. region), Moser & Jülich (*Farbatlas der Basidiomyceten*, 1985). There is an increasing number of guides becoming available on the internet, although quality is more variable.
- macronematous** (of conidiophores), morphologically different from vegetative hyphae (cf. micronematous).
- Macronemeae**, hyphomycetes having conidia unlike the hyphae and the conidiophores. Cf. Micronemeae.
- Macronodus** G.F. Orr (1977) = *Gymnoascus* fide von Arx (*Persoonia* 9: 393, 1977).
- Macroön** Corda (1833) ? = *Helminthosporium* fide Saccardo (*Syll. fung.* 4: 403, 1886). Synonymy is doubtful fide Sutton (*in litt.*).
- Macrophoma** (Sacc.) Berl. & Voglino (1886), *Botryosphaeriaceae*. See Petrak & Sydow (*Beih. Rep. spec. nov. regn. veg.* 42, 1927; redispersions into *Diplodia*), Phillips & Lucas (*Sydowia* 49: 150, 1997), Denman *et al.* (*Stud. Mycol.* 45: 129, 2000; phylogeny), Slippers *et al.* (*Mycol.* 96: 83, 2004; *Botryosphaeria dothidea* aggregate), Phillips *et al.* (*Mycopathologia* 159: 433, 2005; phylogeny).
- Macrophomella** Died. (1916) = *Lasiodiplodia* fide Petrak & Sydow (*Feddes Repert.* 42: 1, 1927).
- Macrophomina** Petr. (1923), anamorphic *Botryosphaeriaceae*, Cpd.0eH.15. 2, widespread. *M. phaseolina* (syn. *Rhizoctonia bataticola*), an important root-parasite in warmer regions. See Goidànich (*Ann. Sper. agr.* N.S. 1: 449, 1947), Dhingra & Sinclair (Eds) (*An annotated bibliography of Macrophomina phaseolina, 1905-1976*, 1977; 904 refs.), Punithalingam (*Nova Hedwigia* 38: 339, 1983; cytology), Jones *et al.* (*CJB* 76: 694, 1998; minichromosomes), Harrington *et al.* (*Pl. Dis.* 84: 83, 2000; diagnostics), Mena-Portales *et al.* (*Boln Soc. Micol. Madrid* 25: 265, 2000; Mexico), Vandemark *et al.* (*Mycol.* 92: 656, 2000; genetic variation), Almeida *et al.* (*Fitopatol. Brasil* 28: 279, 2003; Brazil, genetic variation), Jana *et al.* (*Can. J. Microbiol.* 51: 159, 2005; genetic differentiation), Jana *et al.* (*MR* 109: 81, 2005; population studies), Crous *et al.* (*Stud. Mycol.* 55: 235, 2006; phylogeny), Reyes-Franco *et al.* (*J. Phytopath.* 154: 447, 2006; pathogenicity, genetic variation), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Macrophomopsis** N.E. Stevens & Baechler (1926) = *Lasiodiplodia* fide Petrak & Sydow (*Feddes Repert.* 42: 1, 1927).
- Macrophomopsis** Petr. (1924) = *Fusicoccum* fide Pennycook & Samuels (*Mycotaxon* 24: 445, 1985).
- macrophylline** (of foliose lichens), having large lobes (obsol.).
- Macrophyllosticta** Sousa da Câmara (1929) = *Phyllosticta* fide Sutton (*Mycol. Pap.* 141, 1977).
- macroplasmodium**, used for the large plasmodium of *Physarum polycephalum*.
- Macroplodia** Westend. (1857) nom. rej. = *Sphaeropsis* Sacc. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Macroplodiella** Speg. (1908) = *Phoma* Sacc. fide Clements & Shear (*Gen. Fung.*, 1931).
- Macropodia** Fuckel (1870) = *Helvella* fide Dissing (*Dansk bot. Ark.* 25 no. 1, 1966).
- Macropyrenium** Hampe ex A. Massal. (1860) = *Ocellularia* fide Hale (*Bull. Br. Mus. nat. hist. Bot.* 8: 227, 1981).
- Macrorhabdus** Tomasz., Logan, Snowden, Kurtzman & Phalen (2003), anamorphic *Saccharomycetales*, H??.?. 1 (in bird guts), widespread. See Tomaszewski *et al.* (*Int. J. Syst. Evol. Microbiol.* 53: 1204, 2003), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- macroscopic**, visible without a lens.
- Macroscyphus** Nees ex Gray (1821) = *Helvella* fide Dissing (*Dansk bot. Ark.* 25 no. 1, 1966), Rifai (*Reinwardtia* 7: 376, 1968).
- Macroseptoria** Petr. (1923) = *Trichoseptoria* fide Clements & Shear (*Gen. Fung.*, 1931).
- Macrospora** Fuckel (1870), *Pleosporaceae*. Anamorph *Nimbya*. 3, Europe. See Simmons (*Sydowia* 41: 314, 1989; anamorph), Shoemaker & Babcock (*CJB* 70: 1617, 1992), Barr (*SA* 12: 27, 1993; posn), Fallah & Shearer (*Mycotaxon* 67: 85, 1998), Johnson *et al.* (*Mycotaxon* 84: 413, 2002; N America).
- macrospore**, a large spore when there are spores of two sizes.
- Macrosporiaceae** Nann. (1934) = *Pleosporaceae*.
- Macrosporites** Renault (1899), Fossil Fungi. 3 (Carboniferous), Germany.
- Macrosporium** Fr. (1832) nom. rej. prop. = *Alternaria* fide Hughes (*CJB* 36: 727, 1958).
- Macrostilbum** Pat. (1898) nom. dub., anamorphic *Pezizomycotina*, Hsy.0eH.?. 1, Java. See Seifert (*TBMS* 85: 123, 1985).
- Macrothelia** M. Choisy (1949) = *Amphisphaeria* fide Santesson (*Bull. Soc. linn. Lyon* 23: 103, 1954).
- Macrotrichum** Grev. (1825), anamorphic *Pezizomycotina*, Hso.0eH/≡ eH.?. 2, British Isles.
- Macrotyphula** R.H. Petersen (1972), *Typhulaceae*. 6, widespread. See Berthier (*Bull. mens. Soc. linn. Lyon Num. Spéc.* 46: 213, 1976), Dentinger & McLaughlin (*Mycol.* 98: 746, 2006; phylogeny).
- Macrovalsaria** Petr. (1962), *Dothideomycetes*. 1, widespread (tropical). See Sivanesan (*TBMS* 65: 395, 1975), Barr (*Mycotaxon* 49: 129, 1993; posn).
- Macroventuria** Aa (1971), *Pleosporales*. 2, Africa; USA. See Aa (*Persoonia* 6: 359, 1971), Kodsueb *et al.* (*Mycol.* 98: 571, 2006; phylogeny).
- Macruropyxis** Azbukina (1972), *Uropyxidaceae*. 1 (on *Fraxinus* (*Oleaceae*)), former USSR. See Azbukina (*Komarovskie Ctenija (Moscow & Leningrad)* 19: 20, 1972).
- maculate**, spotted; blotched.
- Maculatifrondes** K.D. Hyde (1996), ? *Phyllachorales*. Anamorph *Cyclodomus*. 1 (on *Palmae* fronds), Ecuador. See Hyde *et al.* (*MR* 100: 1509, 1996), Hyde & Cannon (*Mycol. Pap.* 175: 114, 1999).
- Maculatipalma** J. Fröhl. & K.D. Hyde (1995), *Diaporthales*. 1 (on *Palmae*), Australia. See Fröhlich &

- Hyde (*MR* 99: 727, 1995).
- maculicole** (adj. **-icolous**), an organism living on spots, e.g. leaf spots.
- Madura foot**, see mycetoma.
- maduramycosis**, see mycetoma.
- Madurella** Brumpt (1905), anamorphic *Sordariales*, Hsy.0eP.?. 10 (on humans causing mycetoma, q.v.), widespread (esp. tropical). See Ciferri & Redaelli (*Mycopathologia* 3: 182, 1941), Ahmed *et al.* (*J. Clin. Microbiol.* 40: 1031, 2002; Sudan), Ahmed *et al.* (*J. Clin. Microbiol.* 41: 4537, 2003; clonality), El-labib *et al.* (*Mycoses* 46: 321, 2003; Libya), Hoog *et al.* (*Mycoses* 47: 121, 2004; phylogeny, typification, exclusion of *M. grisea*), Vilela *et al.* (*Mycopathologia* 158: 415, 2004; Brazil), Sande *et al.* (*J. Clin. Microbiol.* 43: 4349, 2005; population biology).
- Magdalaenaea** G. Arnaud (1952), anamorphic *Pezizomycotina*, Hso.1bH.?. 1, Europe; Asia. See Arnaud (*BSMF* 68: 209, 1952), Sati *et al.* (*Mycotaxon* 81: 445, 2002; India).
- magic mushrooms**, typically hallucinogen-containing species of *Psilocybe*, and also *Gymnopilus*, *Panaeolus*, *Conocybe*, and *Amanita muscaria*; hallucinogenic fungi (q.v.).
- Magmopsis** Nyl. (1875) = *Arthopyrenia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Magnaporthaceae** P.F. Cannon (1994), *Sordariomycetidae* (inc. sed.). 13 gen. (+ 14 syn.), 93 spp.
Lit.: Bunting *et al.* (*Phytopathology* 84: 1097, 1994), Cannon (*SA* 13: 25, 1994), Augustin *et al.* (*J. Phytopath.* 147: 109, 1999), Bryan *et al.* (*MR* 103: 319, 1999), Chen *et al.* (*Mycol.* 91: 84, 1999), Kumar *et al.* (*Genetics Bethesda* 152: 971, 1999), Ward & Bateman (*New Phytol.* 141: 323, 1999), Kusaba *et al.* (*Ann. phytopath. Soc. Japan* 65: 588, 1999), Ulrich *et al.* (*New Phytol.* 145: 127, 2000), Winka & Eriksson (*Mycoscience* 41: 97, 2000), Bussaban *et al.* (*Mycol.* 97: 1002, 2005), Réblová (*Mycol.* 98: 68, 2006).
- Magnaporthe** R.A. Krause & R.K. Webster (1972), *Magnaporthaceae*. Anamorph *Pyricularia*. 5, widespread (esp. tropical). *M. grisea* (rice blast; anamorph *Pyricularia oryzae*). See Barr (*Mycol.* 69: 952, 1977), Tsuda & Ueyama (*TMSJ* 19: 425, 1978; teleomorph formation), Kato (*Ann. phytopath. Soc. Japan* 60: 266, 1994; *M. grisea* phylogeny), Kato *et al.* (*Ann. phytopath. Soc. Japan* 60: 175, 1994; *M. grisea* microconidia), Zeigler *et al.* (*Rice blast disease*, 1994), Bunting *et al.* (*Phytopathology* 86: 398, 1996; ITS), Roumen *et al.* (*Eur. J. Pl. Path.* 103: 363, 1997; Europ. pops.), George *et al.* (*Phytopathology* 88: 223, 1998; PCR), Kusaba *et al.* (*Ann. phytopath. Soc. Japan* 64: 125, 1998; host range), Viji & Gnanamanickam (*Pl. Dis.* 82: 36, 1998; India), Kumar *et al.* (*Genetics Bethesda* 152: 971, 1999; population biology, India), Kim *et al.* (*Molecules and Cells* 10: 127, 2000; microsatellites), Couch & Kohn (*Mycol.* 94: 683, 2002; differentiation of *M. oryzae*), Farman (*Phytopathology* 92: 245, 2002; on *Lolium*), Ikeda *et al.* (*Molecular Microbiology* 45: 1355, 2002; genetics), Gilbert *et al.* (*Applied Mycology and Biotechnology* 4: [331, 2004; functional genomics), Javan-Nikkhah *et al.* (*Eur. J. Pl. Path.* 110: 909, 2004; Iran), Rathour *et al.* (*J. Phytopath.* 152: 304, 2004; India, population structure), Tosa *et al.* (*Phytopathology* 94: 454, 2004; on *Lolium*), Consolo *et al.* (*Mycopathologia* 160: 285, 2005; mating types, Argentina), Couch *et al.* (*Genetics Bethesda* 170: 613, 2005; evolution), Dean (*Nature Lond.* 434 no. 7036: 980, 2005; whole genome), Farman & Kim (*Molecular Plant Pathology* 6: 287, 2005; telomeres), Piotti *et al.* (*J. Phytopath.* 153: 80, 2005; Italy), Bussaban *et al.* (*Mycol.* 97: 1002, 2005; anamorph), Ninh Thuan *et al.* (*Eur. J. Pl. Path.* 114: 381, 2006; Vietnam), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny), Ebbole (*Ann. Rev. Phytopath.* 45: 437, 2007; model organism).
- Magninia** M. Choisy (1929) = *Lecanora* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Magnisphaera** J. Campb., J.L. Anderson & Shearer (2003), *Halosphaeriaceae*. 2, widespread. See Campbell *et al.* (*Mycol.* 95: 546, 2003), Pang & Jones (*Nova Hedwigia* 78: 269, 2004).
- Magnosporites** Rouse (1962), *Fossil Fungi ? Fungi*. 1 (Paleogene), Canada.
- Magnusia** Sacc. (1878) [non *Magnusia* Klotzsch 1854, *Begoniaceae*] ≡ *Kernia* Nieuwl.
- Magnusiella** Sadeb. (1893) = *Taphrina* fide Mix (*Kansas Univ. Sci. Bull.* 33: 1, 1949).
- Magnusiomyces** Zender (1925), *Dipodascaceae*. Anamorph *Saprochaete*. 1, widespread. See de Hoog *et al.* (*Stud. Mycol.* 29, 1986), Hoog & Smith (*Stud. Mycol.* 50: 489, 2004).
- Magnusson** (Adolf Hugo; 1885-1964; Sweden). School teacher, Gothenburg (1909-1948). Devoted spare time to lichenology making invaluable contributions to knowledge of the lichens of China, Hawaii (partly with Zahlbruckner, q.v.) and Scandinavia, and to the genera *Acarospora*, *Caloplaca*, *Lecidea* and *Lecanora*. He described about 900 new species in c. 150 papers. *Publs.* A monograph of the genus *Acarospora*. *Kungliga Svenska Vetenskapsakademiens Handlingar* (1929); *Acarosporaceae und Thelocarpaceae. Rabenhorst's Kryptogamen-Flora von Deutschland, Oesterreich und der Schweiz* (1935). Collection of c. 70,000 specimens in Uppsala (UPS). *Biogs, obits etc.* Almborn (*Botaniska Notiser* 117: 428, 1964); Degelius (*Svensk Botanisk Tidskrift* 59: 393, 1965); Grumann (1974: 478); Stafleu & Cowan (*TL-2* 3: 247, 1981).
- Magnussonioliichen** Tomas. & Cif. (1952) = *Polyblastia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Magnussoniomyces** Cif. & Tomas. (1953) ≡ *Magnussonioliichen*.
- Magoderna** Steyaert (1973) = *Amauroderma* Murrill fide Ryvarden (*Syn. Fung.* 5: 180, 1991).
- Mahabalella** B. Sutton & S.D. Patil (1966), anamorphic *Pezizomycotina*, Hso.0eH.15. 3, India; Europe. See Sutton & Patil (*Nova Hedwigia* 11: 203, 1966), Mel'nik *et al.* (*Mikol. Fitopatol.* 37: 54, 2003; Austria).
- Mahanteshamomyces** Hosag. (2004), anamorphic *Asterinaceae*. 1, India. See Hosagoudar (*J. Econ. Taxon. Bot.* 28, 2004).
- Mahevia** Lagarde (1917) = *Hirsutella* fide Kendrick & Carmichael in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 390, 1973).
- Mainsia** H.S. Jacks. (1931) = *Gerwasia* fide Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983).
- Maire** (René Charles Joseph Ernest; 1878-1949; France, later Algeria). Professor of Botany, University of Algiers (1911-1949). Noted for his contributions to fungal cytology, the anatomy of *Russula*, and biodiversity studies of the fungi of north Africa, Catalonia and Greece. *Publs.* *Fungi Catalaunici*. Se-

- ries altera. Contributions a la flore mycologique de la Catalogne. *Publicaciones. Junta de Ciències Naturals de Barcelona* (1933); (with Werner) *Fungi Marroccani. Mémoires de la Société des Sciences Naturelles du Maroc* (1937); (with J. Politis) *Fungi Hellenici. Catalogue raisonné des champignons connus jusqu'ici en Grèce. Actes de l'Institut Botanique de l'Université d'Athènes* (1940). *Biogs, obits etc.* Feldmann & Guinier (*Bulletin de la Société d'Histoire Naturelle de l'Afrique de Nord* 41: 65, 1952, bibliography); Grumann (1974: 336); Kühner (*BSMF* 69: 7, 1953) [portrait]; Stafleu & Cowan (*TL*-2 3: 257, 1981).
- Maireella** Syd. ex Maire (1908) = *Gibbera* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Maireina** W.B. Cooke (1961) = *Cyphellopsis* fide Donk (*Reinwardtia* 1, 1951).
- Maireomyces** Feldmann (1941) nom. dub., ? Fungi. See Kohlmeyer & Kohlmeyer (*Marine Mycology*, 1979).
- Majewskia** Y.B. Lee & K. Sugiy. (1986), Laboulbeniaceae. 1, Japan. See Lee & Sugiyama (*Mycol.* 78: 289, 1986).
- Malacaria** Syd. (1930), Tubeufiaceae. 2 (on *Meliola* etc.), pantropical. See Rossman (*Mycol. Pap.* 157, 1987; key), Johnston (*N.Z. J. Bot.* 37: 289, 1999).
- malaceoid venation**, see veins.
- Malacharia** Fée (1843) ? = *Cerebella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Malacodermis** Bubák & Kabát (1912) = *Glutinium* fide Höhnelt (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt. 1* 125: 27, 1916).
- Malacodermum** Marchand (1896) nom. dub., Fungi. See Donk (*Taxon* 6: 84, 1957).
- Malacodon** Bataille (1923) nom. dub., Cantharellales. See Donk (*Taxon* 5: 102, 1956).
- malacoid**, like mucilage.
- Malacosphaeria** Syd. (1924) = *Eriosphaeria* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Malacostroma** Höhn. (1920) [non *Malacostroma* Gürich 1906, fossil ? *Algae*] = *Phomopsis* (Sacc.) Bubák. fide Petrak (*Annls mycol.* 19: 176, 1921).
- Malajczukia** Trappe & Castellano (1992), Mesophelliaceae. 8, Australia; New Zealand. See Trappe *et al.* (*Aust. Syst. Bot.* 5: 618, 1992).
- Malassezia** Baill. (1889), anamorphic *Malasseziales*. 7 (on humans), widespread. See Anthony *et al.* (*Microb. Ecol. Health Dis.* 7: 161, 1994; epidemiology), Guillot & Guého (*Antonie van Leeuwenhoek* 67: 297, 1995; mol. phylogeny), Guillot *et al.* (*Antonie van Leeuwenhoek* 67: 173, 1995; nomencl.), Guillot *et al.* (*Antonie van Leeuwenhoek* 69: 337, 1996; taxonomy), Boekhout *et al.* (*Medical Mycol.* 36: 365, 1998; PFGE, RAPD), Guillot *et al.* (*Medical Mycol.* 36: 220, 1998; review), Guillot & Bond (*Medical Mycol.* 37: 295, 1999; review *M. pachydermatis*), Begerow *et al.* (*MR* 104: 53, 2000; mol. phylogeny), Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 1351, 2000; mol. phylogeny), Morishita *et al.* (*Mycopathologia* 161: 61, 2006; molecular analysis), Xu *et al.* (*Proc. natn Acad. Sci. U.S.A.* 104: 18730, 2007; phylogeny). See pityriasis versicolor.
- Malasseziales** R.T. Moore (1980). Ustilaginomycotina. 1 gen., 7 spp. Causing pityriasis versicolor (q.v.) of humans. No families recognized.
- Lit.* Moore (*Bot. Mar.* 23: 361, 1980; used for all *Basidioblastomycetes* lacking ballistospores (e.g. *Cryptococcus*, *Rhodotorula*, *Schizoblastosporon*, *Trichosporon*, *Vanrija*), Begerow *et al.* (*MR* 104: 59, 2000; emend. to those belonging in *Ustilaginomycetes*), Begerow *et al.* (*Mycol.* 98: 906, 2006; phylogeny).
- Malbranchea** Sacc. (1882), anamorphic *Myxotrichum*, Hso.0eH.40. 18, widespread. Also anamorphic *Onygenaceae*; teleomorphs *Auxarthron*, *Uncinocarpus*. See Sigler & Carmichael (*Mycotaxon* 4: 412, 1976; key), Currah (*Mycotaxon* 24: 1, 1985), Martínez *et al.* (*TBMS* 86: 490, 1986; conidiogenesis), Sigler *et al.* (*Mycotaxon* 28: 119, 1987; synanamorph), Okada *et al.* (*Mycoscience* 36: 385, 1995; ubiquinones, biochemistry), Sugiyama *et al.* (*Mycoscience* 40: 251, 1999; phylogeny), Sigler *et al.* (*Stud. Mycol.* 47: 111, 2002; teleomorphs).
- Malenconia** Bat. & H. Maia (1960) = *Coccomyces* fide von Arx (*in litt.*).
- malformin**, a plant-malforming cyclic pentapeptide from *Aspergillus niger* (Takahashi & Curtis, *Plant Physiol.* 36: 30, 1961).
- Malinvernina** Rabenh. (1857) = *Podospora* fide Lundqvist (*Symb. bot. upsala.* 20 no. 1, 1972).
- Malleomyces** Hallier (1870) nom. dub., anamorphic *Pezizomycotina*. See Rivolta (*Parass. Veg.*, 1884).
- Mallochia** Arx & Samson (1986), ? *Onygenaceae*. 1, paleotropical. See von Arx & Samson (*Persoonia* 13: 185, 1986), Solé *et al.* (*MR* 106: 388, 2002; phylogeny), Udagawa & Uchiyama (*Stud. Mycol.* 47: 181, 2002; revision).
- Mallotium** (Ach.) Gray (1821) = *Leptogium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Malmella** C.W. Dodge (1933) = *Erioderma* fide Galloway & Jørgensen (*Lichenologist* 7: 139, 1975).
- Malmeomyces** Starbäck (1899), Niessliaceae. 1 (on bamboo), Brazil. See Rossman (*Mycotaxon* 8: 537, 1979), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Malmgrenia** Vain. (1939) = *Cryptothele* fide Jørgensen & Henssen (*Taxon* 39: 343, 1990).
- Malmia** M. Choisy (1931) = *Rinodina* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Malotium** Velen. (1934), Helotiales. 9, former Czechoslovakia.
- Malthomyces** K.D. Hyde & P.F. Cannon (1999), ? *Phyllachoraceae*. 2 (on *Palmae* fronds), India; Sri Lanka. See Hyde & Cannon (*Mycol. Pap.* 175: 114, 1999).
- malting**, see brewing.
- maltoryzine**, a metabolite of *Aspergillus oryzae* var. *microsporus*; toxic for cattle (Iizuka & Iida, *Nature* 196: 681, 1962).
- Malupa** Y. Ono, Buriticá & J.F. Hennen (1992), anamorphic *Pucciniales*. 15, widespread (tropical). Anamorph name for (II). See Ono *et al.* (*MR* 96: 828, 1992).
- Malustela** Bat. & J.A. Lima (1960) = *Curvularia* fide Ellis (*Mycol. Pap.* 106, 1966).
- Malvinia** Döbbeler (2003), ? *Ostropales*. 1, Falkland Islands. See Döbbeler (*Nova Hedwigia* 76: 19, 2003).
- Mamiania** Ces. & De Not. (1863), Diaporthales. 3, widespread (north temperate). See Barr (*Mycol. Mem.* 7, 1978), Monod (*Beih. Sydowia* 9: 1, 1983).
- Mamianiella** Höhn. (1917), Diaporthales. Anamorph *Mazzantiella*. 1 (on *Corylus*), Europe; N. America. See Barr (*Mycol. Mem.* 7, 1978).
- Mamillisphaeria** K.D. Hyde, S.W. Wong & E.B.G.

- Jones (1996), ? Massariaceae. 1, Australia. See Hyde *et al.* (*Nova Hedwigia* 62: 513, 1996).
- Mammaria** Ces. ex Rabenh. (1854), anamorphic *Pseudocercophora*, Hso.0eP.10. 1, Europe; N. America. See Hughes (*Beih. Sydowia* 1: 359, 1957), Park (*TBMS* 60: 351, 1973), Subramanian & Sekar (*Journal of the Singapore National Academy of Science* 15: 58, 1986; teleomorph).
- Mammariopsis** L.J. Hutchison & J. Reid (1988), anamorphic *Pezizomycotina*, Hso.0eH.38; Hso.0-1eH.1/10; Hso.0eH.15. 1, New Zealand. See Hutchison & Reid (*N.Z. J. Bot.* 26: 94, 1988).
- mammiform**, breast-like in form.
- Manaustrum** Cavalc. & A.A. Silva (1972) = *Strigula* fide Lücking *et al.* (*Lichenologist* 30: 121, 1998).
- Manginella** Bat. & H. Maia (1961), anamorphic *Pezizomycotina*, Cpt.0eP.?. 2, Brazil. See Batista & Maia (*Publções Inst. Micol. Recife* 338: 23, 1961), Farr (*Mycol.* 78: 269, 1986).
- Manginia** Viala & Pacottet (1904) = *Sphaceloma* fide Jenkins & Bitancourt (*Mycol.* 33: 338, 1941).
- Manginiella**, see *Mauginiella*.
- Manginula** G. Arnaud (1918) nom. dub., anamorphic *Pezizomycotina*. 5 (recent & fossil), N. America; Australia. See Lange (*Aust. J. Bot.* 17: 565, 1969), Sutton (*Mycol. Pap.* 141, 1977).
- Manginulopsis** Bat. & Peres (1963) = *Leptothyrium* fide von Arx (*K. Ned. Akad. Wet. Amst.* 66: 172, 1963).
- Manglicola** Kohlm. & E. Kohlm. (1971), *Hypsostromataceae*. 2, Guatemala; Guyana. See Huhndorf (*Mycol.* 86: 266, 1994).
- Mangrovispora** K.D. Hyde & Nakagiri (1991), ? *Phyllachorales*. 1 (dead wood, trop. marine), Australia. See Wang & Hyde (*Fungal Diversity* 3: 159, 1999; placement).
- Manikinipollis** Krutzsch (1970), Fossil Fungi ? Fungi. 1 (Miocene), former USSR.
- Manilaea** Syd. & P. Syd. (1914) = *Arthonia* fide Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952).
- Manina** Adans. (1763) nom. dub., *Clavariaceae*. See Donk (*Reinwardtia* 2: 441, 1954).
- Manina** Banker (1912) = *Herichium* Pers. fide Donk (*Taxon* 5: 69, 1956).
- manna**, see *Sphaerothallia*.
- Mannia** Trevis. (1857) [non *Mannia* Opiz 1829, *Hepaticae*] = *Buellia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- mannitol**, a polyhydric alcohol, often found as a storage compound in ectotrophic mycorrhizal mantles and lichens.
- manocyst** (of *Phytophthora*), a projection (receptive papilla) from the oogonium which undergoes fusion with the antheridium.
- Manoharachariomyces** N.K. Rao, D.K. Agarwal & Kunwar (2005), anamorphic *Pezizomycotina*. 1, India. See Rao *et al.* (*Indian Phytopath.* 58: 96, 2005).
- Manokwaria** K.D. Hyde (1993), *Xylariales*. 1 (on *Palmae*), Australia; Irian Jaya. See Hyde (*Sydowia* 45: 246, 1993).
- mantle**, a compact layer of hyphae enclosing short feeder roots of ectomycorrhizal plants, connected to the Hartig (q.v.) net on the inside, and to the extramatrical hyphae (q.v.) on the outside; acts as a nutrient sink.
- Manuripia** Singer (1960), *Marasmiaceae*. 1, Bolivia. See Singer (*Sydowia* 14: 273, 1960).
- Manzonina** Garov. (1866) = *Aspicilia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- map lichen**, species of *Rhizocarpon* (e.g. *R. geographicum*) which have yellow or yellow-green areolae separated by dark black lines (the prothallus) and forming mosaics. See Lichenometry.
- Mapaea** Boedijn (1957) = *Telomapea*.
- Mapaea** Pat. (1906) = *Uredo* fide Berndt (*in litt.*; probably anamorphic *Chaconiaceae*).
- Mapletonia** B. Sutton (1991), anamorphic *Pezizomycotina*, Cpd.1eH.15. 1, Australia. See Sutton (*Sydowia* 43: 162, 1991).
- Mapping distribution**, see Geographical distribution.
- Marasmiaceae** Roze ex Kühner (1980), *Agaricales*. 54 gen. (+ 30 syn.), 1590 spp. The family is circumscribed here to include *Marasmiaceae* and *Omphalotaceae* as circumscribed by Matheny *et al.* (2006).
- Lit.*: Kämmerer *et al.* (*Pl. Syst. Evol.* 150: 101, 1985), Segedin (*N.Z. J. Bot.* 31: 375, 1993), Gordon *et al.* (*MR* 98: 200, 1994), Miller (*Mycol. helv.* 6: 91, 1994), Corner (*Beih. Nova Hedwigia* 111: 1, 1996), Antonín *et al.* (*Mycotaxon* 63: 359, 1997), Desjardin & Horak (*Bibliotheca Mycol.* 168: 152 pp., 1997), Nicholson *et al.* (*Mycol.* 89: 400, 1997), Hibbett *et al.* (*MR* 102: 1041, 1998), Hughes & Petersen (*Pl. Syst. Evol.* 211: 231, 1998), Petersen & Hughes (*Pl. Syst. Evol.* 211: 217, 1998), Antonín (*Mykol. Listy* 68: 13, 1999), Desjardin *et al.* (*Sydowia* 52: 92, 2000), Mata *et al.* (*Mycol.* 93: 1102, 2001), Kirchmair *et al.* (*Persoonia* 17: 583, 2002), Moncalvo *et al.* (*Mol. Phylogen. Evol.* 23: 357, 2002), Saito *et al.* (*Biosc., Biotechn., Biochem.* 66: 2125, 2002), Takahashi (*Myco-science* 43: 343, 2002), Abesha *et al.* (*Mycol.* 95: 1021, 2003), Antonín (*Mycotaxon* 88: 53, 2003), Aruda *et al.* (*MR* 107: 25, 2003), Griffith *et al.* (*N.Z. J. Bot.* 41: 423, 2003), Bodensteiner *et al.* (*Mol. Phylogen. Evol.* 33: 501, 2004), Kirchmair *et al.* (*Mycol.* 96: 1253, 2004), Mossebo & Antonín (*Czech Mycol.* 56: 85, 2004), Wilson & Desjardin (*Mycol.* 97: 667, 2005), Rincones *et al.* (*MR* 110: 821, 2006).
- Marasmiellus** Murrill (1915), *Marasmiaceae*. c. 250, widespread. *M. inoderma*, root rot of maize; *M. paspali* var. *americana*, 'borde blanco' of maize. See Sabet *et al.* (*TBMS* 54: 123, 1970), Singer (*Beih. Nova Hedwigia* 44: 1, 1973; 134 neotrop. spp., extralimital spp.), Singer (*Beih. Nova Hedwigia* 26: 847, 1976), Pegler (*Kew Bull. Addit. Ser.* 6, 1977), Wilson & Desjardin (*Mycol.* 97: 667, 2005; phylogeny).
- Marasmiopsis** Henn. (1898) = *Phaeomarasmium* fide Singer (*Agaric. mod. Tax.*, 1951).
- Marasmius** Fr. (1836) nom. cons., *Marasmiaceae*. c. 500, widespread (esp. tropical). *M. oreades* (fairy-ring champignon), *M. perniciosus*, (see *Crinipellis*), *M. plicatus* (Sugar-cane root rot). See Singer (*Mycol.* 50: 103, 1958; key sections), Singer (*Bull. Jard. bot. Brux.* 34: 317, 1964; key 50 Congo spp.), Singer (*Sydowia* 18: 106, 1965; keys 154 S. Am. spp.), Gilliam (*Mycotaxon* 4: 1, 1976; 30 N. Am. spp.), Singer (*Fl. Neotrop.* 17: 62, 1976; key 233 neotrop. spp.), Pegler (*Kew Bull. Addit. Ser.* 6, 1977; 43 E. Afr. spp.), Desjardin (*Sydowia* 42: 17, 1990; culture), Antonín & Noordeloos (*Libri Botanici* 8, 1993; Europ. spp.), Desjardin *et al.* (*Sydowia* 52: 92, 2000; Indonesia), Antonín (*Mycotaxon* 85: 109, 2003; tropical Africa), Antonín (*Mycotaxon* 89: 399, 2004; sect. *Sicci* in Africa), Mossebo & Antonín (*Czech Mykol.* 56: 85, 2004; Cameroon), Wilson & Desjardin (*Mycol.* 97: 667, 2005; phylogeny), Antonín & Buyck (*Fungal Diversity* 23: 17, 2006; Madagascar, Mascarenes),

- Desjardin & Ovrebo (*Fungal Diversity* 21: 19, 2006; Panamá), Antonín (*Fungus Flora of tropical Africa* 1, 2007) See horse-hair blight fungi.
- Maravalia** Arthur (1922), Chaconiaceae. c. 35 (on angiosperms), widespread (tropical). See Mains (*Bull. Torrey bot. Club* 66: 173, 1939), Ono (*Mycol.* 76: 892, 1984; key), Wingfield *et al.* (*Australas. Pl. Path.* 33: 327, 2004), Thaung (*Australasian Mycologist* 24: 29, 2005; Burma).
- Marcelleina** Brumm., Korf & Rifai (1967), Pezizaceae. 9, widespread (north temperate). See Pfister (*Sydowia* 38: 235, 1986; N. Am.), Moravec (*Mycotaxon* 30: 473, 1987; key), Dissing *et al.* (*Taxon* 39: 130, 1990; nomencl.), Hansen *et al.* (*Mol. Phylogen. Evol.* 36: 1, 2005; phylogeny), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny).
- Marceloa** Bat. & Peres (1962) = *Treubiomyces* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- marcescent** (of basidiomata), withering, drying up *in situ*. Cf. putrescent.
- Marchalia** Sacc. (1889) nom. conf., Polystomellaceae. See von Arx (*Sydowia* 12: 400, 1959).
- Marchaliella** G. Winter ex E. Bommer & M. Rousseau (1891) = *Testudina* fide Hawksworth (*CJB* 57: 91, 1979).
- Marchandiobasidium** Diederich & Schultheis (2003), Corticiaceae. Anamorph *Marchandiomyces*. 1 (on lichens), Europe; N. America. See Diederich *et al.* (*MR* 107: 524, 2003), Larsson (*MR* 111: 1040, 2007; phylogeny).
- Marchandiophalina** Diederich, Lawrey & Binder (2007), Corticiaceae. 1, Venezuela. See Diederich & Lawrey (*Mycol. Progr.* 6: 61, 2007).
- Marchandiomyces** Dieder. & D. Hawksw. (1990), anamorphic *Marchandiobasidium*. 3 (on lichens), widespread. See Sikaroodi *et al.* (*MR* 105: 453, 2001; phylogenetic posn.), DePriest *et al.* (*MR* 109: 57, 2005).
- Marcosia** Syd. & P. Syd. (1916) = *Stigmina* fide Sutton (*TBMS* 58: 164, 1972).
- Margaretbarromyces** Mindell, Stockey, Beard & Currah (2007), Fossil Fungi ? Pleosporales. 1 (Eocene). See Mindell *et al.* (*MR* 111: 680, 2007).
- Margarinomyces** Laxa (1930), anamorphic *Pezizomycotina*. 1, widespread. See Schol-Schwarz (*Persoonia* 6: 63, 1970), Cole & Kendrick (*Mycol.* 65: 682, 1973), Gams (*Stud. Mycol.* 45: 187, 2000; links with *Phialophora*), Mostert *et al.* (*Stud. Mycol.* 54: 115 pp., 2006; key).
- Margaritispota** Ingold (1942), anamorphic *Helotiales*, Hso.≡ eH.15. 2 (aquatic), Europe. See Marvanová & Descals (*J. Linn. Soc. Bot.* 41: 1, 1985), Campbell *et al.* (*MR* 110: 1025, 2006; phylogeny).
- marginal frill** (of a conidium), the periclinal wall left attached to a spore after secession. Cf. basal frill.
- marginal veil** (of agarics), an incurving proliferation of the margin of the pileus which protects the developing hymenium. Cf. partial veil.
- marginate** (1) having a well-marked edge; (2) (of basal bulb of agaric stipe), having a gutter-like rim as in *Leucocortinarius bulbiger*.
- margo proprius**, see excipulum proprium, proper margin.
- margo thallinus**, see excipulum thallinum, thalline margin.
- Mariaella** Šutara (1987) = *Suillus* Gray fide Kuyper (*in litt.*).
- Mariannaea** G. Arnaud ex Samson (1974), anamorphic *Nectriaceae*, Hso.0eH.15. 4, widespread. See Samson (*Stud. Mycol.* 6: 74, 1974), Samuels & Seifert (*Beih. Sydowia* 43: 264, 1991), Okuda & Yamamoto (*Mycoscience* 41: 411, 2000; Japan), Luangsa-ard *et al.* (*Mycol.* 96: 773, 2004; phylogeny), Samuels *et al.* (*CBS Diversity Ser.* 4, 2006; USA).
- Marielliottia** Shoemaker (1999), anamorphic *Pleosporaceae*, Hso.?? 3, widespread. See Shoemaker (*CJB* 76: 1559, 1998).
- Marine fungi.** Fungi are of widespread occurrence in the sea, with over 1500 spp. (excluding coastal lichen-forming fungi) known from this habitat (Hyde *et al.*, *Biodiversity and Conservation* 7: 1147, 1998). These parasitize marine algae or animals or are saprobes on timber, algae (Kohlmeyer, *Veroeff. Inst. Merresforsch. Bremerhaven* Suppl. 5 339, 1974, Nakagiri, *Mycologia* 85: 638, 1993), sea grasses (Cuomo *et al.*, *Prog. Oceanogr.* 21: 189, 1988), protozoal cysts and corals (Kohlmeyer & Volkmann-Kohlmeyer, *CJB* 68: 1554, 1990, Raghukumar & Raghukumar, *Mar. Ecol.* 12: 251, 1991), sea foam (Nakagiri, *IFO Res. Comm.* 14: 52, 1989) and other substrata; spores of many (esp. *Halosphaeriales*) have special appendages for attachment (Hyde & Jones, *Bot. Mar.* 32: 205, 1989; 10 types).
- Other fungi occur in brackish water (Tubaki & Ito, *Rep. Tottori mycol. Inst.* 10: 523, 1973), salt marshes (Bayliss Elliott, *Ann. appl. biol.* 17: 284, 1930; Apinis & Chesters, *TBMS* 47: 419, 1964), mangrove swamps (Hyde & Jones, *Marine Ecology* 9: 15, 1988, Tan Leong & Jones, *CJB* 67: 2686, 1989), in the salt of salt pans (Quinta, *Food Technol.* 22: 102, 1968) and on sand (Rees, *Bot. Mar.* 23: 375, 1980, Nakagiri & Tokura, *Trans. mycol. Soc. Japan* 28: 413, 1987); 27-36 spp. exclusively tropical (Kohlmeyer, *Marine Ecology* 5: 329, 1984).
- A very diverse range of unusual secondary metabolites are produced by marine fungi (San-Martín *et al.*, *J. Chil. Chem. Soc.* 53: 1377, 2008), including potential herbicides (Motti *et al.*, *Appl. Environ. Microbiol.* 73: 1921, 2007), and several have shown great potential for use in bioremediation, particularly in decolorizing effluents (Raghukumar, *MR* 104: 1222, 2000). Marine fungi appear to play an important role in decomposition of organic matter on sandy beaches (Steinke & Lubke, *South African J. Bot.* 69: 540, 2003) and have the potential to be used as pollution indicators (Taboski *et al.*, *FEMS Microbiol. Ecol.* 53: 445, 2006).
- Lichens form distinctive band-like zones on siliceous rocky shores (Fletcher, *Lichenologist* 5: 368, 401, 1973, terminology of zones; in Brown *et al.*, *Lichenology: progress and problems*: 359, 1976, nutrition; in Price *et al.*, *The shore environment* 2: 789, 1980, compr. review).
- Lit.: General:* Fell *et al.* (*Molecular marine biol. biotech.* 1: 175, 1992; molecular detection marine microeukaryotes), Hyde & Pointing (Eds) (*Marine Mycology. A Practical Approach*, 2000), Johnson & Sparrow (*Fungi in oceans and estuaries*, 1961 [reprint, 1970]), Jones (Ed.) (*Recent advances in aquatic mycology*, 1976; compr. review), Kohlmeyer (*in Moss*, 1986: 199; checklist marine *Ascomycota*), Kohlmeyer & Kohlmeyer (*Marine Mycology*, 1979; *Icones Fungorum Maris*, 1968), Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 34: 1, 1991), Moss (Ed.) (*The biology of marine fungi*, 1986).
- Regional:* **Aldabra**, Kohlmeyer & Volkmann-

- Kohlmeyer (*Can J. Bot.* **65**: 571, 1987). **Argentina**, Malacalza & Martinez (*Boln Soc. Argent. Bot.* **14**: 57, 1971). **Australia**, Kohlmeyer (*Aust. J. Mar. Freshwater Res.* **42**: 91, 1991), Hyde (*Aust. Syst. Bot.* **3**: 711, 1990). **British Isles**, Fletcher (*Lichenologist* **7**: 1 [siliceous rocky shore lichens], 73 [calcareous and terricolous lichens], 1975; keys Br. spp.). **Brunei**, Hyde (*Bot. J. Linn. Soc.* **98**: 135, 1988). **Denmark**, Koch & Jones (*Svampe* **8**: 49, 1983). **Ecuador, Galapagos**, Kohlmeyer & Volkmann-Kohlmeyer (*Can J. Bot.* **65**: 571, 1987). **India**, Borse (*Trans. mycol. Soc. Japan* **28**: 55, 1987; *Indian Bot. Repr* **7**: 18, 1988; key 55 spp.). **Malaysia**, Jones & Kuthubutheen (*Sydowia* **41**: 160, 1990). **Pacific**, Volkmann-Kohlmeyer & Kohlmeyer (*Mycol.* **85**: 337, 1993; biogeogr.). **Philippines**, Jones *et al.* (*Asian Marine Biol.* **5**: 103, 1988). **Seychelles**, Hyde & Jones (*Marine Ecol.* **9**: 15, 1988). **South Africa**, Steinke & Jones (*S. Afr. J. Bot.* **59**: 385, 1993). **USA**, Kohlmeyer, (*TMBS* **57**: 473, 1971; New England checklist), Jones (*Bot. J. Linn. Soc.* **91**: 219, 1985); and many other countries.
- Marinosphaera** K.D. Hyde (1989), Sordariomycetes. 1, Indian Ocean; Pacific Ocean. See Hyde (*CJB* **67**: 3078, 1989), Read *et al.* (*MR* **99**: 1465, 1995; ultrastr.).
- Marinospora** A.R. Caval. (1966), Halosphaeriaceae. 3 (marine), widespread. See Johnson *et al.* (*Bot. Mar.* **27**: 557, 1984), Jones (*CJB* **74** Suppl. 1: S790, 1995; ultrastr.), Campbell *et al.* (*Fungal Diversity Res. Ser.* **7**: 15, 2002; phylogeny).
- Mariona** Stempell (1909), Microsporidia. 1.
- Marisolaris** Jørg. Koch & E.B.G. Jones (1989), ? Dothideomycetes. 1 (marine), Denmark. See Koch & Jones (*CJB* **67**: 1190, 1989).
- Mariusia** D. Pons & Boureau (1977), Fossil Fungi, Microthyriaceae. 1 (Cretaceous), France.
- Maronea** A. Massal. (1856), Fuscideaceae (L). 13, widespread. See Magnusson (*Acta horti gotoburg.* **9**: 41, 1934), Singh (*Geophytology* **10**: 34, 1980; India), Brusse (*Bothalia* **19**: 36, 1989; S Africa), Kantvilas (*Biblthca Lichenol.* **78**: 169, 2001; Tasmania), McCarthy & Mallett (*Flora of Australia* **56** A, 2004), Harris (*Opuscula Philolichenum* **3**: 65, 2006; N America), LaGreca (*Lichenologist* **38**: 595, 2006; chemistry), Miadlikowska *et al.* (*Mycol.* **98**: 1088, 2006; phylogeny), Bylin *et al.* (*Biblthca Lichenol.* **96**: 49, 2007; phylogeny).
- Maronella** M. Steiner (1959), Acarosporaceae (L). 1. See Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Hafellner (*Symb. bot. upsala.* **34** no. 1: 87, 2004).
- Maroneomyces** Cif. & Tomas. (1953) = *Maronea*.
- Maronina** Hafellner & R.W. Rogers (1990), Lecanoraceae (L). 2, Australia; S. America. See Hafellner & Rogers (*Biblthca Lichenol.* **38**: 100, 1990), McCarthy & Mallett (*Flora of Australia* **56** A, 2004), Kantvilas & Elix (*Biblthca Lichenol.* **96**: 137, 2007; Australia).
- Marssonina** J.C. Fisch. (1874) [non *Marssonina* H. Karst. 1860, *Gesneriaceae*] = *Marssonina*.
- Marssoniella** Höhn. (1916) [non *Marssoniella* Lemm. 1900, *Algae*] = *Neomarssoniella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Marssoniella** Lemmermann (1900), Microsporidia. 1.
- Marssonina** Magnus (1906), anamorphic *Diplocarpon*, *Drepanopeziza*, Cac.1eH.15/19. 78, widespread (esp. temperate). *M. ochroleuca* (chestnut (*Castanea*) leaf spot), *M. rosae* (black spot of rose). See von Arx (*Verh. K. ned. Akad. Wet. Amst.* **C 51**: 1, 1957), Sutton *et al.* (*TBMS* **86**: 619, 1986; redistribution), Spiers (*Eur. J. For. Path.* **18**: 140, 1988; key 4 spp. on *Populus*), Spiers (*N.Z. Jl Bot.* **27**: 503, 1989; conidial morphology of poplar spp. on host and in culture), Spiers (*Eur. J. For. Path.* **20**: 154, 1990; conidial morphology variation spp. on *Populus*), Farr (*Mycol.* **85**: 814, 1993; relationship to *Septogloeum*), Wenefrida & Spencer (*Pl. Dis.* **77**: 246, 1993; on *Rosa*), Morgan-Jones & Phelps (*Mycotaxon* **55**: 215, 1995; on *Veratrum*), Spiers (*Eur. J. For. Path.* **28**: 233, 1998; on *Salicaceae*), Han *et al.* (*Theoretical and Applied Genetics* **100**: 614, 2000; genetic variation).
- Marssoninites** Babajan & Tasl. (1970), Fossil Fungi. 1 (Tertiary), former USSR.
- Martella** Adans. (1763) = *Hericium* Pers. fide Donk (*Reinwardtia* **2**: 466, 1954).
- Martella** Endl. (1836) = *Hericium* Pers. fide Donk (*Taxon* **5**: 103, 1955).
- Martellia** Mattir. (1900) = *Russula* fide Kuyper (*in litt.*).
- Martensella** Coem. (1863), Kickxellaceae. 1, Europe; N. America. See Jackson & Dearden (*Mycol.* **40**: 168, 1948), Benjamin (*Aliso* **4**: 321, 1959).
- Martensiomycetes** J.A. Mey. (1957), Kickxellaceae. 1, Congo. See Benjamin (*Aliso* **4**: 321, 1959).
- Marthamycetes** Minter (2003), ? Rhytismataceae. 9, widespread. See Minter (*Mycotaxon* **87**: 50, 2003), Johnston (*Aust. Syst. Bot.* **19**: 135, 2006; Australia).
- Marthanella** States & Fogel (1999), ? Boletales. 1, USA. See States & Fogel (*Mycotaxon* **71**: 424, 1999).
- Martin** (George Willard; 1886-1971; USA). Professor of Botany, University of Iowa (1929-1955). Noted for studies on the *Tremellales* (q.v.) and *Mycetozoa* (q.v.). He contributed keys to families of fungi for the first five editions of this *Dictionary*. *Publs.* The *Tremellales* of the north central United States and adjacent Canada. *University of Iowa Studies in Natural History* (1940); (with C.J. Alexopoulos, q.v.) *The Myxomycetes* (1969). *Biogs, obits etc.* Stafleu & Cowan (*TL-2* **3**: 320, 1981); Wells & Lentz (*Mycol.* **65**: 985, 1973, bibliography, portrait).
- Martindalia** Sacc. & Ellis (1885) = *Phleogena* fide Barr & Bigelow (*Mycol.* **60**: 456, 1968).
- Martinella** (Cooke) Sacc. (1892) nom. dub., Fungi. See Sutton (*Mycol. Pap.* **141**, 1977).
- Martinellisia** V.G. Rao & Varghese (1977), anamorphic *Pezizomycotina*, Hso.1eP.10. 1, India. See Rao & Varghese (*Norw. Jl Bot.* **24**: 279, 1977).
- Martinia** Whetzel (1942) [non *Martinia* Vaniot 1903, *Compositae*] = *Martininia*.
- Martininia** Dumont & Korf (1970), Sclerotiniaceae. Anamorph *Myrioconium*. 1, widespread. See Dumont (*Mycol.* **65**: 175, 1973), Zhuang (*Mycotaxon* **29**: 393, 1987).
- Mason** (Edmund William; 1890-1975; England). Wounded in the Somme (1916); Mycologist, IMI (1921-1960). His organization of the IMI fungal reference collection set new standards, showing a profound understanding of how mycological information should be handled, amounting almost to prescience of how it should be structured for digitized databases. Noted for his catalytic ideas on use of conidial development to classify hyphomycetes, publishing little himself, he strongly influenced Hughes and M.B. Ellis (q.v.). *Publs.* *Mycological Papers* **1-3** (1925-1941). *Biogs, obits etc.* Booth (*Bulletin of the British*

- Mycological Society* 9: 114, 1975); Ellis & Hughes (*TBMS* 66: 371, 1976) [portrait].
- Masonhalea** Kärnefelt (1977), Parmeliaceae (L). 1, Arctic. See Kärnefelt *et al.* (*Pl. Syst. Evol.* 183: 113, 1992), Thell *et al.* (*Mycol. Progr.* 1: 335, 2002; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Masonia** G. Sm. (1952) = *Masoniella*.
- Masonia** Hansf. (1944) = *Dictyonella* fide von Arx (*Persoonia* 2: 421, 1963).
- Masoniella** G. Sm. (1952) = *Scopulariopsis* fide Morton & Smith (*Mycol. Pap.* 86, 1963).
- Masoniomyces** J.L. Crane & Dumont (1975), anamorphic *Pezizomycotina*, Hso.0eH.10. 1, Mexico; Caribbean. See Crane & Dumont (*CJB* 53: 847, 1975).
- Massalongia** Körb. (1855), Massalongiaceae (L). 3, Europe; N. America. See Henssen (*CJB* 41: 1331, 1963), Jørgensen in Hawksworth (Ed.) (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. 269 269: 390, 1994; posn), Burgaz & Martínez (*Nova Hedwigia* 73: 381, 2001; Iberian peninsula), Wiklund & Wedin (*Cladistics* 19: 419, 2003; phylogeny), Miadlikowska & Lutzoni (*Am. J. Bot.* 91: 449, 2004; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Wedin *et al.* (*Lichenologist* 39: 61, 2007; n. fam.).
- Massalongiaceae** Wedin, P.M. Jørg. & Wiklund (2007), Peltigerales. 3 gen. (+ 9 syn.), 11 spp.
Lit.: Henssen (*CJB* 41: 1331, 1963), Miadlikowska & Lutzoni (*Am. J. Bot.* 91: 449, 2004), Wedin & Wiklund (*Symb. bot. upsal.* 34 no. 1: 469, 2004), Jørgensen (*Nordic Lichen Flora* 3: Cyanolichens: 87, 2007), Wedin *et al.* (*Lichenologist* 39: 61, 2007).
- Massalongiella** Speg. (1880) = *Enchnoa* fide Petrak & Sydow (*Annls mycol.* 34: 11, 1936).
- Massalongina** Bubák (1916), anamorphic *Pezizomycotina*, St.0eH.?. 1, Europe.
- Massalongo** (Abramo Bartolommeo; 1824-1860; Italy). Professor at the University of Verona. Palaeobotanist and lichenologist, renowned for his contribution to understanding the systematics of lichen-forming fungi with crustose thalli through use of microscopic characters, introducing 114 genera of which many have since been consistently used (e.g. *Arthopyrenia*, *Catillaria*, *Haematomma*, *Pyrenula*, *Solenopsora*) or recently reintroduced (e.g. *Bactrospora*, *Celothelium*, *Psilolechia*). Often involved in controversies with Trevisan (q.v.). Main collections in Verona (VER). *Publs. Ricerche sull'Autonomia dei Licheni Crustosi* (1852); *Systema Lichenum Novorum* (1855) [a selection of these works have been reprinted (Lazzarini, *Selezione di Lavori Lichenologici di A.B. Massalongo*, 1991)]. *Biogs, obits etc.* De Toni (*L'Opera Lichenologica di Abramo Massalongo*, 1933); Grumann (1974: 518); Poelt (*in* Lazzarini, 1991: 13); Stafleu & Cowan (*TL-2* 3: 349, 1981).
- Massalongomyces** Cif. & Tomas. (1953) = *Massalongia*.
- Massaria** De Not. (1844), Massariaceae. Anamorphs *Myxocyclus*, *Neohendersonia*, *Macrodiplodia*. 22, widespread. See Wehmeyer (*Revision of Melanconis*, 1941), Shoemaker & Le Clair (*CJB* 53: 1568, 1975; type studies), Barr (*Mycotaxon* 9: 17, 1979; key 4 N. Am. spp.), Barr (*N. Amer. Fl.* ser. 2 13: 129 pp., 1990; N America), Liew *et al.* (*Mol. Phylogen. Evol.* 16: 392, 2000; phylogeny), Treigienė & Rukšienė (*Botanica Lithuanica* 11: 55, 2005; Lithuania), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Massariaceae** Nitschke (1869), Pyrenulales. 6 gen. (+ 3 syn.), c. 41 spp.
Lit.: Barr (*Sydowia* 38: 11, 1985), Eriksson (*SA* 5: 140, 1986), Barr (*N. Amer. Fl.* ser. 2 13: 129 pp., 1990), Hyde (*MR* 96: 1044, 1992), Hyde *et al.* (*Nova Hedwigia* 62: 513, 1996), Liew *et al.* (*Mol. Phylogen. Evol.* 16: 392, 2000).
- Massariella** Speg. (1880) = *Amphisphaeria* fide Dzagania (*BSMF* 102: 199, 1986), Eriksson & Hawksworth (*SA* 7: 80, 1988).
- Massariellops** Curzi (1927) = *Didymosphaeria* fide Aptroot (*Nova Hedwigia* 60, 1995).
- Massarina** Sacc. (1883), Massarinaceae. Anamorphs *Acrocalymma*, *Ceratophoma*, *Tetraploa*. 125, widespread. See Bose (*Phytopath. Z.* 41: 156, 1961; key), Webster (*TBMS* 48: 449, 1965), Srinivasulu & Sathe (*Sydowia* 26: 83, 1974; Indian spp.), Leuchtmann (*Sydowia* 37: 75, 1984), Hyde (*Mycol.* 83: 839, 1992; key marine spp.), Hyde (*Mycol.* 99: 291, 1995; list 132 names), Aptroot (*Nova Hedwigia* 66: 89, 1998; monogr.), Tsui *et al.* (*Mycol.* 91: 721, 1999; ultrastr.), Au *et al.* (*Bot. Mar.* 44: 261, 2001; ultrastr.), Hyde *et al.* (*Fungal Diversity Res. Ser.* 7: 93, 2002; marine taxa), Liew *et al.* (*Mycol.* 94: 803, 2002; phylogeny), Eriksson & Hawksworth (*Mycol.* 95: 426, 2003; phylogeny, fam. placement), Tanaka & Harada (*Mycoscience* 44: 173, 2003; Japan), Döbbeler (*MR* 111: 1406, 2007), Wang *et al.* (*MR* 111: 1268, 2007; phylogeny).
- Massarinaceae** Munk (1956), Pleosporales. 5 gen. (+ 17 syn.), 189 spp. Molecular data have elucidated some relationships within this fam., but more research is needed. It has previously been confused with the *Lophiostomataceae*. See Aptroot (*Nova Hedwigia* 66: 89, 1998; monogr.), Kodsueb *et al.* (*Botanical Journal of the Linnean Society* 155: 283, 2007; descr.), Wang *et al.* (*MR* 111: 1268, 2007; phylogeny).
- Massarinula** Géneau (1894) = *Massarina* fide Bose (*Phytopath. Z.* 41, 1961), Aptroot (*Nova Hedwigia* 66: 89, 1998).
- Massariola** Füsting (1868), Dothideomycetes. 3 (on bark), Europe.
- Massariopsis** Niessl (1876) = *Amphisphaeria* fide Müller & von Arx *in* Ainsworth *et al.* (Eds) (*The Fungi* 4A: 87, 1973).
- Massariosphaeria** (E. Müll.) Crivelli (1983), Pleosporales. 23, widespread. See Crivelli (*Über die heterogene Ascomycetengattung Pleospora Rbh.*, 1983; key 7 spp.), Leuchtmann (*Sydowia* 37: 75, 1985; key), Holm & Holm (*Symb. bot. upsal.* 28 no. 2: 1, 1988), Huhndorf *et al.* (*Mycotaxon* 37: 203, 1990), Liew *et al.* (*Mol. Phylogen. Evol.* 16: 392, 2000; phylogeny), Inderbitzin *et al.* (*Mycol.* 94: 651, 2002; phylogeny), Tanaka & Harada (*Mycoscience* 45: 96, 2004; Japan), Wang *et al.* (*MR* 111: 1268, 2007; phylogeny).
- Massariothea** Syd. (1939), anamorphic *Pezizomycotina*, St.≡ eP.15. 8, widespread. See Alcorn (*MR* 97: 429, 1993; key).
- Massariovalsa** Sacc. (1882), Melanconidaceae. Anamorph *Melanconiopsis*. c. 4, widespread. See Wehmeyer (*Revision of Melanconis*, 1941), Petrak (*Sydowia* 19: 279, 1966), Speer (*BSMF* 102: 363, 1986).
- Massariovalsaceae** Hara (1913) = Melanconidaceae.
- Massartia** De Wild. (1897), ? Zoopagales. 1 (in *Algae*), Java. See Hesseltine (*Mycol.* 47: 344, 1955).

- Massee** (George Edward; 1850-1917; England). French Foreign Legion (c. 1870s); schoolteacher, Scarborough (c. 1880s); freelance worker, Kew (1890s); Cryptogamic Botanist, Royal Botanic Gardens, Kew (1893-1915). First President of the British Mycological Society (1896). *Publs. British Fungus Flora* (1892-1895); *Textbook of Fungi* (1906); *Diseases of Cultivated Plants and Trees* (1910); *British Fungi and Lichens* (1911); (with Crossland) *Fungus Flora of Yorkshire* (1902-1905). *Biogs, obits etc.* Anon. (*Kew Bulletin* 1922: 335, 1922, bibliography); Grumann (1974: 377); Ramsbottom (*TBMS* 5: 469, 1917; Ramsbottom (*Journal of Botany* London 55: 223, 1915); Stafleu & Cowan (*TL-2* 3: 359, 1981).
- Masseea** Sacc. (1889), Helotiales. 1, N. America. See Baral (*SA* 13: 113, 1994).
- Masseeëlla** Dietel (1895), Pucciniales. c. 5 (on dicots, mostly *Euphorbiaceae*), widespread (palaeotropical). See Sathe (*Sydowia* 19: 187, 1966), Thaung (*Australasian Mycologist* 24: 29, 2005; Burma) Cf. *Kamatomyces*.
- Masseeola** Kuntze (1891) = *Sparassis*.
- Masseeerina** Lloyd (1920) nom. nud., Agaricomycetes. See Donk (*Taxon* 6: 64, 1957).
- Massospora** Peck (1879), Entomophthoraceae. 13 (on cicadas), widespread. *M. cicadina* is a parasite of the 17-year cicada in N. Am. See Soper (*Mycotaxon* 1: 13, 1974; key), Soper *et al.* (*Ann. Ent. Soc. Am.* 69: 89, 1976; biology), Keller & Petrini (*Sydowia* 57: 23, 2005; key).
- Mastigobasidium** Golubev (1999), Leucosporidiaceae. 1, Japan. See Golubev (*Int. J. Syst. Bacteriol.* 49: 1301, 1999; taxonomy), Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 1351, 2000; mol. phylogeny), Aime *et al.* (*Mycol.* 98: 896, 2006; phylogeny).
- Mastigochytrium** Lagerh. (1892) ? = *Rhizophydium* fide Sparrow (*Aquatic Phycomycetes* Edn 2: 1187 pp., 1960).
- Mastigocladium** Matr. (1911) = *Acremonium* fide Gams (*Cephalosporium-artige Schimmelpilze*, 1971).
- Mastigomyces** Imshen. & Kriss (1933), anamorphic *Pezizomycotina*, Hso.???. 2, former USSR. See Babjeva & Levin (*Mikrobiologiya* 48: 541, 1979; neotypification).
- Mastigomycètes** Imshen. & Kriss (1933), anamorphic *Pezizomycotina*, Hso.???. 2, former USSR. See Babjeva & Levin (*Mikrobiologiya* 48: 541, 1979; neotypification).
- Mastigomycotina** (obsol.). Used for fungi with motile zoospores now dispersed in the phyla *Chytridiomycota*, *Hyphochytriomycota*, *Oomycota*, *Plasmodiophoromycota*.
- Mastigonema** Speg. (1926) = *Chaetospermum* fide Petrak & Sydow (*Annls mycol.* 34: 11, 1936).
- mastigoneme**, see flagellum.
- Mastigonetron** Kleb. (1914) = *Harknessia* fide Petrak (*Sydowia* 24: 253, 1971), Sutton (*Mycol. Pap.* 141, 1977).
- mastigopod** (of *Mycetozoa*), a swarm cell (obsol.).
- Mastigosporella** Höhn. (1914), anamorphic *Wuestneiopsis*, Cpd.0eH.19. 2, USA. See Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993).
- Mastigosporium** Riess (1852), anamorphic *Pezizomycotina*, Hsy. = eH.19. 6 (causing leaf spots of grasses), widespread (temperate). See Bollard (*TBMS* 33: 250, 1950), Hughes (*Mycol. Pap.* 36, 1951), Austwick (*TBMS* 37: 161, 1954), Huss *et al.* (*Pflanzen* zenschutzberichte 49: 97, 1988; on *Dactylis* spp.), Mayrhofer *et al.* (*Mitt. naturwiss. Ver. Steiermark* 121: 73, 1991; key), Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 1: 260, 1995; key).
- Mastocephalus** Battarra ex Kuntze (1891) = *Leucocoprinus*.
- Mastodia** Hook. f. & Harv. (1847), Mastodiaceae (L). 6, Antarctica. See Brodo (*Bryologist* 79: 385, 1976), Gremmen *et al.* (*Lichenologist* 27: 387, 1995; ecology), Kohlmeyer *et al.* (*Mycol. Progr.* 3: 51, 2004).
- Mastodiaceae** Zahlbr. (1907), *Pezizomycotina* (inc. sed.) (±L). 2 gen. (+ 3 syn.), 8 spp.
Lit.: Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 34: 1, 1991), Sancho & Valladares (*Polar Biol.* 13: 227, 1993).
- Mastoleucomyces** Battarra ex Kuntze (1891) nom. nud. = *Tricholoma* fide Singer (*Agaric. mod. Tax.*, 1951).
- Mastomyces** Mont. (1848) = *Topospora* fide Groves (*CJB* 43: 495, 1965).
- Mathurisporites** Kalgutkar & Janson. (2000), Fossil Fungi, anamorphic *Ascomycota*. 1, Canada; India. See Kalgutkar & Jansonius (*AASP Contributions Series* 39: 166, 2000).
- matrix** (1) the substratum in or on which an organism is living; (2) mucilaginous material in which conidia and some ascospores are produced, influences dissemination, survival, germination etc. See Louis & Cooke (*TBMS* 84: 661, 1985).
- Matruchotia** Boulanger (1893) nom. dub., anamorphic *Fungi*. See Donk (*Reinwardtia* 2: 466, 1954).
- Matruchotiella** Grigoraki (1924) nom. dub. = *Ateleothylax* fide Dodge (*Medical Mycology*: 431, 1935).
- Matsushimaea** Subram. (1978), anamorphic *Pezizomycotina*, Hso.0bP.10. 1, Japan. See Subramanian (*Kavaka* 5: 96, 1977), Mel'nik & Belomesyatseva (*Mikol. Fitopatol.* 35: 29, 2001; Russia, Belarus).
- Matsushimiella** R.F. Castañeda & Heredia (2001), anamorphic *Pezizomycotina*, Hso.???. 1, Australia. See Castañeda Ruiz *et al.* (*Cryptog. Mycol.* 22: 16, 2001).
- Matsushimomyces** V.G. Rao & Varghese (1979), anamorphic *Pezizomycotina*, Hso.1eH.??10. 1, India. See Rao & Varghese (*Bot. Notiser* 132: 313, 1979), Castañeda Ruiz *et al.* (*Mycotaxon* 87: 385, 2003).
- Matsusphaeria** K.L. Pang & E.B.G. Jones (2003) = *Magnisphaera* fide Pang *et al.* (*Nova Hedwigia* 77: 14, 2003), Pang & Jones (*Nova Hedwigia* 78: 269, 2004).
- matsu-take**, *Tricholoma matsutake*, an important edible fungus in Japan. Nisikado *et al.* (*Ber. Ohara Inst.* 8(4), 1941); pine mushroom. 'Matsutake' of N. Am., *T. ponderosum*, *T. murrillianum* (fide Singer, 1961).
- Mattickiolichen** Tomas. & Cif. (1952) = *Buellia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Mattickiomyces** Cif. & Tomas. (1953) = *Mattickiolichen*.
- Mattirolella** S. Colla (1929), anamorphic *Kathistaceae*, St.0eH.15. 1. See Khan & Kimbrough (*Am. J. Bot.* 61: 395, 1974), Blackwell *et al.* (*Mycol.* 95: 987, 2003).
- Mattirolia** Berl. & Bres. (1889), Thyridiaceae. 1 (from bark), Italy. See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Mattirolomyces** E. Fisch. (1938), *Pezizaceae*. 1 (*Mycorrhizal* under *Cistaceae*), Mediterranean; N. Amer-

- ica. See Percudani *et al.* (*Mol. Phylogen. Evol.* 13: 169, 1999; phylogeny), Díez *et al.* (*Mycol.* 94: 247, 2002; phylogeny), Healy (*Mycol.* 95: 765, 2003; USA), Ferdman *et al.* (*MR* 109: 237, 2005; phylogeny), Kovács *et al.* (*Mycol. Progr.* 6: 19, 2007; ontogeny, mycorrhiza), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Matula** Massee (1888), anamorphic *Aleurocystis*. 2, widespread (tropical). See Martin (*Lloydia* 5: 158, 1942).
- Maublancia** G. Arnaud (1918), Microthyriaceae. 6, S. America; S. Africa.
- Maublancomyces** Herter (1950) = *Gyromitra* fide Eckblad (*Nytt Mag. Bot.* 15: 1, 1968).
- Mauginiella** Cavarra (1925), anamorphic *Pezizomycotina*, Hso.0eH.38. 1 (on *Phoenix*), Mediterranean; Middle East. See Sigler & Carmichael (*Mycotaxon* 4: 349, 1976), von Arx *et al.* (*Sydowia* 34: 42, 1981; ultrastr.), Abdullah *et al.* (*J. Phytopath.* 153: 417, 2005; Spain).
- Maurinia** Niessl (1876) = *Anthostomella* fide Francis (*Mycol. Pap.* 139, 1975), Lu & Hyde (*Fungal Diversity Res. Ser.* 4, 2000).
- Mauritiana** Poonyth, K.D. Hyde, Aptroot & Peerally (2000), Requienellaceae. 1, Mauritius. See Poonyth *et al.* (*Fungal Diversity* 4: 101, 2000).
- Mauritzia** Gyeln. (1935) = *Pyrenopsis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Maurodothella** G. Arnaud (1918) = *Echidnodes* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Maurodothina** G. Arnaud ex Piroz. & Shoemaker (1970) = *Eupelte* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Maurodothis** Sacc., Syd. & P. Syd. ex Syd. & P. Syd. (1904) = *Cycloshizon* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Maurya** Pat. (1898) nom. dub., Fungi. See Petrak (*Sydowia* 5: 345, 1951).
- Mawsonia** C.W. Dodge (1948), ? Lichinaceae (L). 1, Antarctica. See Kärnefelt (*Cryptog. Bot.* 1: 147, 1989).
- Maxillispora** Höhn. (1914) = *Tetracladium* fide Ingold (*TBMS* 25: 371, 1942).
- Mayamontana** Castellano, Trappe & Lodge (2007), Stephanosporaceae. 1. See Castellano *et al.* (*Mycotaxon* 100, 2007).
- Mazaediate lichens**, Traditionally treated as *Caliciales*, but that order has been shown to be heterogenous using molecular methods.
- Lit.*: Hutchinson (*Mycol.* 79: 786, 1987; spp. on polypores), Middelborg & Mattsson (*Sommerfeltia* 5, 1987; Norway), Nádvorník (*Studia bot. čsl.* 5: 6, 1942), Pant & Awasthi (*Biovigyanam* 15: 3, 1989; key 31 spp. India & Nepal), Puntillo (*Webbia* 43: 145, 1989; key 59 spp. Italy), Santesson (*Ark. Bot.* 30A (14), 1943; S. Am.), Sato (*Miscnea bryol. lich.* 7: 39, 1975; gen. concepts), Schmidt (*Mitt. St. Inst. allg. Bot. Hamburg* 13: 111, 1970), Selva & Tibell (*Bryologist* 102: 377, 1999, N Am.), Tibell (*Symb. bot. upsal.* 21(2), 1975; boreal N. Am., *Lichenologist* 13: 161, 1981; Afr., 14: 219, 1982; Costa Rica, *Beih. Nova Hedw.* 79: 597, 1985; system, *Symb. bot. upsal.* 27(2), 1987; keys 18 gen., 78 spp. Australia, *Bot. J. Linn. Soc.* 116: 159, 1994; distrib. 162 spp., dispersal patterns, *Flora Neotropica Monograph* 69, 1996), *Symb. bot. upsal.* 32: 291, 1997; anams, *Bibl. Lichenol.* 71: 107, 1998; S Am. spp.; *Nordic Lichen Flora* 1, 1999), Tobolewski (*Pr. Kom. biol. Poznán* 24 (5), 1966; Poland).
- Mazaediothecium** Aptroot (1991), Pyrenulaceae (L). 2, Costa Rica; Papua New Guinea. See Eriksson (*Lichenologist* 25: 307, 1993), Aptroot *et al.* (*Biblthca Lichenol.* 97, 2008; Costa Rica).
- mazaedium**, a spore mass formed by an ascoma, as in *Caliciales* and *Onygenaceae*, in which the spores, generally with sterile elements, become free from the asci as a dry, loose powdery mass on the fruiting surface.
- Mazosia** A. Massal. (1854), ? Roccellaceae (±L). Anamorph *Sporhaplus*. 21 (partly on lichens), widespread (tropical). See Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952), Batista *et al.* (*Atas Inst. Micol. Univ. Recife* 5: 429, 1967), Kalb & Vězda (*Folia geobot. phytotax.* 23: 199, 1988; key), Eriksson (*SA* 14: 58, 1995; posn), Lücking & Matzer (*Nova Hedwigia* 63: 109, 1996), Lücking & Kalb (*Bot. Jb.* 122: 1, 2000; Brazil), Aptroot *et al.* (*Mycotaxon* 88: 41, 2003; China, Taiwan), Singh & Pinokiyo (*Lichenologist* 40: 23, 2008; India).
- mazu**, see Fermented food and drinks.
- Mazzantia** Mont. (1855), Diaporthaceae. Anamorph *Mazzantiella*. 6, Europe; America. See Monod (*Beih. Sydowia* 9: 1, 1983), Castlebury *et al.* (*Mycoscience* 44: 203, 2003), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Mazzantiella** Höhn. (1925), anamorphic *Mazzantia*. See Clements & Shear (*Gen. Fung.*, 1931).
- McAlpine** (Daniel; 1849-1932; Scotland, later Australia). Lecturer, Heriot-Watt College, Edinburgh (1877); lecturer, Melbourne University (1884); Vegetable Pathologist, Department of Agriculture, Victoria (1890). As Vegetable Pathologist, McAlpine occupied the first full-time permanent post in applied mycology in the then British Empire. *Publs. Rusts of Australia, their Structure, Nature and Classification* (1906); *Smuts of Australia, their Structure, Life History, Treatment and Classification* (1910); *Fungous Diseases of Stone-fruit Trees of Australia, and their Treatment* (1902); *Handbook of Fungous Diseases of the Potato in Australia and their Treatment* (1911). *Biogs, obits etc.* Fish (*Annual Review of Phytopathology* 8: 14, 1970); Stafleu & Cowan (*TL-2* 3: 207, 1981).
- McGinty**, see Lloyd.
- MCZ**, see Media.
- MEA**, see Media.
- Mebarria** J. Reid & C. Booth (1989), Melanconidaceae. Anamorph *Harknessia*. 1, USA. See Barr (*Mycotaxon* 41: 287, 1991).
- medallion clamp**, a clamp connexion with a space between the main hypha and the hook.
- Medastina** Dodart [not traced] nom. dub., ? Fungi.
- Medeolaria** Thaxt. (1922), Medeolariaceae. 1, N. America. See Thaxter (*Proc. Amer. Acad. Arts & Sci.* 57: 425, 1922).
- Medeolariaceae** Korf (1982), Medeolariales. 1 gen., 1 spp.
- Lit.*: Thaxter (*Proc. Amer. Acad. Arts & Sci.* 57: 425, 1922), Korf (*Mycosystema* 3: 19, 1990), Pfister & Kimbrough in McLaughlin *et al.* (Eds) (*The Mycota A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research* 7A: 257, 2001).
- Medeolariales** Korf (1982). *Pezizomycotina*. 1 fam., 1 gen., 1 spp. Fam.: **Medeolariaceae**

For *Lit.* see under fam.

Media. Media for cultivation of fungi can be prepared from natural, synthetic or semi-synthetic components. Essential requirements for fungal growth include carbon and nitrogen sources, vitamins, minerals, air and water. There is no single standard medium on which all fungi grow. Many can be cultivated by supplying simple sugars however low-nutrient media are often required for obtaining sporulation. Since media can affect colony morphology, pigmentation, sporulation and retention of properties, standardization of formulae is often necessary for the purpose of identification. Defined media formulations are essential in quantitative experiments and investigations that require an element of reproducibility. Many culture media are available commercially, others are prepared in the laboratory. Useful publications include Booth (*in* Booth (Ed.), *Methods in microbiology* 4: 57, 1971), Jong *et al.* (*ATCC Filamentous fungi*, edn 19, 1996), Atlas (*Handbook of microbiological media*, 1996), Smith *et al.* (Eds) (*The UKNCC biological resource: properties, maintenance and management*, 2001). The following entry provides an introduction to the most commonly used media for cultivation of fungi.

Potato Carrot Agar (PCA) is used for obtaining sporulation in a wide range of fungi. This medium is low in carbohydrates and many fungi are stimulated to sporulate in response to poor nutrient levels. Most Mucorales grow successfully on PCA and Malt Agar (MA). Many anamorphic fungi and ascomycetes also sporulate successfully on Malt Agar (MA), Cornmeal Agar (CMA) and Oatmeal Agar (OA). Hay Infusion Agar is useful as a low nutrient medium for production of conidia. Potato Dextrose Agar (PDA) is rich in carbohydrates stimulating good vegetative growth in many fungi. In the presence of high carbohydrate levels however, sporulation is often reduced. Some basidiomycetes in culture including *Armillaria* and *Ganoderma* have been grown successfully on Malt Extract Agar (MEA) and Yeast Malt Extract (YM). A specialized medium for obtaining sporulation of wood-rotting basidiomycetes in culture was described by Badcock (*TBMS* 25: 200, 1941). To encourage sporulation in cellulolytic fungi, sterilized pieces of filter paper, wheatstraw or lupin stem can be placed on the surface of weak media such as PCA or Tap Water Agar (TWA). Successful cultivation of chytrids has been obtained using Yeast Peptone Soluble Starch Agar (YPSS). 25% seawater can be added for marine species. The use of Rabbit Dung Agar (RDA) is recommended for obtaining sporulation in coprophilous fungi. A method for culturing pathogenic *Entomophthorales* on coagulated egg-yolk medium was described by Müller-Kögler (*Entomophaga* 3: 261, 1959). Further culture methods for this group are described by Keller (*Sydowia* 40: 122, 1987) and Bałazy (*Fungi.T. XXIV. Entomophthorales*, 1993). Lichen-forming fungi produce good vegetative growth on Malt Yeast Extract Agar (MYE).

Many fungi from medical sources require rich media with a high nitrogen content. Dermatophytes grow successfully on media containing peptone and glucose (Sabouraud's Agar). Keratinophilic fungi benefit from the addition of sterilized animal hair or feathers (Al-Doory, 1968). For further details of media used in medical mycology see Kwon-Chung &

Bennett (*Medical mycology*, edn 4, 1992), Rippon (*Medical mycology. The pathogenic fungi and the pathogenic actinomycetes*, edn 3, 1988).

Specialized media are required for some genera. For growth of *Aspergillus* and *Penicillium*, Czapek Dox Agar (CZ), Czapek Yeast Autolysate (CYA) and 2% Malt Extract Agar (MEA) are recommended. To distinguish closely related species in these genera, Creatine Sucrose Agar (CREA) is useful. CYA and MEA with 20-40% sucrose are used for cultivation of xerophilic species of *Aspergillus* and those producing *Eurotium* teleomorphs. See Samson & Pitt (Eds) (*Advances in Penicillium and Aspergillus Systematics*, 1985). Sporulation of *Fusarium* can be encouraged by the use of Carnation Leaf Agar (Fischer *et al.*, *Phytopathology* 72: 151, 1982) or Spezieller Nährstoffarmer Agar (Nirenberg, *Mitt. Biol. Bundesanst. Land. Forstw.* 169: 1, 1976). Sterilized pieces of filter paper are added to this medium to stimulate sporulation. To study growth rate and colony colour in *Fusarium*, Potato Sucrose Agar (PSA) is recommended. Lima Bean Agar (LBA) and V8 Juice Agar have been used successfully for growing *Pythium* and *Phytophthora*. See Harnish (*Mycol.* 57: 85, 1965), Romero & Gallegly (*Phytopathology* 53: 899, 1963). *Saprolegniaceae* grow well on Cornmeal Agar and Glucose Yeast Peptone Salts medium (GYPS). Inoculated blocks can be transferred to water baited with sterile hemp seeds to obtain sporangia and oogonia. Most yeasts grow successfully on MEA, Glucose Peptone Yeast Extract Agar (GPY) or Yeast Malt Extract Agar (YM). For osmophilic and osmotolerant yeasts, a sugar content of 30-50% is recommended. For further details of media for cultivation of yeasts see Kurtzman & Fell (*The Yeasts, a taxonomic study*, edn 4, 1998), Barnett *et al.* (*The Yeasts: characteristics and identification*, edn 3, 2000).

Bacterial contamination in fungal cultures can be eliminated by the use of media containing antibiotics. Most frequently used is Penicillin G in combination with either streptomycin sulphate or chloramphenicol.

Antibiotic medium: Penicillin G and Chloramphenicol

Chloramphenicol	150 mg
Penicillin G	150 mg
Distilled Water	10 ml
Ethanol	10 ml
Dissolve 150 mg penicillin G in 10ml distilled water. Filter sterilize using a 0.45 µm pore membrane. Dissolve 150 mg chloramphenicol in 10ml ethanol. To add to media, melt 250 ml agar. When still hot, add 1.25 ml chloramphenicol in ethanol using a sterile pipette. Allow agar to cool to 45°C then add 1.25 ml penicillin G. Swirl thoroughly to mix.	

Antibiotic medium: Penicillin G and Streptomycin sulphate

Penicillin G	1.2 g
Streptomycin sulphate	1.0 g
Distilled water	40 ml
Dissolve 1g of streptomycin sulphate powder in sterile water. Add penicillin G and agitate to mix. To add to media, melt 250 ml agar and allow to cool until hand-hot (45°C). Using a sterile pipette, add 2 ml of the antibiotic mixture to the agar and swirl bottle thoroughly to mix.	

Carnation Leaf Agar (CLA)

Agar	20 g
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Distilled water	1 l	Yeast Extract	5 g
Carnation leaf pieces		Agar	20 g
Cut carnation leaves into 1cm pieces, allow to dry and sterilize using a few drops of propylene oxide. Add agar to water. Heat until dissolved and autoclave at 121°C for 15 min. Pour plates and add a few sterile leaf pieces when plates are almost set. See Fisher <i>et al.</i> (<i>Phytopathology</i> 72: 151, 1982).		Distilled Water	1 l
Corn Meal Agar (CMA)		Dissolve ingredients in water. Autoclave at 121°C for 15 min.	
Maize meal	30 g	Glucose Yeast Peptone Salts (GYPS)	
Oxoid Agar N° 3	20 g	Glucose	5.0 g
Tap Water	1 l	Mycological Peptone	0.5 g
Place the maize and water in a saucepan. Heat over a double saucepan until boiling, continue heating for one hour stirring occasionally. Filter the decoction through muslin, add the agar, and boil until it is dissolved. Autoclave at 121°C for 20 min.		Yeast Extract (Oxoid)	0.05 g
Creatine Sucrose Agar (CREA)		KH ₂ PO ₄	0.5 g
Creatine (1H ₂ O)	3.0 g	MgSO ₄ .7H ₂ O	0.15 g
Sucrose	30.0 g	Agar	15.0 g
KCl	0.5 g	Distilled Water	1 l
MgSO ₄ .7H ₂ O	0.5 g	Dissolve agar and yeast extract in water. When agar has dissolved, add peptone and glucose. Autoclave at 121°C for 15 min.	
FeSO ₄ .7H ₂ O	0.01 g	Hay Infusion Agar	
KH ₂ PO ₄ .3H ₂ O	1.3 g	Hay	50.0 g
Bromocresol purple	0.05 g	Agar	15.0 g
Agar	15.0 g	Distilled Water	1 l
Distilled Water	1 l	Sterilize 50 g hay in 1 litre of water at 121°C for 30 min. Strain through cloth and make up to 1 litre. Adjust pH to 6.2 with K ₂ HPO ₄ . Add 15 g agar to 1 litre of extract. Autoclave at 121°C for 15 min.	
Dissolve ingedients in water. Autoclave at 121°C for 15 min. Adjust pH to 8.0-8.2 after autoclaving.		Malt Agar (MA)	
Czapek Dox Agar (CZ)		Toffee barley malt extract	20 g
Made with stock Czapek solution		Oxoid Agar N° 3	20 g
Solution A		Tap water	1 l
Sodium nitrate NaNO ₃	40.0 g	Add malt extract and agar to water in a double saucepan. Heat and stir until dissolved. Adjust pH to 6.5. Autoclave at 121°C for 15 min.	
Potassium chloride KCl	10.0 g	Malt-Czapek Agar (MCZ)	
Magnesium sulphate MgSO ₄ 7H ₂ O	10.0 g	Stock Czapek solution A	50 ml
Ferrous sulphate FeSO ₄ 7H ₂ O	0.2 g	Stock Czapek solution C	50 ml
Dissolve in 1 l distilled water and store in a refrigerator.		Sucrose	30 g
Solution B		Toffee malt extract	40 g
Di-potassium hydrogen orthophosphate K ₂ HPO ₄ 20 g		Oxoid Agar N° 3	20 g
Dissolve in 1 l distilled water and store in a refrigerator.		Distilled water	900 ml
For 1 litre		Dissolve malt extract and agar in water. Heat over a double saucepan until dissolved. Then add sucrose, when dissolved add stock solutions. Adjust pH to 5.0. Autoclave at 121°C for 20 min.	
Stock solution A	50 ml	Malt Extract Agar (MEA) Blakeslee's formulation	
Stock solution C	50 ml	Malt extract (powdered Difco or Oxoid)	20 g
Distilled water	900 ml	Peptone (bacteriological)	1 g
Sucrose (Analar)	30 g	Glucose (Analar)	20 g
Oxoid Agar N° 3	20 g	Oxoid Agar N° 3	15 g
Dissolve agar in distilled water then add sucrose and stock solutions just before autoclaving.		Distilled water	1 l
To each litre add 1 ml of following stock solutions:		Add malt extract, peptone and agar to water. Heat over a double saucepan until dissolved. Add glucose last and stir to dissolve. Sterilize by autoclaving at 121°C for 15 min.	
Zinc sulphate ZnSO ₄ 7H ₂ O Analar 1.0 g in 100 ml distilled water		Malt Extract Agar plus sucrose (M20, M40, M60)	
Cupric sulphate CuSO ₄ 5H ₂ O Analar 0.5 g in 100 ml distilled water		Malt extract	20 g
Autoclave at 121°C for 20 min. See Smith (1954).		Sucrose (Analar)	200 g
Czapek Yeast Autolysate Agar (CYA)		Oxoid Agar N° 3	20 g
di-Potassium hydrogen phosphate K ₂ HPO ₄	1.0 g	Tap water	1 l
Czapek concentrate	10.0 ml	For M40 use 400 g sucrose, for M60 use 600g sucrose. Dissolve malt extract and agar in water by heating in a double saucepan. Reduce heat to avoid caramelisation and add sucrose. Stir until dissolved. Autoclave at 121°C for 15 min.	
Oxoid Yeast extract or autolysate	5.0 g	Malt Yeast Extract (MYE)	
Sucrose (Analar)	30.0 g	Malt extract	20 g
Oxoid Agar N° 3	15.0 g	Yeast Extract	2 g
Distilled water	1.0 l	Agar	20 g
Autoclave at 121°C for 15 min. See Pitt (1973).		Distilled Water	1 l
Glucose Peptone Yeast Extract Agar (GPY)		Dissolve ingredients in water. Autoclave at 121°C	
Glucose	40 g		
Peptone	10 g		

for 15 min.

Oat Agar (OA)

Oat Meal ground	30 g
Oxoid Agar N° 3	20 g
Tap water	1 l

Add oat meal to 500 ml of water in a saucepan. Heat for 1 h. To the other 500 ml water add agar and dissolve in a double saucepan. Pass cooked oat meal through a fine strainer and add to agar mixture. Stir thoroughly. Autoclave at 121°C for 20 min.

Potato Carrot Agar (PCA)

Avoid new crop potatoes, which do not make good media. Red Désirée potatoes have been found to be best. Wash, peel and grate vegetables.

Grated potato	20 g
Grated carrot	20 g
Oxoid Agar N° 3	20 g
Tap water	1 l

Boil vegetables for about 1 h in 500 ml tap water, then pass through a fine sieve keeping the liquid. The agar is added to 500 ml of water in a double saucepan. When the agar has dissolved add the strained liquid and stir. Pour through a funnel into bottles. Sterilize at 121°C for 20 min.

Potato Dextrose Agar (PDA)

Avoid new crop potatoes. Red Désirée have been found to be best.

Potatoes	200 g
Oxoid Agar N° 3	20 g
Dextrose	15 g
Tap water	1 l

Scrub potatoes clean and cut into 12 mm cubes (do not peel). Weigh out 200 g and rinse rapidly under a running tap, and drop into 1 l of tap water in a saucepan. Boil until potatoes are soft (about 1 h) then put through blender. Add 20 g of agar, and heat in a double saucepan until dissolved. Then add 15 g of dextrose and stir until dissolved. Make up to 1 l. Pour into bottles, stirring occasionally to ensure that each bottle has a percentage of solid matter. Autoclave at 121°C for 20 min.

Potato Sucrose Agar (PSA)

To make 1 litre of medium.

Potato water	500 ml
Sucrose	20 g
Oxoid Agar N° 3	20 g
Distilled water	500 ml

Heat in double saucepan until agar is dissolved. Autoclave at 121°C for 15 min. 2.3 kg potatoes makes 7 l. Adjust to pH 6.5 with calcium carbonate if necessary.

To make 2 litres of potato water:

Tap water	1125 g
Potato	450 g

Peel and dice potatoes, suspend in double cheesecloth and boil in the tap water until almost cooked.

PSA using powdered potato

Powdered potato	5 g
Sucrose	20 g
Oxoid Agar N° 3	20 g
Distilled water	1 l
Calcium carbonate	5 g

Autoclave at 121°C for 15 min.

Rabbit Dung Agar (RDA)

The rabbit dung must be from wild rabbits, and dried before use.

Oxoid Agar N° 3	15 g
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Tap water	1 l
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Heat agar to dissolve. Pour into bottles containing the rabbit dung. Autoclave at 126°C for 20 min.

Sabouraud's Agar

Glucose	20 g
Peptone	10 g
Oxoid Agar N° 3	15 g
Water	1 l

Autoclave 114°C for 15 min.

Spezieller Nährstoffarmer Agar (SNA)

Potassium di-hydrogen orthophosphate (KH ₂ PO ₄)	1 g
Potassium nitrate (KNO ₃)	1 g
Magnesium sulphate (MgSO ₄ .7H ₂ O)	0.5 g
Potassium chloride (KCl)	0.5 g
Glucose (Analar)	0.2 g
Sucrose (Analar)	0.2 g
Oxoid Agar N° 3	20 g
Distilled Water	1 l

Dissolve all ingredients, except agar, in distilled water. Add agar and heat in a double saucepan until dissolved. Adjust pH to 6-6.5, then dispense into bottles. Autoclave at 121°C for 20 mins.

Tap Water Agar (TWA)

Tap water	1 l
Oxoid Agar N° 3	15 g

Dissolve agar in water. Autoclave at 121°C for 20 min.

V8 Agar (as recommended for *Actinomycetes*)

V8 Vegetable juice	200 ml
Calcium carbonate	4 g
Oxoid Agar N° 3	20 g
Water	800 ml

Adjust to pH 7.3 with KOH Autoclave at 121°C for 20 min. See Galindo & Gallegly (1960).

Yeast Malt Agar (YM)

Yeast Extract	3 g
Malt Extract	3 g
Mycological Peptone	5 g
Glucose	10 g
Agar	20 g
Distilled Water	1 l

Dissolve ingredients in water and adjust pH to 5-6. Add agar and heat until dissolved. Autoclave at 121°C for 15 minutes.

Yeast Peptone Soluble Starch Agar (YPSS)

Yeast Extract	4.0 g
Soluble Starch	15.0 g
KH ₂ PO ₄	1.0 g
MgSO ₄ .7H ₂ O	0.5 g
Agar	20.0 g
Distilled Water	1 l

Dissolve ingredients in water. Autoclave at 121°C for 15 minutes.

Addition of dried materials to media

Filter papers

Cut filter papers to size (approximately 1 x 0.7 cm). Transfer to glass universal bottles and autoclave at 121°C for 20 min. Using sterilised forceps, transfer pieces of filter paper to agar plates when set.

Wheatstraws

Cut dried wheatstraws into 2 cm lengths and transfer to glass universal bottles, 10 pieces in each. Autoclave at 121°C for 20 min. Using sterilised forceps, add wheatstraws to poured plates before the agar sets.

Medical and veterinary mycology. The scientific

study of fungi that cause diseases in humans and animals, and the characteristics and epidemiology of the diseases they cause. In this *Dictionary*, veterinary mycology is treated as relating to vertebrates only; see also: Insects (and other invertebrates) and fungi. Fungi affect different organs and according to the disorder syndromes, the diseases are named chromoblastomycoses, dermatophytoses, mycetoma, onichoblastomycoses, otomycoses, phaeohyphomycoses, rhinosporidiosis, etc. Clinical groupings for fungal infections recognize skin diseases attributed to superficial (e.g. piedra, seborrhoeic dermatitis), cutaneous (e.g. candidiasis of skin, dermatophytosis, ringworm of the scalp) and subcutaneous (e.g. lobomycosis, mucoromycosis, sporotrichomycosis) mycoses; infectious diseases are described as dimorphic (e.g. blastomycosis, histoplasmosis) and opportunistic (e.g. aspergillosis, candidiasis, cryptococcosis) systematic mycoses. The earliest to be described (see Gruby) and best known mycosis is ringworm (tinea), of the skin and hair (caused by gymnoascaceous fungi). The other widespread and systemic mycoses (e.g. coccidioidomycosis, cryptococcosis, histoplasmosis) are frequently fatal.

More than 3400 fungal names have appeared in the medical and veterinary literature (de Hoog *et al.*, *Atlas of clinical fungi*, edn 2, 1126 pp., 2000). Fungi important in medical and veterinary mycology include some members of the following genera: *Abidia*, *Arthrini*, *Aspergillus*, *Bipolaris*, *Blastomyces*, *Candida*, *Cladophialophora*, *Cladosporium*, *Coccidioides*, *Cryptococcus*, *Exophiala*, *Histoplasma*, *Malassezia*, *Microsporum*, *Mucor*, *Phialophora*, *Penicillium*, *Pneumocystis*, *Pseudallescheria*, *Rhizopus*, *Rhinosporidium*, *Sporothrix*, *Stachybotrys*, *Trichophyton*, *Trichosporon*, *Trichothecium*.

Fungi pathogenic for humans are often polymorphic (see dimorphic) or 'pleomorphic' and this, in addition to the number of species proposed on clinical grounds and without adequate descriptions, made the earlier literature very confused. Most fungi causing serious skin mycoses are extremely variable soil saprobes with an ability to adapt to the environment of human or animal tissues. Primary fungal infections of dimorphic systematic mycoses are mainly pulmonary, following inhalation of conidia. Opportunistic systematic infections are caused by cosmopolitan fungi with a very low level of virulence, and occur when the normal defence mechanism of the host is weakened as, for example, in AIDS patients. Most of the fungal pathogens important in veterinary mycology are the same as those in medical mycology, but there are exceptions. The zoophilic dermatophyte *Microsporum gallinae* causes disease in chickens, but not humans; some of more common infections of the skin and tails of fish are caused by organisms no longer considered to be Fungi, e.g., *Saprolegnia* spp.

Mycoses (with the exception of dermatophytoses) are generally not contagious but originate from fungal populations in both the external and internal environments where many potential pathogens are present as saprobes (e.g. *Candida albicans* in the human mouth, alimentary and genital tracts; *Coccidioides immitis* and *Histoplasma capsulatum* in soil). With the rise in numbers of people who are immunocompromised, more and different opportunistic fungi are being recorded as causing often serious mycoses on such patients; see opportunistic fungi.

Medical antifungal agents belongs to groups of allylamines (butenafine, naftifine, etc.), antimetabolites, azoles (fluconazole, ketoconazole, clotrimazole, itraconazole, oxiconazole, etc.), chitin and glucan synthesis inhibitors, polyenes (different drugs on the basis of nystatin, amphotericin B, etc.) and some systemic (griseofulvin) and topical drugs (Pfaller *et al.*, *J. Clin. Microbiol.* 42: 3142, 2004; Charlier *et al.*, *J. Antimicrob. Chemoter.* 57: 384, 2006; Matta *et al.*, *Antimicrob. Agents and Chemother.* 51: 1573, 2007; etc.). The eukaryotic nature of fungi and their hosts leads to problems with antifungal drug toxicity or cross-reactivity with host molecules during treatment. Therapy for dermatophytoses is by topical application of fungicides, oral administration of griseofulvin, or X-ray epilation. Systemic mycoses, which are frequently difficult to cure, may respond to surgery, X-rays, potassium iodide, or antibiotics (see amphotericin, nystatin). Certain honeys have significant antifungal activity against isolates of *Candida* spp. (Irish *et al.*, *Medical Mycology* 44: 289, 2006) which cause systemic mycoses and are increasing worldwide (Pfaller & Diekema, *Clin. Microbiol. Rev.* 20: 133, 2007). A wide range of molecular, immunological and cytological techniques is essential for ongoing research in medical mycology (Irish *et al.*, in Kavanagh (Ed.) *Medical Mycology: Cellular and Molecular Techniques*, 348pp., 2006).

For some important mycoses named after the pathogenic agents see: adiaspiromycosis, aspergillosis, blastomycosis, candidiasis, chromomycosis, *Coccidioides* (coccidioidomycosis), cryptococcosis, dermatophyte (ringworm), epizootic lymphangitis, *Histoplasma* (histoplasmosis), mycosis, mycetoma, *Paracoccidioides* (paracoccidiomycosis), phycomycosis, piedra, rhinosporidiosis, sporotrichosis, tinea; see also Allergy.

The International Society for Human and Animal Mycology (ISHAM) encourages and facilitates the study and practice of all aspects of medical and veterinary mycology; see also Internet, Societies and organizations.

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See also: Voss (*Hautarzt*, 56: 71-74, 2005).

See also Laboratory safety.

Medical uses of Fungi. At various times different fungi have been put to medical use. *Fomes officinalis* (Agaricum, the female, white, or purging agaric) was a noted 'universal remedy' (see Faull, *Mycol.* 11: 267, 1919; 'pineapple fungus'). Yeast is a part of some patent medicines and takadiastase has medical uses. *Lycoperdon* spores and capillitium has been used for stopping blood from wounds. *Inonotus obliquus* has been widely used in Siberia for prevention of cancers (Solzhenitsyn, *Cancer ward*, 1968). In the Far East *Cordyceps sinensis* (attached to the larva ('caterpillar') of which it is a parasite), bukuryo (sclerotia of *Pachyma hoelen*) and lingzhi (*Ganoderma lucidum*) are widely used as medicines. Many spp. continue to be used in Chinese traditional medicine (Ying *et al.*, *Icones of medicinal fungi for China*, 1987; 272 spp.). The Bini and Igbo peoples of Nigeria use *Daldinia concentrica* s.l. for curing skin diseases, stomach upsets, ulcers, whooping cough and for prevention of excessive growth of the foetus for easy delivery (Akpaja *et al.*, *Int. j. medicinal mushrooms* 7: 373, 2005). The medieval Doctrine of Signatures, whereby an organism's appearance was considered to indicate the diseased organs it could treat, led to use of a variety of lichens for medicinal purposes (e.g. dog lichen, lungwort); some lichens are still supplied by pharmacies and health shops, either loose or in pastilles, e.g. Iceland moss (*Cetraria islandica*); see Richardson (*in* Galun, *CRC Handbook of lichenology* 3: 93, 1988; review). For further applications of products from lichens see Fahselt (*Symbiosis* 16: 117, 1994; review). Few, if any, fungi now, however, appear in lists of officially sanctioned medicines (in Britain, for example, the last fungus to be listed in the British Pharmaceutical Codex was ergot (q.v.), the sclerotia of *Claviceps purpurea*; the Codex has now replaced by the British Pharmacopoeia, in which several preparations from ergot are listed, but not the fungus itself).

Interest in medicinal use of fungi has grown enormously since the ninth edition of this *Dictionary*, with the establishment of the *Int. j. medicinal mushrooms* devoted to the topic. This has been accompanied by intense exploration of chemicals produced by fungi and of pharmaceutical value, for example β -glucans used in cancer therapies (from e.g. *Agaricus subrufescens*), or the secondary metabolite concentricolide, isolated from *Daldinia eschscholzii*, which has potential value for treating HIV-positive patients (Stadler *et al.*, *Phytochemistry* 56: 787, 2001).

Lit.: Chang & Miles (*Mushrooms: cultivation, nutritional value, medicinal effect, and environmental impact*, edn 2, 2004), Chen & Seviour (*MR* 111: 635, 2007; review of medicinal importance of fungal β -(1 $\rightarrow$ 3), (1 $\rightarrow$ 6)-glucans), Didukh *et al.* (*Impact of the family Agaricaceae (Fr.) Cohn on nutrition and medicine*, 2004). See also Antibiotics.

medium, culture, a substance or solution for the cul-

- ture of microorganisms (see Media).
- medulla** (1) (of lichen thalli), the loose layer of hyphae below the cortex and algal layer; (2) (of sporocarps of macromycetes), the part composed mainly or entirely of longitudinal hyphae.
- medullary excipulum** (of ascomata), tissue below the generative layer in an apothecium; hypothecium. See excipulum.
- Medusamyces** G.L. Barron & Szijarto (1990), anamorphic *Pezizomycotina*, Hso.0eH.?. 1 (on rotifers), Canada. See Barron & Szijarto (*Mycol.* 82: 136, 1990).
- Medusina** Chevall. (1826) = *Hericium* Pers. fide Saccardo (*Syll. fung.* 5: 1, 1887).
- Medusomyces** Lindau (1913) nom. conf., Fungi. See Lindner (*Ber. dt. bot. Ges.* 31: 364, 1913).
- Medusosphaera** Golovin & Gamalizk. (1962) = *Erysiphe* fide Braun & Takamatsu (*Schlechtendalia* 4: 3, 2000).
- Medusula** Eschw. (1824) [non *Medusula* Pers. 1807, *Violaceae*] nom. dub. ? = *Sarcographa* fide Staiger (*Biblthca Lichenol.* 85, 2002).
- Medusula** Tode (1790) nom. dub., anamorphic *Pezizomycotina*. See Holubová-Jechová (*Sydowia* 46: 244, 1994).
- Medusulina** Müll. Arg. (1894) = *Fissurina* fide Staiger (*Biblthca Lichenol.* 85, 2002), Archer (*Telopea* 10: 589, 2004; Australia).
- mega-** (prefix), of great size; large; cf. macro-.
- Megacapitula** J.L. Chen & Tzean (1993), anamorphic *Pezizomycotina*, Hso.#eP.1. 1, Taiwan. See Chen & Tzean (*MR* 97: 347, 1993).
- Megachytriaceae** Sparrow (1943) = *Cladochytriaceae*.
- Megachytrium** Sparrow (1931), *Cladochytriaceae*. 1 (on *Elodea*), N. America.
- Megacladosporium** Vienn.-Bourg. (1949) = *Fusicladium* fide Hughes (*Mycol. Pap.* 36, 1951), Partridge & Morgan-Jones (*Mycotaxon* 85: 357, 2003), Schubert *et al.* (*Schlechtendalia* 9, 2003).
- Megacollybia** Kotl. & Pouzar (1972), *Marasmiaceae*. 1, Europe. See Kotlaba & Pouzar (*Česká Mykol.* 26: 220, 1972).
- Megalaria** Hafellner (1984), *Megalariaceae* (L.). 1, widespread (temperate). See Ekman & Tønsberg (*Bryologist* 99: 34, 1996), Kantvilas *et al.* (*Lichenologist* 31: 213, 1999), Ekman (*MR* 105: 783, 2001; phylogeny).
- Megalariaceae** Hafellner (1984), *Lecanorales* (L.). 3 gen., 3 spp.
Lit.: Ekman & Tønsberg (*Bryologist* 99: 34, 1996), Kantvilas *et al.* (*Lichenologist* 31: 213, 1999), Ekman (*MR* 105: 783, 2001).
- Megaloblastenia** Sipman (1983), *Megalosporaceae* (L.). 2, widespread. See Kantvilas (*Lichenologist* 26: 349, 1994).
- Megalocitosporides** Wernicke (1892) = *Coccidioides* fide Dodge (*Medical Mycology*, 1935).
- Megalocystidium** Jülich (1978), *Stereaceae*. c. 10, widespread. See Boidin *et al.* (*BSMF* 113: 60, 1997).
- Megalodochium** Deighton (1960), anamorphic *Pezizomycotina*, Hsp.0eP.1. 2, Africa (tropical). See Deighton (*Mycol. Pap.* 78: 17, 1960).
- megalogonidium** (obsol.), a macrogonidium (q.v.).
- Megalographa** A. Massal. (1860), ? *Dothideomycetes*. See Staiger (*Biblthca Lichenol.* 85, 2002).
- Megalohypha** A. Ferrer & Shearer (2007), *Aliquandostipitaceae*. 1, Panama; Thailand. See Ferrer *et al.* (*Mycol.* 99: 456, 2007).
- Megalonectria** Speg. (1881) = *Nectria* fide Seifert (*Stud. Mycol.* 27, 1985), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Megalopsora** Vain. (1921) = *Physcidia* fide Kalb & Elix (*Biblthca Lichenol.* 57: 265, 1995).
- Megaloseptoria** Naumov (1925), anamorphic *Dothideomycetes*, Cpd.0fH.15. 1, Russia. See Shoemaker (*CJB* 45: 1297, 1967).
- Megalospora** A. Massal. (1852) = *Mycoblastus* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Megalospora** Meyen (1843), *Megalosporaceae* (L.). 35, widespread (esp. tropical). See Hafellner & Bellemère (*Nova Hedwigia* 35: 207, 1982; ultrastr.), Sipman (*Biblthca Lichenol.* 18, 1983; monogr., key), Kantvilas (*Lichenologist* 26: 349, 1994; key 16 spp. Australia), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998; DNA), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Untari (*Mycotaxon* 97: 129, 2006; Indonesia), Lücking (*Fungal Diversity* 27: 103, 2007; key American spp.).
- Megalospora** Naumov (1927) = *Gemmamyces*.
- Megalosporaceae** Vězda ex Hafellner & Bellem. (1982), *Teloschistales* (L.). 3 gen. (+ 5 syn.), 39 spp.
Lit.: Sipman (*Biblthca Lichenol.* 18, 1983; monogr.), Sipman (*Willdenowia* 15: 557, 1986), Kantvilas (*Lichenologist* 26: 349, 1994; key 19 spp. Australia), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny).
- Megalosporon**, see *Endothrix*.
- Megalotremis** Aptroot (1991), *Trypetheliaceae* (L.). 10, widespread (tropical). See Aptroot (*Nova Hedwigia* 60: 325, 1995), Aptroot *et al.* (*Biblthca Lichenol.* 64, 1997), Aptroot *et al.* (*Biblthca Lichenol.* 97, 2008; Costa Rica).
- Megaloxyphium** Cif., Bat. & Nascim. (1956) = *Lep-toxyphium* fide Hughes (*Mycol.* 68: 693, 1976).
- Megaspora** (Clauzade & Cl. Roux) Hafellner & V. Wirth (1987), *Megasporaceae* (L.). 2, widespread (north temperate). See Lumbsch *et al.* (*J. Hattori bot. Lab.* 75: 295, 1994; posn), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998; DNA), Ivanova & Hafellner (*Biblthca Lichenol.* 82: 113, 2001; phylogeny), Schmitt *et al.* (*J. Hattori bot. Lab.* 100: 753, 2006; phylogeny).
- Megasporaceae** Lumbsch (1994), *Pertusariales* (L.). 3 gen. (+ 10 syn.), 236 spp.
Lit.: Hafellner (*Acta Bot. Malac.* 16: 133, 1991), Lumbsch *et al.* (*J. Hattori bot. Lab.* 75: 295, 1994), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998), Ivanova & Hafellner (*Biblthca Lichenol.* 82: 113, 2001), Schmitt *et al.* (*J. Hattori bot. Lab.* 100: 753, 2006), Lumbsch *et al.* (*MR* 111: 257, 2007; phylogeny).
- megaspore**, see macrospore.
- Megasporoporia** Ryvarden & J.E. Wright (1982), *Polyporaceae*. 8, widespread (pantropical). See Ryvarden & Wright (*Mycotaxon* 16: 173, 1982), Dai & Wu (*Mycotaxon* 89: 379, 2004; China).
- Megaster** Cif., Bat., Nascim. & P.C. Azevedo (1956), anamorphic *Pezizomycotina*, Hso.0bP.1. 2, Brazil. See Ciferri *et al.* (*Publções Inst. Micol. Recife* 48: 2, 1956).
- Megathecium** Link (1826) nom. rej. prop. = *Ceratostoma* Fr.
- Megatricholoma** G. Kost (1984) = *Tricholoma* fide

- Kuyper (*in litt.*).
- Megatrachophyton** Neveu-Lem. (1921) = *Trichophyton* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Mehtamyces** Mundk. & Thirum. (1945), Pucciniales. 1 (on *Stereospermum* (*Bignoniaceae*)), Africa; India; Sri Lanka. See Thirumalachar & Mundkur (*Indian Phytopath.* 2: 193, 1949; syn of *Phragmidiella*), Ramachar & Rao (*Mycol.* 73: 778, 1981), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003).
- meiocyte**, a cell in which meiosis takes place. Cf. gonotokont.
- Meionomyces** Thaxt. (1931), Laboulbeniaceae. 6, widespread (tropical). See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- meiophase**, the part of a life cycle in which a diploid nucleus undergoes reduction.
- Meiorganaceae** R. Heim ex Jülich (1982) = Coniophoraceae.
- Meiorganum** R. Heim (1966), Paxillaceae. 2, Malaysia; New Caledonia. See Heim (*Compte rendu hebdomadaire des Sciences de l'Académie des sciences Paris* 261: 1720, 1965).
- meiosporangium**, a thick-walled diploid sporangium of certain *Blastocladales* producing uninucleate, haploid zoospores (**meiospores**, q.v.) (Emerson, 1950); see Dick (*Mycologist* 1: 166, 1987); cf. mitosporangium.
- meiospore** (1) a spore from a meiosporangium (q.v.); (2) (of ascomycetes and basidiomycetes), a basidiospore or ascospore which is the product of meiosis (see Kendrick & Watling, *in* Kendrick (Ed.), *The whole fungus* 2: 473, 1979).
- meiotangium**, for the sporangium or gametangium in which meiosis occurs. See Corner (*TBMS* 15: 336, 1931).
- Meira** Boekhout, Scorzetti, Gerson & Sztejnberg (2003), Exobasidiomycetidae. 3 (from mites), Israel; Japan. See Boekhout *et al.* (*Int. J. Syst. Evol. Microbiol.* 53: 1655, 2003; phylogeny, links with *Cryptobasidiaceae*), Sampaio (*Frontiers in Basidiomycete Mycology*: 49, 2004), Yasuda (*Mycoscience* 47: 36, 2006; from Japanese pear), Yasuda *et al.* (*Mycoscience* 47: 36, 2006).
- Meissneria** Fée (1837) [non *Meisneria* DC. 1828, *Melastomataceae*] = *Laurera*.
- Meixner test**. To detect amatoxins. Express juice from a fresh basidioma onto a piece of newspaper, allow to dry, add one drop of conc. hydrochloric acid (HCl) when a blue colour indicates presence of amatoxins. Adding more than one drop will significantly reduce detection rate when amatoxins are present only at low levels. Always perform the test with controls, using for example a species of *Russula* (not containing amatoxins) and a species known to contain amatoxins (e.g. *Amanita virosa*). See Meixner (*Z. Mykol.* 45: 137, 1979), Beutler & Vergeer (*Mycol.* 72: 1142, 1981), Vergeer (*West J. Med.* 138: 576, 1983).
- Melachroia** Boud. (1885) = *Podophacidium* fide Seaver (*North American Cup Fungi* (Inoperculates), 1951).
- Melaleuca** Pat. (1887) [non *Melaleuca* L. 1767, *Myrtaceae*] = *Melanoleuca*.
- Melampsora** Castagne (1843), Melampsoraceae. c. 90 (autoecious (*Euphorbia*, *Hypericum*, *Linum*), or heteroecious: (0, I) on conifers (*Abies*, *Larix*, *Pinus*, *Tsuga*) or angiosperms (*Allium*, *Mercurialis*, *Ribes*); (II, III) on *Salicaceae*), widespread (esp. north temperate). *M. lini* on flax (*Linum*). See Newcombe *et al.* (*MR* 104: 261, 2000; hybrid sp.), Tian *et al.* (*Mycoscience* 45: 56, 2004; phylog.), Pei *et al.* (*Rust Diseases of Willow and Poplar*: 1, 2005; phylog.), Pei *et al.* (*MR* 109: 401, 2005; phylog.).
- Melampsoraceae** Dietel (1897), Pucciniales. 1 gen. (+ 5 syn.), 90 spp.
Lit.: Burdon & Roberts (*Pl. Path.* 44: 270, 1995), Spiers & Hopcroft (*MR* 100: 1163, 1996), Brasier (*BioScience* 51: 123, 2001), Samils *et al.* (*Eur. J. Pl. Path.* 107: 399, 2001), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003), Maier *et al.* (*CJB* 81: 12, 2003), Nakamura *et al.* (*Mycoscience* 44: 253, 2003), Smith *et al.* (*Mycol.* 96: 1330, 2004), Tian *et al.* (*Mycoscience* 45: 56, 2004), Wingfield *et al.* (*Australas. Pl. Path.* 33: 327, 2004), Pei (*Rust Diseases of Willow and Poplar*: 11, 2005), Pei *et al.* (*MR* 109: 401, 2005), Pei *et al.* (*Rust Diseases of Willow and Poplar*: 1, 2005), Aime (*Mycoscience* 47: 112, 2006).
- Melampsorella** J. Schröt. (1874), Pucciniastraceae. 2 (on *Abies* (0, I); on *Boraginaceae* and *Caryophyllaceae* (II, III)), widespread (north temperate). See Berndt & Oberwinkler (*Mycol.* 89: 698, 1997).
- Melampsoridium** Kleb. (1899), Pucciniastraceae. 9 (on *Larix* (0, I; where known) (*Pinaceae*); on *Betulaceae* (II, III) esp.), widespread (esp. north temperate). See Kurkela *et al.* (*Mycol.* 91: 987, 1999; on birch and alder).
- Melampsoropsis** (J. Schröt.) Arthur (1906) = *Chrysomyxa* fide Arthur (*Manual Rusts US & Canada*, 1934).
- Melampyidiomyces** Cif. & Tomas. (1953) = *Melampyidium*.
- Melampyidium**, see *Melampylidium*.
- Melampylidium** Stirt. ex Müll. Arg. (1894) = *Bactrospora* fide Egea & Torrente (*Mycotaxon* 53: 57, 1995).
- Melanamphora** Lafl. (1976), Diaporthales. Anamorph *Cytosporina*. 2 (from bark), widespread. See Prasil *et al.* (*Česká Mykol.* 28: 1, 1974; anamorph).
- Melanaria** Erichsen (1936) = *Pertusaria* fide Hawksworth *et al.* (*Lichenologist* 12: 1, 1980), Schmitt *et al.* (*Bibliotheca Lichenol.* 86: 147, 2003; phylogeny), Schmitt *et al.* (*Lichenologist* 38: 411, 2006; phylogeny).
- Melanaspicilia** Vain. (1909) = *Buellia* fide Lamb (*Sci. Repts Br. Antarct. Surv.* 61, 1968).
- Melanchlenus** Calandron (1953) nom. inval. = *Exophiala* fide de Hoog (*Stud. Mycol.* 15, 1977), Hoog *et al.* (*J. Clin. Microbiol.* 41: 4767, 2003).
- Melanconiaceae** Corda (1842) = Melanconidaceae.
- Melanconiales**. (obsol.). Traditionally used for anamorphic fungi with acervular conidiomata. Not accepted by von Höhnelt (1923) who treated *Melanconiales* in the *Hyphomycetes*, *Tuberculariales*, or by Sutton (1973, 1980) who discussed relationships of suprageneric taxa in Deuteromycotina. See Anamorphic fungi.
- Melanconidaceae** G. Winter (1886), Diaporthales. 13 gen. (+ 13 syn.), 104 spp.
Lit.: Wehmeyer (*Revision of Melanconis*, 1941), Barr (*Mycol. Mem.* 7, 1978), von Arx *in* Kendrick (Ed.) (*The whole fungus* 1: 201, 1979), Sieber *et al.* (*CJB* 69: 2170, 1991), Belisario & Onofri (*MR* 99: 1059, 1995), Orsenigo *et al.* (*Mycotaxon* 67: 257, 1998), Belisario (*Eur. J. For. Path.* 29: 317, 1999),

- Yanna *et al.* (*Fungal Diversity* 2: 199, 1999), Castlebury *et al.* (*Mycol.* 94: 1017, 2002), Rossman *et al.* (*Mycoscience* 48: 135, 2007; phylogeny).
- Melanconidium** (Sacc.) Kuntze (1898) = *Melanconis*.
- Melanconiella** Sacc. (1882), Diaporthales. See Wehmeyer (*Revision of Melanconis*, 1941), Rossman *et al.* (*Mycoscience* 48: 135, 2007; review).
- Melanconiopsis** Ellis & Everh. (1900), anamorphic *Massariovalsa*, Cac.0eP.19. 4, widespread. See Speer (*BSMF* 102: 363, 1986), Suarez *et al.* (*MR* 104: 1530, 2000; Argentina).
- Melanconis** Tul. & C. Tul. (1863), Melanconidaceae. Anamorph *Melanconium*. 28, widespread. *M. juglandis* (die-back of *Juglans*). The genus seems to be polyphyletic. See Wehmeyer (*Revision of Melanconis*, 1941), Castlebury *et al.* (*Mycol.* 94: 1017, 2002).
- Melanconites** Göpp. (1852), Fossil Fungi. 1 (Tertiary), Europe.
- Melanconium** Link (1809), anamorphic *Melanconis*, Cac.0eP.19. c. 50, widespread. See Sutton (*Persoonia* 3: 193, 1964; typification), Sieber *et al.* (*CJB* 69: 2170, 1991; biochem. charact. *Alnus* isol.), Shamoun & Sieber (*Mycotaxon* 49: 151, 1993; isozyme, protein patterns *Alnus* isol.), Belisario (*Eur. J. For. Path.* 29: 317, 1999; on *Juglans*).
- Melanelia** Essl. (1978), Parmeliaceae (L). 42, widespread (esp. temperate and boreal). See Esslinger (*Taxon* 29: 692, 1980), Lumbsch *et al.* (*Mycotaxon* 33: 447, 1988), Kashiwadani *et al.* (*Bull. natn. Sci. Mus. Tokyo*, B 24: 43, 1998; Japan), Crespo *et al.* (*Lichenologist* 31: 451, 1999; morphology, chemistry, phylogeny), Guzow-Krzeminska & Wegrzyn (*Lichenologist* 35: 83, 2003; phylogeny), Chen & Esslinger (*Mycotaxon* 93: 71, 2005; China), Rico *et al.* (*Lichenologist* 37: 199, 2005; Iberian peninsula), Blanco *et al.* (*Mol. Phylogen. Evol.* 39: 52, 2006; phylogeny).
- Melanelixia** O. Blanco, A. Crespo, Divakar, Essl., D. Hawksw. & Lumbsch (2004), Parmeliaceae (L). 8, widespread. See Blanco *et al.* (*MR*, 2004), Blanco *et al.* (*Mol. Phylogen. Evol.* 39: 52, 2006; phylogeny), Laundon (*Lichenologist* 38: 277, 2006; infraspecific taxa), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Honegger & Zippler (*MR* 111: 424, 2007; mating systems).
- Melaniella** R. Bauer, Vánky, Begerow & Oberw. (1999), Melaniellaceae. 2 (on *Selaginella*), India; Jawa; Zimbabwe. See Vánky & Vánky (*Lidia* 5: 157, 2002; southern Africa).
- Melaniellaceae** R. Bauer, Vánky, Begerow & Oberw. (1999), Doassansiales. 1 gen., 2 spp.
Lit.: Bauer *et al.* (*CJB* 75: 1273, 1997), Bauer *et al.* (*Mycol.* 91: 475, 1999), Vánky (*Mycol. Balcanica* 1: 175, 2004).
- melanin**, a black pigment (tyrosine derivative) produced by fungi, animals etc. (Butler *et al.* (*Mycol.* 93: 1, 2001; pathogenic properties), Wheeler, *TBMS* 81: 29, 1983; synthesis).
- melanized**, containing dark brown pigments.
- Melanobasidium** Maubl. (1906) = *Sphaceloma* fide Jenkins & Bitancourt (*Mycol.* 33: 338, 1941).
- Melanobasis** Clem. & Shear (1931) = *Sphaceloma* fide Sutton (*Mycol. Pap.* 141, 1977).
- Melanobotrys** Rodway (1926) = *Xylobotryum* fide Clements & Shear (*Gen. Fung.*, 1931).
- Melanocarpus** Arx (1975), Sordariales. 3 (thermophilic), widespread. See Maheshwari & Kamalam (*J. gen. Microbiol.* 131: 3017, 1985), Guarro *et al.* (*MR* 100: 75, 1996).
- Melanocephala** S. Hughes (1979), anamorphic *Pezizomycotina*, Hso.0eP.1. 5, widespread. See Hughes (*N.Z. Jl Bot.* 17: 166, 1979), Wu & Zhuang (*Fungal Diversity Res. Ser.* 15, 2005).
- Melanochaeta** E. Müll., Harr & Sulmont (1969), Chaetosphaeriaceae. Anamorphs *Sporoschisma*, *Chalara*-like. 4 (from wood etc.), Europe; Sri Lanka. See Réblová (*Czech Mycol.* 50: 73, 1997), Réblová *et al.* (*Sydowia* 51: 49, 1999), Sivichai *et al.* (*MR* 104: 478, 2000), Huhndorf *et al.* (*Mycol.* 96: 368, 2004; phylogeny), Fernández *et al.* (*Mycol.* 98: 121, 2006), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Melanochlamys** Syd. & P. Syd. (1914) = *Gilletiella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Melanocryptococcus** Della Torre & Cif. (1964) = *Cryptococcus* Vuill. fide von Arx *et al.* (*Stud. Mycol.* 14: 1, 1977).
- Melanodecton** A. Massal. (1860) = *Chiodecton* fide Thor (*Op. Bot.* 103, 1990).
- Melanodiscus** Höhn. (1918), anamorphic *Pezizomycotina*, Hsp.0eP.?. 1, Europe.
- Melanodochium** Syd. (1938) ? = *Sphaceloma* fide Sutton (*Mycol. Pap.* 141, 1977).
- Melanodothis** R.H. Arnold (1972), Mycosphaerellaceae. Anamorph *Ramularia*-like. 1, Asia; N. America. See Sivanesan (*Bitunicate Ascomycetes and their Anamorphs*, 1984).
- Melanogaster** Corda (1831) nom. cons., Paxillaceae. 25, widespread. See Zeller & Dodge (*Ann. Mo. bot. Gdn* 23: 639, 1936), Wang *et al.* (*Mycotaxon* 93: 315, 2005; Japan).
- Melanogastraceae** E. Fisch. (1933) = Paxillaceae.
- Melanogastrales** = Boletales. See also under Hypogeous fungi, gasteromycetes.
- Melanogone** Wollenw. & Ha. Richt. (1934) = *Humicola* fide Mason (*Mycol. Pap.* 5: 113, 1941).
- Melanogramma** Pers. [not traced] nom. dub., Fungi. See Keissler (*Nyt Mag. naturv.* 66: 79, 1927).
- Melanographa** Müll. Arg. (1882), Melaspileaceae (L). See Lendemer (*Bryologist* 106: 311, 2003).
- Melanographium** Sacc. (1913), anamorphic *Pezizomycotina*, Hso/Hsy.0eP.10. 9, Asia (tropical). See Ellis (*Dematiaceous Hyphomycetes*, 1971), Srivastava & Morgan-Jones (*Mycotaxon* 57: 195, 1996; India), Goh & Hyde (*MR* 101: 1097, 1997; Hong Kong, key), Somrithipol & Jones (*Fungal Diversity* 19: 137, 2005; Thailand).
- Melanohalea** O. Blanco, A. Crespo, Divakar, Essl., D. Hawksw. & Lumbsch (2004), Parmeliaceae (L). 20, widespread. See Blanco *et al.* (*MR* 108: 882, 2004), Divakar & Upreti (*Lichenologist* 37: 511, 2005), Blanco *et al.* (*Mol. Phylogen. Evol.* 39: 52, 2006; phylogeny).
- Melanolecia** Hertel (1981), Lecanorales (L). 8, widespread. See Poelt & Vězda (*Biblthca Lichenol.* 16, 1981), Buschbom & Mueller (*Mol. Phylogen. Evol.* 32: 66, 2004; reln with *Farnoldia*).
- Melanoleuca** Pat. (1897) nom. cons., Tricholomataceae. c. 50, widespread. See Bresinsky & Stangl (*Z. Pilzk.* 43: 145, 1977), Gillman & Miller (*Mycol.* 69: 927, 1977), Kühner (*Bull. Soc. linn. Lyon* 47: 12, 1978), Boekhout (*Persoonia* 13: 397, 1988; Netherlands), Boekhout & Kuyper (*Persoonia* 16: 253, 1996), Fontenla *et al.* (*Rivista di Micologia* 44: 27, 2001), Fontenla *et al.* (*Micologia e Vegetazione Mediterranea* 17: 18, 2002), Fontenla *et al.* (*Rivista*

- di Micologia* 48: 113, 2005; spore morphology).
- Melanomma** Nitschke ex Fuckel (1870), Melanomataceae. Anamorph *Nigrolentilocus*. c. 27, widespread. See Chesters (*TBMS* 22: 116, 1938), Holm (*Symb. bot. upsal.* 14 no. 3: 1, 1957), Réblová (*Czech Mycol.* 50: 161, 1998), Liew *et al.* (*Mol. Phylogen. Evol.* 16: 392, 2000; DNA), Inderbitzin & Huang (*Mycoscience* 42: 187, 2001; China), Kruys *et al.* (*MR* 110: 527, 2006; phylogeny), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny), Wang *et al.* (*MR* 111: 1268, 2007; phylogeny).
- Melanommataceae** G. Winter (1885), Pleosporales. 21 gen. (+ 9 syn.), 265 spp. The family is polyphyletic and in need of revision.
- Lit.*: Boise (*Mycol.* 77: 230, 1985), Hawksworth & Boise (*Sydowia* 38: 114, 1985), Barr (*N. Amer. Fl. ser. 2* 13: 129 pp., 1990), Huhndorf (*Mycol.* 90: 527, 1998), Hyde & Fröhlich (*Sydowia* 50: 81, 1998), Réblová (*Czech Mycol.* 50: 161, 1998), Hyde & Goh (*Nova Hedwigia* 68: 251, 1999), Liew *et al.* (*Mol. Phylogen. Evol.* 16: 392, 2000), Lindemuth *et al.* (*MR* 105: 1176, 2001), Lumbsch & Lindemuth (*MR* 105: 901, 2001), Kodsueb *et al.* (*Mycol.* 98: 571, 2006), Wang *et al.* (*MR* 111: 1268, 2007; phylogeny).
- Melanommatales** = Pleosporales.
- Melanomphalia** M.P. Christ. (1936), Tricholomataceae. 1, Europe. See Christiansen (*Friesia* 1: 288, 1936), Montag (*Z. Mykol.* 62: 75, 1996), Aime *et al.* (*Am. J. Bot.* 92: 74, 2005; most species should be placed in *Crepidotus*), Eyssartier & Boisselet (*BSMF* 120: 423, 2004).
- Melanomyces** Syd. & P. Syd. (1917) nom. dub., Fungi. See Petrak (*Sydowia* 1: 169, 1947).
- Melanopelta** Kirschst. (1939) = *Gnomonia* fide Bolay (*Ber. schweiz. bot. Ges.* 81, 1972).
- Melanopeziza** Velen. (1939), ? Helotiales. 1, former Czechoslovakia.
- Melanophloea** P. James & Vězda (1971), Thelocarpaceae (L.). 1, British Solomon Islands; Papua New Guinea. See James & Vězda (*Lichenologist* 5: 89, 1971).
- Melanophoma** Papendorf & J.W. du Toit (1967), anamorphic *Pezizomycotina*, Cpd.0eH.15. 1, S. Africa. See Papendorf & du Toit (*TBMS* 50: 503, 1967).
- Melanophora** Arx (1957) = *Sphaceloma* fide Jenkins (*Aq. Inst. Biol. S. Paulo* 38: 83, 1971).
- Melanophthalmum** Fée (1825) = *Strigula* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Melanophyllum** Velen. (1921), Agaricaceae. 3, widespread. See Velenovský (*České Houby*: 569, 1921), Migliozi & Zecchin (*Boll. Gruppo Micol. 'G. Bresadola'* 44: 49, 2001), Vellinga (*MR* 108: 354, 2004; phylogeny).
- Melanoplaca** Syd. & P. Syd. (1917) = *Dothidasteroma* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Melanoporella** Murrill (1907) = *Nigrofomes* fide Lowe (*Tech. Pub. Sta. Univ. Coll. Forestry, Syracuse* 90, 1966) but used by, Pegler (*The polypores [Bull. BMS Suppl.]*, 1973).
- Melanoporia** Murrill (1907) = *Nigrofomes* fide Ryvarden (*Norw. J. Bot.* 19: 233, 1972).
- Melanoportha** Wehm. (1938) = *Diaporthe* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Melanops** Nitschke ex Fuckel (1870), Botryosphaeriaceae. 1. See Holm (*Taxon* 24: 475, 1975), Phillips & Pennycook (*Sydowia* 56: 288, 2004), Crous *et al.* (*Stud. Mycol.* 55: 235, 2006).
- Melanopsamma** Niessl (1876), Hypocreales. Anamorphs *Custingophora*-like, *Stachybotrys*. 41 (on old wood etc.), widespread (north temperate). See Barr (*Mycotaxon* 39: 43, 1990; status, posn), Samuels & Barr (*CJB* 75: 2165, 1998; key N Am. spp.), Castlebury *et al.* (*MR* 108: 864, 2004; phylogeny).
- Melanopsammella** Höhn. (1920), Chaetosphaeriaceae. Anamorphs *Chloridium*, *Gonytrichum*. 1, Europe. See Alcorn (*Mycotaxon* 39: 361, 1990; phylogeny), Réblová (*Czech Mycol.* 50: 73, 1997), Réblová *et al.* (*Sydowia* 51: 49, 1999), Réblová (*Stud. Mycol.* 45: 149, 2000; review), Fernández & Huhndorf (*Fungal Diversity* 18: 15, 2005), Fernández *et al.* (*Mycol.* 98: 121, 2006; phylogeny).
- Melanopsammia** Höhn. (1919) = *Lentomita* fide Holm (*Svensk bot. Tidskr.* 62: 217, 1968).
- Melanopsammopsis** Stahel (1915) = *Microcylus* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Melanopsichiaceae** Vánky (2001) = Ustilaginaceae.
- Melanopsichium** Beck (1894), Ustilaginaceae. 2 (on *Polygonaceae*), widespread. See Zundel (*Mycol.* 35: 180, 1943), Zundel (*Mycol.* 35: 654, 1943), Zundel (*Mycol.* 52: 189, 1961), Vánky (*Illustrated genera of smut fungi*, 1987), Vánky (*Mycol. Balcanica* 2: 113, 2005).
- Melanopus** Pat. (1887) = *Polyporus* P. Micheli ex Adans. fide Singer (*Agaric. mod. Tax.*, 1951).
- Melanormia** Körb. (1865), ? Helotiales (?L.). 1, Germany.
- Melanosella** Örosi-Pál (1936), anamorphic *Pezizomycotina*, Hso.0eH.?. 1 (yeast-like), widespread. *M. mors-apis* (melanosis of bees).
- Melanosorus** De Not. (1847) = *Rhytisma*.
- Melanosphaeria** Sawada (1922) ? = *Sirosphaera* fide Petch (*TBMS* 11: 258, 1926).
- Melanosphaerites** Grüss (1928), Fossil Fungi. 2 (Devonian), Europe.
- Melanospora** Corda (1837) nom. cons., Ceratostomataceae. Anamorphs *Harzia*, *Gonytrichum*. 29 (from soil, often fungicolous), widespread. See Doguet (*Botaniste* 39, 1955), Cannon & Hawksworth (*J. Linn. Soc. Bot.* 84: 115, 1982; key 12 Br. spp.), Vakili (*MR* 93: 67, 1989; anamorph), Goh & Hanlin (*Mycol.* 86: 357, 1994; ontogeny), Goh & Hanlin (*Mycol.* 90: 655, 1998; TEM), Goh *et al.* (*Fungal Science Taipei* 13: 1, 1998; anamorph), Jones & Blackwell (*MR* 102: 661, 1998; DNA), Stchigel *et al.* (*MR* 103: 1305, 1999), Nitzan *et al.* (*Sydowia* 56: 281, 2004), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny), Schoch *et al.* (*MR* 111: 154, 2007; phylogeny), Tsui *et al.* (*Mycol.* 99: 884, 2007; phylogeny, anamorph).
- Melanospora** Mudd (1861) = *Poeltinula*.
- Melanosporaceae** Bessey (1950) = Ceratostomataceae.
- Melanosporales** N. Zhang & M. Blackw. (2007). Hypocreomycetidae. 1 fam., 12 gen., 63 spp. Fam.: **Ceratostomataceae**
- For *Lit.* see under fam.
- Melanosporites** Pampal. (1902), Fossil Fungi. 1 (Miocene), Italy.
- Melanosporopsis** Naumov (1927) = *Melanospora* Corda fide Clements & Shear (*Gen. Fung.*, 1931).
- melanosporous**, black-spored.
- Melanostigma** Kirschst. (1939) = *Herpotrichiella* fide Barr (*Rhodora* 78: 67, 1976).
- Melanostroma** Corda (1829) = *Ceuthospora* Grev. fide Nag Raj in Sherwood (Ed.) (*Mycotaxon* 5: 1, 1977).

- Melanostromella** Petr. (1953) = *Antennularia* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Melanotaeniaceae** Begerow, R. Bauer & Oberw. (1998), Ustilaginales. 3 gen., 14 spp.
Lit.: Ingold (*TBMS* 91: 712, 1988), Boekhout *et al.* (*Stud. Mycol.* 38: 175, 1995), Bauer *et al.* (*CJB* 75: 1273, 1997), Begerow *et al.* (*CJB* 75: 2045, 1998), Piepenbring *et al.* (*Protoplasma* 204: 202, 1998), Walker (*MR* 105: 225, 2001), Vánky (*Mycol. Balcanica* 1: 175, 2004).
- Melanotaenium** de Bary (1874), Melanotaeniaceae. 9, widespread. Black spots or swellings on dicotyledonous plants. See Zambettakis & Joly (*BSMF* 88: 193, 1972; key, numerical taxonomy), Vánky (*Illustrated genera of smut fungi*, 1987), Bauer *et al.* (*CJB* 75: 1273, 1997), Vánky (*Mycotaxon* 70: 44, 1999), Vánky (*Mycol. Balcanica* 2: 169, 2005).
- Melanotheca** Fée (1837) = *Pyrenula* Ach. (1809) fide Harris (*Mem. N. Y. bot. Gdn* 49, 1989).
- Melanothecomycetes** Cif. & Tomas. (1953) = *Laurera* fide Letrouit-Galinou (*Revue bryol. lichén.* 26: 207, 1957).
- Melanothecopsis** C.W. Dodge (1967), Pyrenulaceae (?L). 5, widespread. See Dodge (*Nova Hedwigia* 12: 308, 1966).
- Melanotopelia** Lumbsch & Mangold (2008), Thelotremataceae (L). 2, N. America; Australia. See Mangold *et al.* (*Lichenologist* 40: 39, 2008).
- Melanotrema** A. Frisch (2006), Thelotremataceae (L). 6, pantropical. See Frisch (*Biblthca Lichenol.* 92: 382, 2006), Frisch *et al.* (*Biblthca Lichenol.* 92: 517, 2006; phylogeny).
- Melanotrichum** Corda (1833) = *Trichosporum* Vuill. fide Saccardo (*Syll. fung.* 4: 292, 1886).
- Melanotus** Pat. (1900) = *Psilocybe* (Fr.) P. Kumm. fide Kuyper (*in litt.*).
- Melanustilospora** Denchev (2003), Urocystidaceae. 2 (on *Araceae*), Europe. See Denchev (*Mycotaxon* 87: 475, 2003).
- Melascypha** Boud. (1885) = *Pseudoplectania* fide Seaver (*North American Cup Fungi* (Operculates), 1928).
- Melasmia** Lév. (1846), anamorphic *Rhytisma*, St.0eH.15. 20, widespread. See Braun (*Arnoldia* 15: 44, 1998; *M. ulmicola*).
- Melaspilea** Nyl. (1857), Melaspileaceae ($\pm$ L). c. s.lat. 66, widespread (esp. tropical). See Hafellner in Hawksworth (Ed.) (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. 269 269: 419, 1994; rels, polyphyly), Vrijsmoed *et al.* (*MR* 100: 291, 1996), Kantvilas & Coppins (*Lichenologist* 29: 525, 1997), Lendemer (*Bryologist* 106: 311, 2003; nomencl.).
- Melaspileaceae** Walt. Watson (1929), Arthoniomycetes (inc. sed.) ($\pm$ L). 1 gen. (+ 6 syn.), c. 66 spp.
Lit.: Hafellner in Hawksworth (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. 269 269: 419, 1994), Vrijsmoed *et al.* (*MR* 100: 291, 1996).
- Melaspileella** (P. Karst.) Vain. (1921) ? = *Melaspilea* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Melaspileomyces** Cif. & Tomas. (1953) = *Melaspilea* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Melastiza** Boud. (1885), Pyronemataceae. 14, widespread (north temperate). See Maas Geesteranus (*Persoonia* 4: 418, 1967; key), Dissing (*Svampe*: 29, 1980; key Danish spp.), Lassuer (*Docums Mycol.* 11 no. 42: 1, 1980; key), Häffner (*Beitr. Kenntn. Pilze Mitteleur.* 2: 183, 1986; key 9 spp.), Arroyo & Calonge (*Boln Soc. Micol. Madrid* 12: 23, 1988), Moravec (*Czech Mycol.* 47: 237, 1994; synonym of *Aleuria*), Spooner & Yao (*Mycotaxon* 53: 467, 1995), Hansen *et al.* (*Mol. Phylogen. Evol.* 36: 1, 2005; phylogeny), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Liu & Zhuang (*Mycosystema* 25: 546, 2006; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Melastiziella** Svrček (1948) = *Scutellinia* fide Eckblad (*Nytt Mag. Bot.* 15: 1, 1968).
- Melchioria** Penz. & Sacc. (1897), Trichosphaeriaceae. 1, Java.
- Meliderma** Velen. (1920) = *Cortinarius* fide Singer (*Agaric. mod. Tax.*, 1951).
- Melidium** Eschw. (1822) = *Thamnidium* Link fide Benny (*Mycol.* 84: 834, 1992).
- Meliniomyces** Hambl. & Sigler (2005), anamorphic *Leotiomycetes*. 3 (mycorrhizal), widespread (north temperate). See Hambleton & Sigler (*Stud. Mycol.* 53: 16, 2005), Vohnik *et al.* (*Czech Mycol.* 59: 215, 2007; from truffle).
- Meliola** Fr. (1825), Meliolaceae. c. 1297 (from living leaves), widespread (esp. tropical). Each species is commonly given a 'Beeli formula' (q.v.). See Hansford (*Beih. Sydowia* 2, 1961), Hansford (*Beih. Sydowia* 5, 1963), Luttrell (*Mycol.* 81: 192, 1989; ontogeny), Mueller *et al.* (*CJB* 69: 803, 1991; mucronate hyphopodia), Reynolds (*Mycotaxon* 42: 99, 1991), Mibey & Hawksworth (*SA* 14: 25, 1995; capitate hyphopodia), Dianese & Furlanetto (*Progress in Microbial Ecology* Proceedings of the Seventh International Symposium on Microbial Ecology. Santos, São Paulo, Brazil 1995: 207, 1997; Brazil), Hosagoudar *et al.* (*The Meliolineae A Supplement*: 201 pp., 1997; revision), Mibey & Hawksworth (*Mycol. Pap.* 174: 108 pp., 1997; Kenya), Hu *et al.* (*Flora Fungorum Sinicorum* 11, 1999; China), Mibey & Cannon (*Cryptog. Mycol.* 20: 249, 1999; Kenya), Saenz & Taylor (*MR* 103: 1049, 1999; phylogeny).
- Meliolaceae** G.W. Martin ex Hansf. (1946), Meliolales. 22 gen. (+ 12 syn.), 1980 spp.
Lit.: Hansford (*Mycol. Pap.* 23, 1948; W. Afr.), Boedijn (*Persoonia* 1: 393, 1961; Indonesia), Hansford (*Sydowia Beih.* 2, 1961; 1814 taxa), Yamamoto (*Spec. Publ. Agric. nat. Taiwan Univ.* 10: 197, 1961; Taiwan), Hansford (*Sydowia Beih.* 5, 1963; 1814 figs), Hansford (*Sydowia* 16: 302, 1963), Stevenson (*Sydowia* 22: 225, 1969; host index), Goos & Anderson (*Sydowia* 26: 73, 1974; Hawaii), Hawksworth & Eriksson (*SA* 5: 142, 1986; status), Mueller *et al.* (*CJB* 69: 803, 1991; ultrastr. hyphopodia), Mueller *et al.* (*MR* 95: 1208, 1991), Hosagoudar (*Meliolales of India*: 363 pp., 1996), Hosagoudar (*Meliolales of India*, 1996), Hu *et al.* (*Flora Fungorum Sinicorum* 4. Meliolales: 270 pp., 1996), Hosagoudar *et al.* (*The Meliolineae A Supplement*, 1997), Hosagoudar *et al.* (*The Meliolineae A Supplement*: 201 pp., 1997), Mibey & Hawksworth (*Mycol. Pap.* 174, 1997; Kenya), Mibey & Hawksworth (*Mycol. Pap.* 174: 108 pp., 1997), Saenz & Taylor (*MR* 103: 1049, 1999).
- Meliolales** Gäum. ex D. Hawksw. & O.E. Erikss. (1986). Meliolomycetidae. 1 fam., 22 gen., 1980 spp. Fam.:

Meliolaceae

Lit.: Hosagoudar (*Meliolales of India*, 1996), Katumoto & Hosagoudar (*J. Econ. Tax. Bot.* 13: 615, 1989; lists 169 taxa supplemental to Hansford's monograph), Saenz & Taylor (*MR* 103: 1049, 1999; phylogeny), Schmiedeknecht (*Wiss. Zeitschr. Friedrich-Schiller Univ. Jena* 38, 185, 1989; 109 spp. Cuba), and see under *Meliolaceae*.

Meliolaster Doidge (1920) = *Amazonia* fide Stevens (*Annls mycol.* 25: 405, 1927).

Meliolaster Höhn. (1918), *Asterinaceae*. 1, widespread (tropical).

Meliolidium Speg. (1924) = *Perisporiopsis* Henn. fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).

Meliolina Syd. & P. Syd. (1914), *Meliolinaceae*. Anamorph *Briana*. 39, widespread. See Reynolds (*Cryptog. Mycol.* 10: 305, 1989; asci), Hughes (*Mycol. Pap.* 166, 1993; key), Saenz & Taylor (*MR* 103: 1049, 1999; phylogeny), Hosagoudar (*Zoos' Print Journal* 17: 786, 2002; key).

Meliolinaceae S. Hughes (1993), *Pezizomycotina* (inc. sed.). 2 gen., 40 spp.

Lit.: Reynolds (*Pacific Sci.* 43: 161, 1989), Reynolds (*Cryptog. Mycol.* 10: 305, 1989), Hughes (*Mycol. Pap.* 166: 255 pp., 1993), Hughes (*Mycol. Pap.* 166, 1993), Johnston (*N.Z. Jl Bot.* 37: 289, 1999), Saenz & Taylor (*MR* 103: 1049, 1999; phylogeny).

melioline, one of the *Meliolaceae*, esp. *Meliola* spp.

Meliolinella Hansf. (1946) = *Scolionema* fide von Arx & Müller (*Stud. Mycol.* 9, 1975), Hosagoudar (*Persoonia* 18: 123, 2002).

Meliolinites Selkirk ex Janson. & Hills (1978), *Fossil Fungi*. 3 (Eocene, Miocene), Australia; USA.

Meliolinopsis Beeli (1920) = *Patouillardina* G. Arnaud.

Meliolinopsis F. Stevens (1924) = *Scolionema* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Melioliphila Speg. (1924), *Tubeufiaceae*. Anamorphs *Chionomyces*, *Eriomycopsis*. 7, widespread (tropical). See Rossman (*Mycol. Pap.* 157, 1987; key).

Meliolomycetidae, *Sordariomycetes*. Ord.:

Meliolales

For *Lit.* see fam.

Meliolopsis (Sacc.) Sacc. (1891) nom. dub., *Fungi*. See Theissen & Sydow (*Annls mycol.* 15: 465, 1917).

Meliothecium Sacc. (1901) = *Myxothecium*.

Melittosporiopsis, see *Mellittosporiopsis*.

Melittosporium, see *Mellittosporium*.

Mellittosporiella Höhn. (1919), *Rhytismatales*. 2, Europe; N. America. See Sherwood (*Mycotaxon* 5: 1, 1977), Sherwood (*Sydowia* 38: 267, 1986).

Mellittosporiopsis Rehm (1900) = *Tapellaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Mellittosporium Corda (1838), *Rhytismatales*. 3, Europe; N. America. See Hawksworth & Kinsey (*SA* 14: 59, 1995; nomencl.).

Meloderma Darker (1967), *Rhytismataceae*. 4, widespread. Nests within *Lophodermium* in phylogenetic analyses. See Johnston (*Mycotaxon* 33: 423, 1988; gen. concept), Gernandt *et al.* (*Mycol.* 93: 915, 2001; phylogeny), Ortiz-García *et al.* (*Mycol.* 95: 846, 2003; phylogeny).

Melogramma Fr. (1849), *Melogrammataceae*. Anamorph *Cytosporina*. 3, Europe. See Laflamme (*Sydowia* 28: 237, 1977), Barr (*Mycol. Mem.* 7, 1978), Cannon (*SA* 7: 23, 1988; posn).

Melogrammataceae G. Winter (1886), *Diaporthales*. 1 gen., 3 spp. Ascomata perithecial, long-necked, clustered within a dark pseudostroma. Asci cylindrical, fairly thick-walled but not fissitunicate, with an apical ring that does not stain in iodine, remaining attached at maturity. Ascospores fusiform to cylindrical, often curved, with several transverse septa, dark brown but with the end cells remaining $\pm$ hyaline. Anamorph coelomycetous.

Melomastia Nitschke ex Sacc. (1875), *Xylariales*. 3 or 4 (bark and wood), widespread. Probably close to *Pleurotrema* as interpreted by Harris & Barr, but the true identity of that genus is uncertain. See Kang *et al.* (*Fungal Diversity* 2: 135, 1999).

melophase, the part of a life cycle in which a diploid nucleus undergoes reduction.

Melophia Sacc. (1884), anamorphic *Pezizomycotina*, *St.OffH.*? 10, widespread. See Sutton (*Mycol. Pap.* 141, 1977).

Melzericium Hauerslev (1975), *Atheliaceae*. 3, widespread. See Greslebin & Rajchenberg (*N.Z. Jl Bot.* 41: 437, 2003; Patagonia).

Melzerodontia Hjortstam & Ryvarden (1980), *Corticaceae*. 3, Tanzania. See Hjortstam & Ryvarden (*Mycotaxon* 12: 177, 1980).

Membranatheca Matsush. (1995) = *Amerosporium* fide Sutton (*in litt.*).

Membranicium J. Erikss. (1958) = *Phanerochaete* fide Donk (*Persoonia* 2: 223, 1962) but see, Hayashi (*Bull. Govt. For. Res. Stn* 88: 260, 1974).

Membranomyces Jülich (1975), *Clavulinaceae*. 2, Europe; Canada. See Dentinger & McLaughlin (*Mycol.* 98: 746, 2006; phylogeny).

membranous (**membranaceous**), like a thin skin or parchment.

Memnoniella Höhn. (1923), anamorphic *Hypocreales*, *Hso.0eP.15*. 5, widespread. See Verona & Mazzucchetti (*Publ. Ente naz. Cellul. Carta*, 1968), Haugland *et al.* (*Mycol.* 93: 54, 2001; phylogeny), Photita *et al.* (*Cryptog. Mycol.* 24: 147, 2003; on *Musa*).

Memnonium Corda (1833) = *Trichosporium* Vuill. fide Saccardo (*Syll. fung.* 4: 294, 1886).

memnospore, a spore remaining at its place of origin (Gregory, *in* Madelin (Ed.), *The fungus spore*, 1966). Cf. xenospore.

Mendogia Racib. (1900), *Schizothyriaceae*. 2, widespread.

Mendoziopeltis Bat. (1959), *Micropeltidaceae*. 2, C. America. See Batista (*Publicões Inst. Micol. Recife* 56: 434, 1959).

Menegazzia A. Massal. (1854), *Parmeliaceae* (L.). c. 78, widespread (esp. south temperate). See Santesson (*Ark. Bot.* 30A no. 11: 1, 1943), Adler & Calvelo (*Mycotaxon* 59: 367, 1996), Bjerke & Elvebakk (*Mycotaxon* 78: 363, 2001; S. Am.), James *et al.* (*Bibliothca Lichenol.* 78: 91, 2001; New Guinea), Bjerke (*Lichenologist* 34: 503, 2002; neotropics), Aptroot *et al.* (*Bryologist* 106: 157, 2003; Taiwan), Bjerke (*Lichenologist* 36: 15, 2004; Japan), Kantvilas & Louwhoff (*Lichenologist* 36: 103, 2004; Australia), Thell *et al.* (*Mycol. Progr.* 3: 297, 2004; phylogeny), Bjerke (*Mycotaxon* 91: 423, 2005; S America), Bjerke & Obermayer (*Nova Hedwigia* 81: 301, 2005; Tibet), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Arup *et al.* (*Mycol.* 99: 42, 2007; phylogeny), Bjerke & Sipman (*J. Linn. Soc. Bot.* 153: 489, 2007; SE Asia).

Menezesia Torrend (1913), ? *Saccharomycetales*. 1,

- Madeira.
- Menidochium** R.F. Castañeda & W.B. Kendr. (1990), anamorphic *Pezizomycotina*, Hsp.0eP.15. 1, Cuba. See Castañeda & Kendrick (*Univ. Waterloo Biol. Ser.* 32: 28, 1990).
- Meniscoideisporites** Watanabe, H. Nishida & Kobayashi (1999), Fossil Fungi. 1. See Watanabe *et al.* (*Int. J. Pl. Sci.* 160: 438, 1999).
- Menispora** Pers. (1822), anamorphic *Chaetosphaeria*, Hso.0eH.15. 13, widespread (esp. temperate). See Hughes (*CJB* 41: 693, 1963; key), Holubová-Jechová (*Folia geobot. phytotax.* 8: 317, 1973; key 4 spp.), Constantinescu *et al.* (*MR* 99: 585, 1995; teleomorph-anamorph connexions), Réblová (*Stud. Mycol.* 45: 149, 2000; review), Réblová & Winka (*Mycol.* 92: 939, 2000; phylogeny), Markovskaja (*Botanica Lithuanica* 8: 63, 2002; Lithuania), Fernández *et al.* (*Mycol.* 98: 121, 2006; phylogeny), Réblová *et al.* (*MR* 110: 104, 2006; teleomorph), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Menisporella** Agnihothr. (1962) = *Dictyochaeta* fide Sutton (*in litt.*).
- Menisporopascus** Matsush. (2003), *Chaetosphaeriaceae*. Anamorph *Menisporopsis*. 1, Japan. See Matsushima (*Matsush. Mycol. Mem.* 10: 141, 2001).
- Menisporopsis** S. Hughes (1952), anamorphic *Chaetosphaeriaceae*, Hsy.0-1eH.15. 6, Africa; New Zealand. See Hughes (*Mycol. Pap.* 48: 59, 1952), Castañeda Ruiz *et al.* (*Mycotaxon* 64: 335, 1997), Tsui *et al.* (*MR* 103: 148, 1999), Castañeda Ruiz *et al.* (*Cryptog. Mycol.* 22: 259, 2001; Venezuela), Matsushima (*Matsush. Mycol. Mem.* 10, 2001; teleomorph).
- Menoidea** L. Mangin & Har. (1907), anamorphic *Pezizomycotina*, Hsp.0eH.?. 1, France; British Isles. See Wilson & Waldie (*TBMS* 13: 151, 1928).
- Mensularia** Lázaro Ibiza (1916), *Hymenochaetaceae*. 4, widespread. See Wagner & Fischer (*Mycol.* 94: 998, 2002).
- Merarthonis** Clem. (1909) = *Arthonia* fide Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952).
- Mercadomyces** J. Mena (1988), anamorphic *Pezizomycotina*, Hsy.≡ eP.25. 1, Cuba. See Mena (*Revta Jardín bot. Nac. Univ. Habana* 9: 52, 1988).
- merenchyma**, see *plectenchyma*.
- Meria** Vuill. (1896), anamorphic *Rhabdocline*, Hso.0eH.?. 2, Europe; N. America. *M. laricis* on *Larix*. See Peace & Holmes (*Oxf. forest. Mem.* 15, 1933), Drechsler (*Phytopathology* 31: 773, 1941), Jansson *et al.* (*Antonie van Leeuwenhoek* 50: 321, 1984; ultrastr., life history), Gernandt *et al.* (*Mycol.* 89: 735, 1997; teleomorph), Stone & Gernandt (*Mycotaxon* 91: 115, 2005; phylogeny), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Merimbla** Pitt (1979), anamorphic *Talaromyces*, Hso.0eH.15. 4, widespread. See Pitt (*CJB* 57: 2394, 1979), Ogawa & Sugiyama (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 149, 2000; phylogeny), Pitt *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 9, 2000; accepted names), Bills *et al.* (*MR* 105: 1273, 2001; Mexico).
- Meringosphaeria** Peyronel (1918) = *Acerbiella* fide Clements & Shear (*Gen. Fung.*, 1931).
- Meripilaceae** Jülich (1982), Polyporales. 7 gen. (+ 7 syn.), 57 spp.
Lit.: Larsen & Lombard (*Mycol.* 80: 612, 1988), Corner (*Beih. Nova Hedwigia* 96: 218 pp., 1989), Shen *et al.* (*Mycol.* 94: 472, 2002), Kim *et al.* (*Antonie van Leeuwenhoek* 83: 81, 2003), Wang *et al.* (*Mycol.* 96: 1015, 2004), Binder *et al.* (*Systematics and Biodiversity* 3: 113, 2005).
- Meripilus** P. Karst. (1882), *Meripilaceae*. 5, widespread. See Corner (*Beih. Nova Hedwigia* 78: 193, 1984), Larson & Lombard (*Mycol.* 80: 612, 1988; key).
- Merisma** (Fr.) Gillet (1878) ≡ *Grifola*.
- Merisma** Pers. (1797) = *Thelephora* fide Donk (*Reinwardtia* 2: 435, 1954).
- Merismatium** Zopf (1898), *Verrucariaceae*. c. 11 (on lichens), Europe. See Triebel (*Biblthca Lichenol.* 35, 1989).
- merismatoid** (of a pileus), made up of smaller pilei.
- Merismella** Syd. (1927), anamorphic *Chaetothyrium*, Cpt.0eH.38. 5, C. America. See Hofmann & Piepenbring (*Fungal Diversity* 22: 55, 2006; Panama).
- Merismodes** Earle (1909), *Niaceae*. 20, widespread. See Singer (*Agaric. mod. Tax.* edn 3, 1975).
- merispore**, see *sporidesm*.
- Meristacraceae** Humber (1989), *Entomophthorales*. 3 gen. (+ 3 syn.), 7 spp.
Lit.: Tucker (*Mycotaxon* 13: 481, 1981; key), Humber (*Mycotaxon* 34: 441, 1989), Saikawa (*CJB* 67: 2484, 1989), Saikawa & Sakuramata (*Trans. Mycol. Soc. Japan* 33: 237, 1992), Saikawa *et al.* (*CJB* 75: 762, 1997).
- Meristacrum** Drechsler (1940), *Meristacraceae*. 2, widespread. See Drechsler (*J. Wash. Acad. Sci.* 30: 250, 1940), Drechsler (*Sydowia* 14: 98, 1960; spore discharge), Davidson & Barron (*CJB* 51: 231, 1973), Couch *et al.* (*Proc. natn Acad. Sci. U.S.A.* 76: 2299, 1979), Tucker (*Mycotaxon* 13: 481, 1981; key), Prasad & Dayal (*Curr. Sci.* 55: 321, 1986), Saikawa *et al.* (*CJB* 75: 762, 1997; ultrastr.), Keller & Petrini (*Sydowia* 57: 23, 2005; key).
- meristem arthrospore**, one of the chain of conidia maturing in basipetal succession and originating by apical wall building at the tip of the conidiogenous cell; - **blastospore**, a conidium arising either apically or laterally from a conidiogenous cell which elongates through ring wall building at the base (a basauxic conidiophore; Hughes, 1953). See Anamorphic fungi.
- meristematic** (of conidiophores), see *wall-building*.
- meristogenous** (of pycnidia, etc.), formed by growth and division of one hypha; **symphogenous**, formed from a number of hyphae. See Sutton (*in Ainsworth et al.* (Eds), *The Fungi* 4A: 1973).
- Meristosporum** A. Massal. (1860) = *Laurera* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Merocinta** Pell & E.U. Canning (1993), *Microsporidia*. 1.
- Merodontis** Clem. (1909), *Helotiales*. 1, Java. See Carpenter (*Mem. N. Y. bot. Gdn* 33, 1981; status).
- merogamy**, copulation between special sex cells or gametes.
- Merolpidiaceae** A. Fisch. (1892) = *Synchytriaceae*.
- meront** (of *Mycetozoa*), one of the daughter myxamoebae cut off in succession by a parent myxamoeba.
- Merophora** Clem. (1909) = *Umbilicaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Meroplacis** Clem. (1909) = *Caloplaca* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Merorinis** Clem. (1909) = *Rinodina* fide Zahlbruckner

- (*Catalogus Lichenum Universalis* 7, 1931).
- merosporangium** (of *Zygomycetes*), a cylindrical outgrowth from the swollen end of a sporangiophore in which a chain-like series of sporangiospores is generally produced. See Benjamin (*Mycol.* 58: 1, 1966; review, in Kendrick (Ed.), *The whole fungus* 2: 573, 1979).
- Merosporium** Corda (1831) nom. dub., ? Fungi. See Hughes (*CJB* 36: 784, 1958), Hennebert (*CJB* 76: 1596, 1998).
- Merostictina** Clem. (1909) = *Pseudocyphellaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Merostictis** Clem. (1909) = *Diplonaevia* fide Hein (*Nova Hedwigia* 38: 669, 1983).
- Merrilliopeltis** Henn. (1908) = *Oxydothis* fide Barr (*Mycol.* 68, 1976), Hyde (*Sydowia* 46: 265, 1995).
- Merugia** Rogerson & Samuels (1990), *Sordariomycetes*. 1 (living petioles of *Palicourea*), Guyana. See Rogerson & Samuels (*Mem. N. Y. bot. Gdn* 64: 165, 1990).
- Meruliaceae** P. Karst. (1881), Polyporales. 47 gen. (+ 44 syn.), 420 spp.
Lit.: Reid (*Beih. Nova Hedwigia* 18: 1090, 1965), Chamuris (*Mycol. Mem.* 14: 247 pp., 1988; as *Podoscyphaceae*), Corner (*Beih. Nova Hedwigia* 96: 218 pp., 1989), Tzean & Liou (*Phytopathology* 83: 1015, 1993; as *Hyphodermataceae*), Nakasone & Sytsma (*Mycol.* 85: 996, 1993), Nakasone & Burdsall Jr. (*Mycotaxon* 54: 335, 1995), Chang *et al.* (*Mycol. Monogr.* 10: 126 pp., 1996; as *Podoscyphaceae*), Legon & Pegler (*Mycologist* 10: 180, 1996; as *Podoscyphaceae*), Ginns (*Mycol.* 90: 19, 1998; as *Podoscyphaceae*), Langer (*Folia cryptog. Estonica* 33: 57, 1998; as *Hyphodermataceae*), Johannesson *et al.* (*MR* 104: 92, 2000), Parmasto & Hallenberg (*Nordic JI Bot.* 20: 105, 2000), Hjortstam (*Mycotaxon* 79: 181, 2001; as *Hyphodermataceae*), Kim & Jung (*Mycotaxon* 82: 295, 2002), Nakasone (*Mycotaxon* 81: 477, 2002), Koker *et al.* (*MR* 107: 1032, 2003), Mossebo & Ryvarden (*Mycotaxon* 88: 229, 2003), Nilsson *et al.* (*MR* 107: 645, 2003; as *Hyphodermataceae*), Dai (*Mycotaxon* 89: 389, 2004), Douanla-Meli & Langer (*Mycotaxon* 90: 323, 2004; as *Podoscyphaceae*), Greslebin *et al.* (*Mycol.* 96: 261, 2004), Hjortstam & Ryvarden (*Syn. Fung.* 18: 14, 2004), Larsson *et al.* (*MR* 108: 983, 2004), Binder *et al.* (*Systematics and Biodiversity* 3: 113, 2005), Larsson (*MR* 111: 186, 2007; as *Hyphodermataceae*).
- Merulicium** J. Erikss. & Ryvarden (1976), ? *Pterulaceae*. 1, Nordic. See Eriksson & Ryvarden (*Cortic. N. Europ.* 4: 859, 1976).
- Merulioporia** Bondartsev & Singer (1943) = *Perenniporia* fide Donk (*Taxon* 5: 69, 1956), Lowe (*Tech. Pub. Sta. Univ. Coll. Forestry, Syracuse* 90, 1966) = *Merulius* (Cortic.) fide.
- Meruliopsis** Bondartsev (1959), *Phanerochaetaceae*. 13, widespread. See Bondartsev (*Izv. Akad. Nauk Estonsk. SSR Ser. Biol.* 8: 274, 1959), Napoli (*Boll. Gruppo Micol. 'G. Bresadola'* 40: 343, 1997).
- Meruliporia** Murrill (1942) = *Meruliopsis* fide Parmasto (*Consp. Syst. Corticiaceae*: 103, 1968).
- Merulius** Fr. (1821) = *Phlebia* fide Nakasone & Burdsall (*Mycotaxon* 21: 241, 1984).
- Merulius** Haller ex Boehm. (1760) = *Cantharellus* fide Stalpers (*in litt.*).
- Mesniera** Sacc. & P. Syd. (1902), *Mesnieraceae*. 1 (from living leaves), Java. See Eriksson (*Op. Bot.* 60, 1981), Cannon (*Stud. Mycol.* 31: 49, 1989), Pearce & Hyde (*Fungal Diversity* 6: 83, 2001).
- Mesnieraceae** Arx & E. Müll. (1975), ? *Dothideomycetes* (inc. sed.). 3 gen., 4 spp.
Lit.: Hyde (*Mycotaxon* 57: 347, 1996).
- Mesobotrys** Sacc. (1880) = *Gonytrichum* fide Hughes (*CJB* 36: 727, 1958).
- mesochroic**, see colour.
- Mesochytrium** B.V. Gromov, Mamkaeva & Pljusch (2000), *Chytridiaceae*. 1 (on *Chlorococcum*), Russia. See Gromov *et al.* (*Nova Hedwigia* 71: 159, 2000).
- mesodermatous** (of hyphae), having the outer wall and lumen of about the same thickness. Cf. *leptodermatous*.
- Mesomycetozoa**, Rankless name for the organisms contained in the DRIPs clade (q.v.). See Herr *et al.* (*J. Clin. Microbiol.* 37: 2750, 1999).
- Mesonella** Petr. & Syd. (1924) ? = *Guignardia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Mesophellia** Berk. (1857), *Mesophelliaceae*. c. 15, Australasia. See Beaton & Weste (*TBMS* 79: 455, 1983; key), Bougher & Lebel (*Aust. Syst. Bot.* 14: 439, 2001).
- Mesophelliaceae** Jülich (1982), *Hysterangiales*. 8 gen. (+ 2 syn.), 33 spp.
Lit.: Beaton & Weste (*TBMS* 82: 665, 1984), Cribb (*Qd Nat.* 30: 25, 1990), Dell *et al.* (*New Phytol.* 114: 449, 1990), Trappe *et al.* (*Aust. Syst. Bot.* 5: 618, 1992), Trappe *et al.* (*Aust. Syst. Bot.* 9: 808, 1996), Trappe *et al.* (*Aust. Syst. Bot.* 9: 773, 1996), Bougher & Lebel (*Aust. Syst. Bot.* 14: 439, 2001), Trappe & Bougher (*Australas. Mycol.* 21: 9, 2002).
- Mesophelliopsis** Bat. & A.F. Vital (1957), *Agaricales*. 1, Brazil. ? = *Geastrum* (Gastr.) fide Demoulin (*in litt.*).
- mesophile**, see thermophily.
- Mesopsora** Dietel (1922) = *Melampsora* fide Berndt (*in litt.*).
- Mesopyrenia** M. Choisy (1931) = *Arthopyrenia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- mesospore** (1) a 1-celled teliospore among 2-celled ones; (2) an amphispore (obsol.); (3) the middle layer of a three-layered spore wall.
- meta-** (prefix), changed in form or position; between; with; after.
- Metabasidiomycetidae**. Subclass in *Basidiomycota* (Lowy, *Taxon* 17: 125, 1968), for fungi considered intermediate between *Heterobasidiomycetes* and *Homobasidiomycetes*.
- metabasidium**, see basidium.
- metabiosis**, the association of two organisms acting or living one after the other; cf. synergism.
- Metabolic products**. Fungal metabolites are many and diverse. In addition to those associated with protein synthesis and respiration many additional products ('secondary metabolites') have been isolated and, frequently, chemically defined. Some of these are waste products while others such as antibiotics, pigments and toxins clearly have biological functions. Because of their synthetic abilities fungi are used in industry for the production of alcohol, citric acid and other organic acids, various enzymes, riboflavin, etc. (see Industrial mycology). Molecular genetic and metabolomic approaches are slowly providing a greater insight into the initiation, synthesis and production of secondary metabolites. In *Aspergillus nidulans*, for

example, it has been shown how the metabolic model establishes the functional links between genes. David *et al.* *BMC Genomics* 9: 163, 2008)

Many fungal products, even when chemically defined, have been given vernacular names derived from the scientific names of the fungi involved, e.g. 'griseofulvin' from *Penicillium griseofulvum*. More than 400 such names were compiled in the sixth edition of this *Dictionary*, but most of these have been omitted since the seventh because of the monograph by Turner (1971) and Turner & Aldridge (1982) although representative antibiotics, hormones, mycotoxins, pigments, and other interesting metabolites are still included. See also Hegnauer (*Chemotaxonomie der Pflanzen* 7: 277, 1986).

About 400 compounds have been reliably reported from lichens of which about 230 are only known in this biological group (lichen products, lichen substances; Culberson & Elix, *Meth. Pl. Biochem.* 1: 509, 1989; Huneck, *Beih. Nova Hedw.* 79: 793, 1984). The lichen substances are mainly derivatives of orcinol and β -orcinol and are weak phenolic acids. The most important groups of these are depsides (e.g. olivetoric acid), depsidones (e.g. physodic acid), and dibenzonfuran derivatives (e.g. usnic acid). Most are colourless but some are brightly coloured: red, yellow, orange or emerald green (e.g. pulvic acid derivatives such as vulpinic acid). These are deposited on the surfaces of hyphae in the medulla and cortex (different substances often occurring in different regions of the thalli; e.g. hymenium, thalline exciple, medulla, cortex) and are produced by the fungal partner; the hypothesis that production was dependent on the presence of an alga (Culberson & Ahmadjian, *Mycol.* 72: 90, 1980), has not been upheld by later work (Leuckert *et al.*, *Mycol.* 82: 370, 1990). However, their position and quantitative expression can be affected by the thallus environment (Fahselt, 1994).

Some depsides and depsidones give characteristic colours with 10% caustic potash (K), bleach (C), K followed by C (KC), C followed by KC (CK), iodine (I, q.v.), and *p*-phenylenediamine (P, PD; see Steiner's stable PD solution); diagnostic microcrystal tests (q.v.); and characteristic colours in UV-light. The metabolic products generally characterize particular lichens and are routinely used in identification of antibiotic properties. Their role in the lichen thallus is largely unknown, but may be partly antimicrobial and antifeedent (see Lawrey, *Biology of lichenized fungi*, 1984).

Lit.: Raistrick *et al.* (Studies in the biochemistry of microorganisms [mainly devoted to fungi, 116 parts], *Phil. Trans.* B220: 1, 1931; *Biochem. J.* 25-93, 1931-1964), Asahina & Shibata (*Chemistry of lichen substances*, 1954 [reprint 1971], WHO (*WHO Chron.* 17: 389, 1963; nomenclature pharmaceutical preparations), Miller (*The Pfizer handbook of microbial metabolites*, 1961), Shibata *et al.* (*List of fungal products*, 1964), Culberson (*Chemical and botanical guide to lichen products*, 1969; *Bryologist* 73: 177, 1970 [suppl. 1]; *et al.*, Second supplement, 1977), Turner (*Fungal metabolites*, 1971), Turner & Aldridge, (*Fungal metabolites II*, 1983), Pidoplichko (*Metabolity pochvennykh mikromitsetov*, 1971; of soil fungi), Weete (*Fungal lipid biochemistry*, 1974), Eugster (*Z. Pilzk.* 39: 45, 1973; review), Sussman (*Taxon* 23: 301, 1974; trends in metabolic specialization), Fahselt (*Symbiosis* 16: 117, 1994), Cole *et al.*

(*Handbook of Secondary Fungal Metabolites*, [3 vols], 2003), Keller (*Nature Reviews Microbiology* 12:937, 2005).

See also antibiotics, Chemotaxonomy, chromatography, dyeing, ergot, Hallucinogenic fungi, hormones, litmus, Mycetism, Mycotoxicoes, Phytotoxic mycotoxins, Pigments, Toxins.

Metabotryon Syd. (1926) = *Sphaerellopsis* Cooke fide Sutton (*Mycol. Pap.* 141, 1977).

Metabourdotia L.S. Olive (1957), ? Auriculariales. 1, Tahiti. See Olive (*Am. J. Bot.* 44: 429, 1957).

Metacapnodiaceae S. Hughes & Corlett (1972), Capnodiaceae. 6 gen. (+ 2 syn.), 19 spp.

Lit.: Hughes (*N.Z. Jl Bot.* 10: 225, 1972), Hughes (*Mycol.* 68: 693, 1976; gen. names, anamorphs), Parbery & Brown (*Microbiology of the Phyllosphere*: 101, 1986), Sugiyama & Amano in Sugiyama (Ed.) (*Pleomorphic Fungi: The Diversity and its Taxonomic Implications*: 141, 1987), Reynolds (*CJB* 76: 2125, 1998; phylogeny).

Metacapnodium Speg. (1918), Metacapnodiaceae. Anamorphs *Capnophialophora*, *Capnobotrys*, *Capnosporium*. c. 10, widespread (tropical). See Hughes (*N.Z. Jl Bot.* 10: 239, 1972), Reynolds (*Mycotaxon* 23: 153, 1985; synonymy with *Limacinia*), Eriksson & Hawksworth (*SA* 6: 138, 1987; nomencl.).

metacellulose, a cellulose in certain fungi.

Metachora Syd., P. Syd. & E.J. Butler (1911) = *Phyllachora* Nitschke ex Fuckel (1870) fide Cannon (*Mycol. Pap.* 163, 1991).

metachroic, see Colour.

metachromic, giving a red reaction to cresyl blue. See Singer (*The Agaricales (mushrooms) in modern taxonomy*: 77, 1951).

Metacoleroa Petr. (1927) = *Venturia* Sacc. fide Kruys *et al.* (*MR* 110: 527, 2006; phylogeny), Crous *et al.* (*Stud. Mycol.* 58: 185, 2007; phylogeny), Winton *et al.* (*Mycol.* 99: 240, 2007; phylogeny).

Metacordyceps G.H. Sung, J.M. Sung, Hywel-Jones & Spatafora (2007), Clavicipitaceae. Anamorphs *Metarhizium*, *Nomuraea*, *Paecilomyces*-like, *Pochonia*. 6 (entomogenous), widespread (esp. E. Asia). See Sung *et al.* (*Stud. Mycol.* 57, 2007).

Metadiplodia Syd. (1937), anamorphic *Pezizomycotina*, Cpd.1eP.19. 38, widespread. See Zambettakis (*BSMF* 70: 219, 1955), Sutton (*Sydowia* 43: 264, 1991; redescr. type sp.).

Metadothella Henn. (1904), ? Hypocreales. 1, Peru.

Metadothis (Sacc.) Sacc. (1892) = *Dothiora* Fr. (1849) fide Saccardo (*Syll. fung.* 12: 430, 1897).

Metamelanea Henssen (1989), Lichinaceae (L). 2, Europe; N. America. See Henssen (*Lichenologist* 21: 102, 1989), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key), Schultz (*Lichenologist* 40: 81, 2008; UK).

Metameris Theiss. & Syd. (1915), Pleosporales. 3 (on ferns), widespread (northern hemisphere). See Holm & Holm (*Bot. Notiser* 131: 97, 1978; synonym of *Scirrhia*), Barr (*Mycotaxon* 43: 371, 1992).

Metanectria Sacc. (1878) = *Thelocarpon* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).

Metapezizella Petr. (1968), Helotiaceae. 1, Mexico. See Petrak (*Sydowia* 20: 207, 1966).

metaphysis (obsol.) used by Petrak; see paraphysis.

metaplasma, see epiplasma.

Metarhizium Sorokin (1879), anamorphic *Metacordyceps*, Hsy.0eH.15. 9 (on *Insecta*), widespread. See Tulloch (*TBMS* 66: 407, 1976; key), Guo *et al.* (*Acta*

- Mycol. Sin.* 5: 177, 1986), Rombach *et al.* (*Mycotaxon* 27: 87, 1986; *M. flavo-viride* var. *minus* on leaf- and plant-hoppers on rice), Rombach *et al.* (*TBMS* 88: 451, 1987; *M. album* on leaf-hoppers and plant-hoppers on rice), Shimizu *et al.* (*J. Invert. Path.* 60: 185, 1992; electrophoretic karyotype of *M. anisopliae*), Bridge *et al.* (*J. gen. Microbiol.* 139: 1163, 1993; morphology, biochem., molecular differentiation), Rakotonirainy *et al.* (*MR* 98: 225, 1994; rRNA and separation of taxa), Pipe *et al.* (*MR* 99: 485, 1995; RFLPs in *M. anisopliae*), Mavridou *et al.* (*MR* 102: 1233, 1998; rRNA analysis), Revankar *et al.* (*J. Clin. Microbiol.* 37: 195, 1999; in man), Driver *et al.* (*MR* 104: 134, 2000; revision, phylogeny), Bidochka *et al.* (*Appl. Environm. Microbiol.* 67: 1335, 2001; ecology), Evans (*Mycology Series* 19: 517, 2003; biocontrol), Padmavathi *et al.* (*MR* 107: 572, 2003; telomere fingerprinting), Pantou *et al.* (*Fungal Genetics Biol.* 38: 159, 2003; genetics), Bidochka & Small (*Insect-Fungal Associations Ecology and Evolution*: 28, 2005; phylogeography), Bidochka *et al.* (*Environmental Microbiology* 7: 1361, 2005; phylogeny, speciation), Bischoff *et al.* (*Mycol.* 98: 737, 2006; cryptic speciation), Ghikas *et al.* (*Archs Microbiol.* 185: 393, 2006; mitochondrial genome), Huang *et al.* (*Mycotaxon* 94: 181, 2005; phylogeny), Sung *et al.* (*Stud. Mycol.* 57, 2007).
- Metasphaerella** Speg. (1924) nom. dub., Fungi. See Petrak & Sydow (*Annls mycol.* 34: 42, 1936).
- Metasphaeria** Sacc. (1883) nom. ambig. = *Saccothecium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Metasteridium** Speg. (1923) nom. dub., ? Meliolaceae. No spp. named. See Eriksson & Hawksworth (*SA* 7: 59, 1988).
- metathallus**, assimilative (photobiont-containing) part of a lichen thallus, esp. where there is also a prothallus (q.v.).
- Metathyriella** Syd. (1927), Schizothyriaceae. 3 or 4, America (tropical). See Reynolds & Gilbert (*Cryptog. Mycol.* 27: 249, 2006; Panama).
- Metazythia** Petr. (1950), anamorphic *Pezizomycotina*, Cpd.0eH.15. 1, S. America. See Petrak (*Sydowia* 4: 373, 1950).
- Metazythiopsis** M. Morelet (1988), anamorphic *Pezizomycotina*, Cpd.0eH.15. 1, France. See Morelet (*Annales de la Société des Sciences Naturelles et d'Archéologie de Toulon et du Var* 40: 41, 1988).
- Metchnikovella** Caullery & Mesnil (1897), Microsporidia. 3.
- Methods.**
- General literature:** Booth (Ed.) (*Methods in microbiology* 4, 1971), Constantinescu (*Metode Şi tehnici în micologie*, 1974), Fuller (*Lower fungi in the laboratory*, 1978), Hall (*Methods for the Examination of Organismal Diversity in Soils and Sediments*, 1996), Hawksworth (*Mycologist's handbook*, 1974), Hawksworth & Kirsop (Eds) (*Filamentous fungi*, 1985 [source book]), Johanssen (*Plant microtechnique*, 1940), Koch (*Fungi in the laboratory*, 1966), Kone-man & Roberts (*Practical laboratory mycology*, edn 3, 1985), Malloch (*Moulds: their isolation, cultivation and identification*, 1981), McLean & Cooke (*Plant science formulae*, 1941), Smith (*An introduction to industrial mycology*, edn 7, 1981), Spector (Ed.) (*Handbook of biological data*, 1956), Stevens (Ed.) (*Mycology guidebook*, 1974), Waller & Lenné (*Plant pathologist's pocketbook*, 2001). See also Lichens, Literature, Medical and veterinary mycology, Plant pathogenic fungi.
- Special topics** (q.v.):
- Abbreviation of authors' names, see Authors' names
- Arsenic detection, see *Scopulariopsis*
- Auxanogram
- Bauch test
- Beeli formulae
- Biomass determination, see biomass
- Block culture, see Culture methods
- Cellulolysis adequacy index
- Chemotaxonomy
- Chromatography
- Collection and preservation
- Colour nomenclature, see Colour
- Continuous culture, see Culture methods
- Coolplate
- Culture media, see Media
- Culture methods
- Culture preservation, see Genetic resource collections
- Electron microscopy (EM), see Ultrastructure
- Electrophoresis
- Fixatives
- Fungicide testing, see Fungicides
- Herbarium beetle control
- Herbarium management, see Reference collections
- Hydrogen-ion concentration
- Iodine
- Ionomidotic reaction
- Isolation methods
- Keys, construction of
- Laboratory safety, see Safety, laboratory
- Lyophilization, see Genetic resource collections
- Media, culture
- Meixner test
- Melzer's solution, see Stains
- Microchemical tests for lichen products, see Metabolic products, microcrystal tests
- Microscopy
- Mite infestation control, see mites
- Molecular biology
- Mounting media
- Nomenclature
- Normal saline solution
- Numerical taxonomy
- Phytosociology
- Preservatives
- Protoplasts
- Reference collections
- RIEC
- Scanning electron microscopy (SEM)
- Serological Techniques, see Serology
- Single-spore isolation, see Isolation methods
- Spore
- Spore print
- Spore trapping, see Air spora
- Stains
- Statistical methods and design of experiments
- Steiner's stable PD solution
- Sterilization
- Ultrastructure
- Zymogram.
- Methysterostomella** Speg. (1910) ? = *Phragmopeltis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- metoecious** (obsol.) used by de Bary; see heteroecious.
- Metraria** Cooke & Massee (1891), Agaricaceae. 2, Australia; Nigeria. See Singer (*Agaric. mod. Tax.* 4th

- ed: 609, 1986; type includes material of *Hebeloma* (*Bolbitiaceae*) and *Amanita* (*Amanitaceae*)).
- Metrodia** Raithelh. (1971), Agaricaceae. 2, Argentina. See Raithelhuber (*Metrodiana* 2: xxvii, 1971).
- Metschnikowia** T. Kamiński (1899), Metschnikowiaceae. Anamorphs *Candida*, *Nectaromyces*. 42 (from sea water and arthropods, esp. associated with nectar), widespread. See Pitt & Miller (*Mycol.* 60: 682, 1968; anamorphs), Pitt & Miller (*Mycol.* 62: 462, 1970; parasexual cycle), Batra (*USDA Tech. Bull.* 1469, 1973; key), Giménez-Jurado (*Syst. Appl. Microbiol.* 15: 432, 1992), Mendonça-Hagler *et al.* (*Int. J. Syst. Bacteriol.* 43: 368, 1993; rRNA phylogeny), Giménez-Jurado *et al.* (*Antonie van Leeuwenhoek* 68: 101, 1995), Lopandic *et al.* (*Syst. Appl. Microbiol.* 19: 393, 1996), Valente *et al.* (*J. gen. appl. Microbiol.* Tokyo 43: 179, 1997; ITS), Lachance *et al.* (*Can. J. Microbiol.* 44: 279, 1998), Miller & Phaff in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 256, 1998), Kurtzman & Droby (*Syst. Appl. Microbiol.* 24: 395, 2001; biocontrol), Lachance *et al.* (*Can. J. Microbiol.* 47: 103, 2001; from insects), Lachance & Bowles (*FEMS Yeast Res.* 2: 81, 2002; from beetles), Giménez-Jurado *et al.* (*Int. J. Syst. Evol. Microbiol.* 53: 1665, 2003; from insects), Marinoni *et al.* (*FEMS Yeast Res.* 3: 85, 2003; ascospores), Lachance & Bowles (*Stud. Mycol.* 50: 69, 2004; from beetles), Marinoni & Lachance (*FEMS Yeast Res.* 4: 587, 2004; speciation), Lachance *et al.* (*Int. J. Syst. Evol. Microbiol.* 55: 1369, 2005; from beetles, Hawaii), Molnár & Prillinger (*Syst. Appl. Microbiol.* 28: 717, 2005; phylogeny), Lachance *et al.* (*Int. J. Syst. Evol. Microbiol.* 56: 1141, 2006; from insects, Africa), Nguyen *et al.* (*MR* 110: 346, 2006; from insects), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny), Xue *et al.* (*Int. J. Syst. Evol. Microbiol.* 56: 2245, 2006; from *Zizyphus*).
- Metschnikowiaceae** T. Kamiński (1899), Saccharomycetales. 2 gen. (+ 6 syn.), 44 spp.
- Lit.*: Lachance & Phaff in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 148, 1998), Miller & Phaff in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 256, 1998), Giménez-Jurado *et al.* (*Int. J. Syst. Evol. Microbiol.* 53: 1665, 2003), Lachance *et al.* (*FEMS Yeast Res.* 4: 253, 2003), Lachance *et al.* (*FEMS Yeast Res.* 3: 97, 2003), Diezmann *et al.* (*J. Clin. Microbiol.* 42: 5624, 2004), Marinoni & Lachance (*FEMS Yeast Res.* 4: 587, 2004), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Metschnikowiella** Genkel (1913) = *Metschnikowia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- metula**, a conidiophore branch having phialides, e.g. of *Penicillium* and *Aspergillus* (obsol.).
- Metulocladosporiella** Crous, Schroers, J.Z. Groenew., U. Braun & K. Schub. (2006), anamorphic *Herpotrichiellaceae*. 3, widespread. See Crous *et al.* (*MR* 110: 269, 2006).
- Metulocyphella** Agerer (1983), ? Marasmiaceae. 2, S. America. See Agerer (*Z. Mykol.* 49: 155, 1983).
- Metulodontia** Parmasto (1968), Peniophoraceae. 2, widespread. See Jülich (*Persoonia* 8: 78, 1974).
- metuloid**, an encrusted cystidium thick-walled at maturity, as in *Peniophora*.
- Metuloidea** G. Cunn. (1965) = *Junghuhnina* fide Ryvarden (*Gen. Polyp.*: 184, 1991).
- Metus** D.J. Galloway & P. James (1987), Cladoniaceae (L.). 3, Chile; Australasia. See Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998; DNA), Wedin *et al.* (*Lichenologist* 32: 171, 2000; phylogeny), Stenroos *et al.* (*Mycol. Progr.* 1: 267, 2002; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Messuti *et al.* (*Bibliotheca Lichenol.* 95: 471, 2007; Argentina).
- Miainomyces** Corda (1833) = *Sporotrichum* fide Saccardo (*Syll. fung.* 4: 106, 1886).
- micaceous** (of a pileus surface), covered with bright particles.
- Micarea** Fr. (1825) nom. cons., Pilocarpaceae (L.). c. 107, widespread. See Vězda & Wirth (*Folia geobot. phytotax.* 11: 93, 1976; key 31 spp.), Coppins (*Bull. Br. Mus. nat. hist. Bot.* 11: 17, 1983; monogr. 45 Eur. spp.), Coppins (*Notes R. bot. Gdn Edinb.* 45: 161, 1988; Europe), Coppins (*Taxon* 38: 499, 1989; nomencl.), Coppins & Kantvilas (*Lichenologist* 22: 277, 1990; Tasmania), Pietschmann (*Nova Hedwigia* 51: 521, 1990; asci), Coppins (*Bibliotheca Lichenol.* 58: 57, 1995; Europe), Coppins (*Lichenologist* 31: 559, 1999; S Africa), Andersen & Ekman (*MR* 109: 21, 2005; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Micarea** Fr. (1825) nom. rej. = *Placynthiella* Elenkin fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Micareaceae** Vězda ex Hafellner (1984) = *Pilocarpaceae*.
- Lit.*: Coppins & Purvis (*Lichenologist* 19: 29, 1987), Hawksworth (*CRC Handbook of Lichenology*: 181, 1988), Coppins & Kantvilas (*Lichenologist* 22: 277, 1990), Pietschmann (*Nova Hedwigia* 51: 521, 1990), Brodo & Tønsberg (*Acta Bot. Fenn.* 150: 1, 1994), Triebel *et al.* (*Symb. bot. upsal.* 32: 323, 1997), Coppins (*Lichenologist* 31: 559, 1999), Andersen & Ekman (*Lichenologist* 36: 27, 2004), Andersen & Ekman (*MR* 109: 21, 2005).
- Micheli** (Pier Antonio; 1679-1737; Italy). Botanist to Cosmo III (Grand Duke of Tuscany), keeper of the public gardens in Florence, and Professor of Botany, University of Pisa (1706). His additions to the knowledge of fungi, including lichen-forming species, were the greatest made by any one man before Persoon and Fries. He described these discoveries in *Nova Plantarum Genera*, his most important printed work. Some of Micheli's fungal names are still used for common genera (e.g. *Aspergillus*, *Clathrus*, *Mucor* and *Polyporus*). He made a new systematic arrangement with keys to what would now be regarded as genera and species. With the help of the microscope (then coming into use), he was the first to see cystidia on the lamella-edge and between the lamellae of agarics, and he saw the arrangement of spores (which he took to be seeds) in groups of four in the *Agaricaceae*, and in asci of *Pertusaria*. He was the first to make experiments on the culture of moulds by placing spores of *Botrytis*, *Aspergillus* and *Mucor* on freshly-cut bits of melon, quince and pear, noting their growth and development [for an English translation of his observations on culturing moulds, see Buller, *Transactions of the Royal Society of Canada* section 4, series 3, 9: 1915 (reprinted by Ainsworth, 1976)]. His important discoveries in connexion with flowering plants and bryophytes are, in general, better known. *Publs. Nova Plantarum Genera* (1729) [this book was completed in 1719, but the first part not published till 1729, and the second (the Figures

for which are still in existence) was never printed]. *Biogs, obits etc.* Ainsworth (*Introduction to the History of Mycology*, 1976); Hawksworth (introduction, *Nova Plantarum Genera*, 1976 reprint); Stafleu & Cowan (*TL-2* 3: 446, 1981); Targioni-Tozzetti (*Notizie della Vita e delle Opere di Pier Antonio Micheli*, 1858).

Michenera Berk. & M.A. Curtis (1868), anamorphic *Licrostroma*. 3, pantropical. See Donk (*Taxon* 11: 89, 1962), Parbery & Rumba (*MR* 95: 761, 1991).

Micraspis Darker (1963), Helotiales. Anamorph *Periperidium*. 3 (on *Rhytismatales*), N. America; British Isles. See Darker (*CJB* 41: 1389, 1963).

micro- (prefix), small; one-thousandth (Système International d'Unités); see micron.

microaerophilic, making best growth under lowered oxygen pressure.

Microallomyces R. Emers. & J.A. Robertson (1974), Blastocladiaceae. 1 (from pond sediment), Costa Rica. See Meyer (*Mycol.* 79: 44, 1987; ultrastr.).

Microanthomyces Grüss (1926) = *Candida* fide Lodder (*Yeasts, a taxonomic study* 2nd edn, 1970).

Microascaceae Luttr. ex Malloch (1970), Microascales. 20 gen. (+ 18 syn.), 131 spp.

Lit.: Malloch (*Mycol.* 62: 729, 1970), von Arx *et al.* (*Beih. Nova Hedwigia* 94, 1988), von Arx *et al.* (*Beih. Nova Hedwigia* 94: 104 pp., 1988), Barr (*Mycotaxon* 39: 43, 1990; concept), Dykstra *et al.* (*Mycol.* 81: 896, 1989), Issakainen *et al.* (*J. Med. Vet. Mycol.* 35: 389, 1997), Abbott *et al.* (*Mycol.* 90: 297, 1998), Wedde *et al.* (*Medical Mycology* 36: 61, 1998), Issakainen *et al.* (*MR* 103: 1179, 1999), Lee & Hanlin (*Mycol.* 91: 434, 1999; DNA), Okada *et al.* (*CJB* 76: 1495, 1998), Hausner *et al.* (*CJB* 78: 903, 2000), Rainer *et al.* (*J. Clin. Microbiol.* 38: 3267, 2000), Issakainen *et al.* (*Medical Mycology* 41: 31, 2003), Rainer & Hoog (*MR* 110: 151, 2006).

Microascales Luttr. ex Benny & R.K. Benj. (1980). Hypocreomycetidae. 4 fam., 92 gen., 397 spp. Stromata absent. Ascomata solitary, perithecial or cleistothecial, usually black, thin-walled, sometimes with well-developed smooth setae. Interascal tissue absent or rarely of undifferentiated hyphae. Asci $\pm$ globose to clavate, very thin-walled, evanescent, 8-spored, sometimes formed in chains. Ascospores hyaline, yellow or reddish brown, aseptate or septate, sometimes curved, sometimes with very inconspicuous germ pores, with or without a sheath. Anamorphs hyphomycetous, prominent. Saprobic from soil or rotting vegetation, sometimes marine, a few opportunistic human and animal pathogens, cosmop. Fams:

- (1) **Ceratocystaceae**
- (2) **Chadefaudiellaceae**
- (3) **Halosphaeriaceae**
- (4) **Microascaceae**.

The *Halosphaeriaceae* are often placed separately in their own order, and further molecular studies may confirm this arrangement. *Lit.*: Tang *et al.* (*Ant. v. Leeuwenh.* 91: 327, 2007).

Microascus Sacc. (1916) $\equiv$ *Microdiscus* Sacc.

Microascus Zukal (1885), Microascaceae. Anamorphs *Cephalotrichum*, *Scopulariopsis*, *Wardomyces*, *Wardomycesopsis*. 19 (coprophilous, on soil etc.), widespread. See Barron *et al.* (*CJB* 39: 1609, 1961), Corlett (*CJB* 41: 253, 1963; ontogeny, sexuality), Corlett (*CJB* 44: 79, 1966; perithecial development), von Arx (*Persoonia* 8: 191, 1975; key), Nishimura & Miyaji (*Mycopathologia* 90: 29, 1985; yeast-like state),

von Arx *et al.* (*Beih. Nova Hedwigia* 94, 1988), Hausner *et al.* (*CJB* 71: 1249, 1993; DNA), Abbott *et al.* (*Mycol.* 90: 297, 1998; anamorph), Lee & Hanlin (*Mycol.* 91: 434, 1999; DNA), Abbott & Sigler (*Mycol.* 93: 1211, 2001; heterothallism), Abbott *et al.* (*Mycol.* 94: 362, 2002), Issakainen *et al.* (*Medical Mycology* 41: 31, 2003; anamorph), Mohammadi *et al.* (*European Journal of Clinical Microbiology & Infectious Diseases* 23: 215, 2004; clinical strain), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).

Microasellaria Tuzet, Manier & Jolivet (1957) nom. dub., Kickxellomycotina. See Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986).

Microbasidium Bubák & Ranoj. (1914) = *Hadrotrichum* fide Höhnelt (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt. 1* 125: 111, 1916).

microbe, a microorganism (q.v.).

microbial (adj.), pertaining to microbes (q.v.).

microbiology, the study of microorganisms (q.v.).

microbiota, all the microorganisms present in the area or habitat specified, including algae, bacteria and protozoa as well as fungi; see mycobiota.

Microbispora Nonom. & Y. Ohara (1957), Actinobacteria. q.v.

Microblastosporon Cif. (1930), anamorphic *Pezizomycotina*, Hso.0eH.?. 1, Europe.

microbodies, see peroxisome.

Microbotryaceae R.T. Moore (1996), Microbotryales. 5 gen. (+ 2 syn.), 104 spp.

Lit.: Berbee *et al.* (*CJB* 69: 1795, 1991), Begerow *et al.* (*CJB* 75: 2045, 1998), Vánky (*Mycotaxon* 67: 33, 1998), Swann *et al.* (*Mycol.* 91: 51, 1999), Bucheli *et al.* (*Mol. Ecol.* 10: 285, 2001), Vánky (*Aust. Syst. Bot.* 14: 385, 2001), Almaraz *et al.* (*MR* 106: 541, 2002), Hood *et al.* (*Infect. Genet. Evol.* 2: 167, 2003), Sampaio *et al.* (*Mycol. Progr.* 2: 63, 2003), Van Putten *et al.* (*Evolution* Lancaster, Pa. 57: 766, 2003), Begerow *et al.* (*MR* 108: 1257, 2004), Giraud (*Heredity* 93: 559, 2004), Van Putten *et al.* (*J. Evol. Biol.* 18: 203, 2005), Vánky (*Mycol. Balcanica* 1: 175, 2004), Lutz *et al.* (*Mycol. Progr.* 4: 225, 2005), Kemler *et al.* (*BMC Evol. Biol.* 6: 35, 2006).

Microbotryales R. Bauer & Oberw. (1997). Microbotryomycetes. 2 fam., 9 gen., 114 spp. Fams:

- (1) **Microbotryaceae**
- (2) **Ustilentylomataceae**

For *Lit.* see under fam.

Microbotryodiplodia Sousa da Câmara (1951) = *Microdiplodia* Allesch. fide Petrak (*Sydowia* 16: 353, 1963), Sutton (*Mycol. Pap.* 141, 1977).

Microbotryomycetes R. Bauer, Begerow, J.P. Samp., M. Weiss & Oberw. (2006), Pucciniomycotina. 4 ord., 4 fam., 25 gen., 208 spp. Host-parasite interactions without deposits of specific fungal vesicles. Ord:

- (1) **Heterogastridiales**
- (2) **Leucosporidiales**
- (3) **Microbotryales**
- (4) **Sporidiobolales**

Lit.: Bauer *et al.* (*Mycol. Progr.* 5: 41, 2006).

Microbotryum Lév. (1847), Microbotryaceae. 87 (on dicots), widespread (temperate). See Deml & Oberwinkler (*Phytopath. Z.* 104: 345, 1982), Vánky (*Mycotaxon* 67: 33, 1998; monogr., emend., key), Swann *et al.* (*Mycol.* 91: 51, 1999; classific.), Almaraz *et al.* (*MR* 106: 541, 2002; phylogeny), Vánky (*Mycologia Balcanica* 1: 189, 2004; taxonomy, nomenclature,

- problems in species delimitation), Lutz *et al.* (*Mycol. Progr.* 4: 225, 2005; molecular characters), Aime *et al.* (*Mycol.* 98: 896, 2006; phylogeny).
- Microcaliciaceae** Tibell (1984), Teloschistales ($\pm$ L). 1 gen. (+ 2 syn.), 4 spp.
- Lit.*: Tibell (*Biblthca Lichenol.* 71: 107 pp., 1998), Tibell (*Nordic Lichen Flora* 1. Introductory Parts; Calicioid Lichens and Fungi: 20, 1999).
- Microcalicium** Vain. (1927), Microcaliciaceae. 4 (mainly on lichens), widespread (boreal; temperate). See Tibell (*Bot. Notiser* 131: 229, 1978; key), Hawksworth (*Bull. Br. Mus. nat. hist. Bot.* 9: 1, 1981; anamorphs), Tibell (*Symb. bot. upsal.* 27 no. 1: 279 pp., 1987; Australasia), Tibell (*Symb. bot. upsal.* 32 no. 1: 291, 1997; anamorphs), Tibell (*Biblthca Lichenol.* 71: 107 pp., 1998; S America).
- Microcalliomyces** Bat. & Cif. (1962) = *Microcallis* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Microcalliopsis** Bat. & Cif. (1962) = *Microcallis* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Microcallis** Syd. (1926), Chaetothyriaceae. 10, widespread (tropical). See Hansford (*Mycol. Pap.* 15, 1946).
- microcephalic**, see septum.
- Microcephalis** Bainier (1882) = *Syncephalis* fide Benjamin (*Aliso* 4: 321, 1959).
- Microcera** Desm. (1848) = *Fusarium* fide Petch (*TBMS* 7: 89, 1921), Wollenweber & Reinking (*Die Fusarien*: 6, 1935), Dingley (*Mem. N. Y. bot. Gdn* 49: 206, 1989).
- Microclava** F. Stevens (1917), anamorphic *Pezizomycotina*, Hso.1eP.1. 4, pantropical. See Deighton (*TBMS* 52: 315, 1969; key).
- Microcollybia** Métrod ex Lennox (1979) = *Collybia* fide Kuyper (*in litt.*).
- Microcollybia** Métrod (1952) nom. nud. = *Collybia* fide Singer (*Agaric. mod. Tax.* edn 3, 1975).
- microconidium** (1) the smaller conidium of a fungus which also has macroconidia; (2) a spermatium (q.v.).
- microcrystal test**, method of identification of phenolic metabolites in lichens developed by Asahina (q.v.) involving re-crystalizations on microscope slide from a range of solvents and the formation of salts with diagnostic shapes. The crystals are examined microscopically for identification. Many of these tests are extremely sensitive and can detect some compounds at concentrations close to the resolution possible by thin-layer chromatography (q.v.).
- Lit.*: Asahina (*J. Jap. Bot.* 12-16, 1936-40), Hale (1974), Hawksworth (*Bull. Br. lichen Soc.* 28: 5, 1971), Thomson (*The lichen genus Cladonia in North America*, 1968). See Metabolic products.
- microculture**, a culture of an organism under the microscope, as in a hanging drop.
- Microcyclella** Theiss. (1914), Dothideomycetes. 1, Africa.
- Microcyclephaeria** Bat. (1958), *Pezizomycotina*. 1, Australia. See Batista (*Revta Biol. Lisb.* 1: 301, 1958).
- microcyclic** (of conidiation), germination of spores by the direct function of the conidia without the intervention of mycelial growth (Hanlin, *Mycoscience* 35: 113, 1994); (of rusts), see *Pucciniales*.
- Microcyclus** Sacc., Syd. & P. Syd. (1904), ? *Mycosphaerellaceae*. Anamorphs *Aposphaeria*-like, *Fusicladium*-like, *Pazschkeella*. c. 17, widespread (esp. tropical). Almost certainly polyphyletic. *M. ulei* (anamorphs *Aposphaeria ulei*, *Fusicladium macrosporum*); S. Am. leaf blight of *Hevea*). See Cannon *et al.* (*MR* 99: 353, 1995; key 7 S. Am. spp.), Barr (*Mycotaxon* 60: 433, 1996).
- microcyst**, see cyst.
- Microcyta** Petr. & Syd. (1927) = *Ceuthosporella* Petr. & Syd. fide Sutton (*Mycol. Pap.* 141, 1977).
- microcytospore** (1) an encysted zoospore (planospore); (2) an encysted gametangium (*Blastocladiiales*).
- Microdiplodia** Allesch. (1901), anamorphic *Botryosphaeriaceae*, Cpd.1eP.?. 31, widespread. See Zambettakis (*BSMF* 70: 219, 1955), Sutton (*Mycol. Pap.* 141, 1977), Crous *et al.* (*Stud. Mycol.* 55: 235, 2006; phylogeny).
- Microdiplodia** Tassi (1902) ? = *Microdiplodia* Allesch. fide Sutton (*Mycol. Pap.* 141, 1977).
- Microdiplodiites** Babajan & Tasl. (1973), Fossil Fungi. 1 (Tertiary), former USSR.
- Microdiscula** Höhn. (1915), anamorphic *Pezizomycotina*, Cpd.0eH.?. 1, Europe.
- Microdiscus** Sacc. (1916), Helotiales. 1, N. America.
- Microdiscus** Steinecke (1916) nom. dub., ? Fungi.
- Microdochium** Syd. (1924), anamorphic *Monographella*, Hsp.0= eH.21. 10, widespread. *M. nivale* (pink snow mould of turf grasses), *M. panattonianum* (lettuce ring spot). See Sutton *et al.* (*CJB* 50: 1899, 1972), Sutton & Hodges (*Nova Hedwigia* 27: 215, 1976), v. Arx (*Sydowia* 34: 30, 1981), Samuels & Hallett (*TBMS* 81: 473, 1983; teleomorphs), Litschko & Burpee (*TBMS* 89: 252, 1987; variation in *M. nivale*), Parman & Price (*Australas. Pl. Path.* 20: 41, 1991; microsclerotia in *M. panattonianum*), Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 1: 267, 1995; subgen., key), Mahuku *et al.* (*MR* 102: 559, 1998; on turfgrass, genetics), Glynn *et al.* (*MR* 109: 872, 2005; speciation), Kwasna & Bateman (*Mycol.* 99: 765, 2007; UK, key).
- Microdothella** Syd. & P. Syd. (1914), Dothideales. 2, N. America; Philippines.
- Microdothiorella** C.A.A. Costa & Sousa da Câmara (1955), anamorphic *Pezizomycotina*, St.0eH.?. 1, Portugal. See Costa & Sousa da Câmara (*Agron. lusit.* 17: 156, 1955).
- Microeccrina** Maessen (1955) = *Arthromitus* fide Manier (*Annl's Parasit. hum. comp.* 38: 1, 1961) See *Arthromitus*.
- microendospore**, minute cytoplasmic particles behaving like spores in *Ophiostoma ulmi* (Ouellette & Gagnon, *CJB* 38: 235, 1960).
- Microeurotium** Ghatak (1936), ? *Pezizales*. 1 (? coprophilous), British Isles.
- Microfilum** N. Faye, B.S. Toguebaye & G. Bouix (1991), Microsporidia. 1.
- microflora**, sometimes used, inappropriately, for all the microorganisms present in a specified site or habitat; see microbiota, mycobiota.
- microform**, see *Pucciniales* and Table 5.
- microfungi**, see *Micromycetes*.
- Microgemma** Ralphs & Matthews (1986), Microsporidia. 4.
- Microglæna** Körb. (1855) [non *Microglæna* Ehrenb. 1831, *Chlorophyta*] = *Thelenella* fide Eriksson (*Op. Bot.* 60, 1981), Mayrhofer & Poelt (*Herzogia* 7: 13, 1985; Europe), Mayrhofer (*Biblthca Lichenol.* 26: 106 pp., 1987).
- Microglænaeaceae** Servit (1954) = *Thelenellaceae*.
- Microglænomycetes** Cif. & Tomas. (1953) = *Chroma-*

- tochlamys fide Mayrhofer & Poelt (*Herzogia* 7: 13, 1985).
- Microglena** Lönnr. (1858) = *Microglaena*.
- Microgloeum** Petr. (1922), anamorphic *Blumeriella*, Cac.0eH.10. 1, widespread.
- Microglossum** Gillet (1879), Leotiaceae. 8, widespread (temperate). See Mains (*Mycol.* 47: 846, 1955; key N Am spp.), Maas Geesteranus (*Persoonia* 3: 82, 1964), Nitare & Ryman (*Svensk bot. Tidskr.* 78: 63, 1984; Sweden), Spooner (*Biblthca Mycol.* 116: 711 pp., 1987; Australasia), Verkley (*Persoonia* 15: 405, 1994; ultrastr.), Gernandt *et al.* (*Mycol.* 93: 915, 2001; phylogeny), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006; phylogeny), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Microglossum** Sacc. (1884) = *Geoglossum* fide Spooner (*in litt.*, 2008).
- microgonidia**, very small green bodies in lichen hyphae (Minks) (obsol.).
- Micrographa** Müll. Arg. (1890) ? = *Lembosia* fide Santesson (*Svensk bot. Tidskr.* 43: 547, 1949), Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Micrographina** Fink (1930) = *Mazosia* fide Santesson (*Svensk bot. Tidskr.* 43: 547, 1949).
- Micrographomyces** Cif. & Tomas. (1953) nom. illegit. = *Micrographa*.
- Microhaplosporella** Sousa da Câmara (1949) ? = *Aplosporella* fide Sutton (*in litt.*).
- Microhendersonula** Dias & Sousa da Câmara (1952), anamorphic *Pezizomycotina*, St. = eP.?. 1, Portugal. See Dias & Sousa da Câmara (*Agron. lusit.* 14: 118, 1952).
- Microhilum** H.Y. Yip & A.C. Rath (1989), anamorphic *Cordycipitaceae*, Hso.0eH.10. 1 (on *Oncoptera* larvae), Australia. See Yip & Rath (*J. Invert. Path.* 53: 361, 1989), Wright & Patel (*MR* 96: 578, 1992), Sung *et al.* (*Stud. Mycol.* 57, 2007; phylogeny).
- Microides** H.Y. Yip & A.C. Rath (1989), anamorphic *Cordycipitaceae*, Hso.0eH.10. 1 (on *Oncoptera* larvae), Australia. See Yip & Rath (*J. Invert. Path.* 53: 361, 1989), Wright & Patel (*MR* 96: 578, 1992), Sung *et al.* (*Stud. Mycol.* 57, 2007; phylogeny).
- Microlecia** M. Choisy (1949) = *Catillaria* fide Hafellner (*Beih. Nova Hedwigia* 79: 241, 1984).
- microlichens**, lichens in which the whole of their morphological characteristics can be seen only with a magnifier equal or larger than $\times 10$. See Messuti (*Br. Lich. Soc. Bull.* 73: 49, 1993).
- Microlychnus** A. Funk (1973) = *Gyalideopsis* fide Sérusiaux & De Sloover (*Veröff. geobot. Inst., Zürich* 91: 260, 1986), Lücking *et al.* (*Lichenologist* 37: 123, 2005).
- Micromastia** Speg. (1909), Dothideomycetes. 2.
- micrometre**, one-thousandth of a millimetre (0.001 mm; 1 μ m) (Système International d'Unités); formerly often as ' μ '.
- Micromium** Pers. (1811) = *Phlyctis*.
- Micromma** A. Massal. (1860) = *Pyrenula* Ach. (1814).
- Micromonospora** Orskov (1923), Actinobacteria. q.v.
- Micromphale** Gray (1821) nom. rej. = *Marasmiellus* fide Antonín *et al.* (*Mycotaxon* 63: 359, 1997; taxonomy) A proposal to reject *Micromphale* against *Marasmiellus* has not been published.
- Micromucor** (W. Gams) Arx (1984) = *Umbelopsis* fide von Arx (*Sydowia* 35: 10, 1982; key), Yip (*TBMS* 86: 334, 1986), Amano *et al.* (*Mycotaxon* 44: 257, 1992; chemotaxonomy), Ruiter *et al.* (*MR* 97: 690, 1993; chemotaxonomy) = *Umbelopsis* (Mortierell.) fide.
- Micromucor** Malchevsk. (1939) = *Umbelopsis* fide Kirk (*in litt.*).
- Micromyces** P.A. Dang. (1889), Synchroniaceae. 12 (on green algae), widespread. See Sparrow (*Aquatic Phycomycetes* Edn 2: 194, 1960; key), Kadłubowska (*Acta Mycologica Warszawa* 34: 177, 1999; Poland).
- Micromycetes**, fungi having small (microscopic) sporocarps; microfungi. Most handbooks for the identification of microfungi are based on systematic groups (e.g. ascomycetes, hyphomycetes, coelomycetes), orders (*Laboulbeniales*, *Saprolegniales*), or genera (*Aspergillus*, *Penicillium*), q.v. Ellis & Ellis (*Microfungi on land plants: an identification handbook*, 1985; and *Microfungi on miscellaneous substrates*, 1988) cover most temperate groups. See also Literature.
- Micromycopsidaceae** Subram. (1974) = *Synchroniaceae*.
- Micromycopsis** Scherff. (1926) ? = *Micromyces* fide Sparrow (*Aquatic Phycomycetes* Edn 2: 1187 pp., 1960) but see, Subramanian (*Curr. Sci.* 43: 723, 1974).
- Micromyriangium** Petr. (1929) = *Uleomyces* fide von Arx (*Persoonia* 2: 421, 1963).
- micron**, see micrometre.
- Micronectria** Speg. (1885) nom. dub., Sordariomycetes. 3, widespread. See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999; ? placement in *Hyponectriaceae*).
- Micronectriella** Höhn. (1906) = *Sphaerulina* fide von Arx & Müller (*Stud. Mycol.* 9, 1975), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Micronectriopsis** Höhn. (1918) = *Linocarpon* fide Hyde (*J. Linn. Soc. Bot.* 123: 109, 1997), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Micronegeria**, see *Mikronegeria*.
- micronematous (micronemeous)**, (1) having hyphae of small diameter; (2) (of conidiophores) similar morphologically to vegetative hyphae (cf. *Microne-meeae*).
- Microne-meeae**, hyphomycetes with conidiophores or conidia like the hyphae (e.g. *Oospora*), or having no hyphae. Cf. *Macrone-meeae*.
- microorganism**, an organism which belongs to a phylum many members of which either cannot be seen with the unaided eye or require microscopic examination and/or growth in pure culture for their identification; a microbe; includes all unicellular prokaryotes and eukaryotes, and also some multicellular eukaryotes, i.e. microscopic algae, bacteria, fungi (including yeasts), protozoa and viruses; sometimes used (incorrectly) only for prokaryotes (bacteria and viruses). See Cowan (*A dictionary of microbial taxonomy*: 162, 1978; inappropriateness of term), Zavarzin (*in Allsopp et al.* (Eds), *Microbial diversity and ecosystem function*: 17, 1995; concept).
- Micropeltella** Syd. & P. Syd. (1913) = *Micropeltis* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Micropeltidaceae** Clem. & Shear (1931), ? Dothideomycetes (inc. sed.). 27 gen. (+ 25 syn.), 186 spp.
Lit.: Batista (*Publções Inst. Micol. Recife* 56, 1959; 445 spp.), Eboh (*Sydowia* 39: 37, 1986), Farr (*Mycol.* 79: 97, 1987), Panwar *et al.* (*Geobios New Rep.* 10: 41, 1991), Hsieh *et al.* (*MR* 99: 917, 1995), Hyde (*Sydowia* 49: 1, 1997), Cannon (*IMI Descr. Fungi Bact.* 141: [22] pp., 1999).
- Micropeltidium** Speg. (1919) = *Micropeltis* fide von

- Arx & Müller (*Stud. Mycol.* 9, 1975).
- Micropeltis** Mont. (1842), Micropeltidaceae. c. 106, widespread (tropical). See Batista (*Publções Inst. Microl. Recife* 56, 1959), Reynolds & Gilbert (*Aust. Syst. Bot.* 18: 265, 2005; Australia), Hofmann & Piepenbring (*Fungal Diversity* 22: 55, 2006; Panama), Reynolds & Gilbert (*Cryptog. Mycol.* 27: 249, 2006; Panama).
- Micropeltopsis** Vain. (1921) = *Lichenopeltella* fide Santesson (*SA* 9: 15, 1990).
- Micropera** Lév. (1846) [non *Micropera* Lindl. 1832, *Orchidaceae*] = *Foveostroma* fide DiCosmo (*CJB* 56: 1682, 1978).
- Microperella** Höhn. (1909), anamorphic *Pezizomycotina*, St.1eH.1. 1, Japan.
- Micropeziza** Fuckel (1870), Helotiales. 5, Europe. See Nannfeldt (*Bot. Notiser* 129: 323, 1976; key), Nauta & Spooner (*Mycologist* 14: 65, 2000; UK), Raitviir (*Folia cryptog. Estonica* 40: 43, 2003; Estonia).
- Microphiale** (Stizenb.) Zahlbr. (1902) = *Dimerella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Rivas Platas *et al.* (*Fungal Diversity* 23: 255, 2006).
- Microphiodothis** Speg. (1919) = *Ophiodothella* fide Petrak (*Sydowia* 5: 352, 1951).
- Microphlyctis** J. Schröt. (1889) nom. dub., Chytridiales.
- Microphoma** N.F. Buchw. (1958) = *Dothichiza* fide Sutton (*Mycol. Pap.* 141, 1977).
- microphylline** (of lichen thalli), composed of minute lobes or scales.
- Microphyma** Speg. (1889) = *Phillipsiella* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Micropodia** Boud. (1885), ? Helotiaceae. 1 or 2, Europe. Some authors place this gen. in the *Hyaloscyphaceae*.
- Microporaceae** Jülich (1982) = Polyporaceae.
- Microporellus** Murrill (1905), Polyporaceae. 19, widespread (tropical). See Reid (*Microscopy* 32: 452, 1975), Decock & Ryvarden (*Czech Mycol.* 54: 19, 2002).
- Microporus** P. Beauv. (1805), Polyporaceae. 11, widespread. See Pegler (*The polypores [Bull. BMS Suppl.]*, 1973), Ryvarden & Johansen (*Prelim. Polyp. Fl. E. Afr.*: 429, 1980; key 7 Afr. spp.).
- Micropsalliota** Höhn. (1914), Agaricaceae. c. 40, widespread (esp. tropical). See Heinemann (*BSMF* 106: 1, 1990; key 73 spp.), Heinemann & Leelavathy (*MR* 95: 341, 1991; key spp. of Kerala), Vellinga (*MR* 108: 354, 2004; phylogeny).
- Micropuccinia** Rostr. (1902) = *Puccinia* fide Dietel (*Nat. Pflanzenfam.* 6, 1928) See, Laundon (*Mycol. Pap.* 99, 1965).
- micro-Puccinia**, a microform of *Puccinia*.
- Micropustulomyces** R.W. Barreto (1995), anamorphic *Capnodiales*, Cac. = eH.1/4. 1, Brazil. See Barreto *et al.* (*MR* 99: 779, 1995).
- Micropyrenula** Vain. (1921) = *Microtheliopsis* fide Santesson (*Svensk bot. Tidskr.* 43: 547, 1949).
- Micropyxis** Seeler (1943) [non *Micropyxis* Duby 1930, *Algae*] = *Gelatinopsis*.
- microsclerid**, see cystidium.
- microsclerotium**, a very small sclerotium, as in *Verticillium dahliae*; pseudosclerotium.
- Microscopy**.
- Light microscopes**. The compound microscope has two sets of lenses (objective and eyepiece) which magnify the object at each step. The image has a

maximum final magnification of around $\times 1000$. Stereomicroscopes (also known as dissecting microscopes) are lower power and have a long free working distance for manipulation of the specimen. For use in the field, portable instruments are available. For viewing with the compound microscope, a small sample of the subject is mounted on a glass slide with water or a mountant which may contain a stain, and overlaid with a coverslip. Common stains in mycology are cotton blue or fuchsin in lactic acid, or lactic acid alone if no stain is needed. Air bubbles can be eliminated by gentle heating. To keep the slide for examination at a later date, the coverslip must be sealed with a preparatory sealant or nail varnish.

Brightfield: The most common method of viewing subjects in the compound microscope. Light travels from beneath the subject, passing through a condenser and through the subject, illuminating translucent structures.

Differential Interference Contrast (DIC; Nomarski). This system uses special polarizing prisms arranged according to a design by Georges Nomarski; high quality objectives are required in addition to a dedicated condenser and adapter, with a concomitant rise in cost. Using such lenses and prisms results in an almost three dimensional image of the subject, particularly useful for colourless structures such as gelatinous sheaths.

Phase contrast: Special objectives and condenser are required for this technique. The image suffers from optical imperfections, such as a halo, but this effect can be of some value in drawing attention to small objects or details. Low contrast material benefits greatly from this technique, but it can be difficult to measure accurately in phase contrast.

Darkfield: Direct light is prevented from passing through the objective aperture and the image is formed from light scattered by features in the object, the detail appearing bright against a dark background.

Fluorescence: Microscopy in which the image is formed by fluorescence emitted from the specimen when illuminated with ultra-violet radiation. The sample may autofluoresce naturally, but fluorochromes such as mithramycin and calcafluor are typically used to enhance specific structures. Fluorescence microscopy has been important in detecting regions of wall synthesis in fungal hyphae and spores.

Limitations in depth of field with light microscopy can now, to some extent, be overcome when using digital cameras, by photographic the same object several times, each at a slightly different plane of focus, then using proprietary montage software to 'stitch' the resulting images into a single composite image. Among other activities, the software compares the different images and selects in favour of well-defined edges. Where such edges are not present, the result may be unsatisfactory, with 'halo' artefacts.

Electron microscopes. Scanning electron microscopy (SEM; q.v.) provides higher magnification images (to around $\times 80,000$) of the surface morphology of the specimen, and also gives large depth of field. Transmission electron microscopy (TEM) images provide a view similar to that of light microscopy at much higher magnifications (over $\times 100,000$) to show ultrastructural details. Specimens are prepared by fixing, dehydrating, staining, embedding in resin and

cutting ultrathin sections on an ultramicrotome; see also Ultrastructure.

Lit.: Beckett & Read (in Todd (Ed.), *Ultrastructure techniques for microorganisms*, 1986), Bradbury (*An introduction to the optical microscope* (rev. edn), 1989), Ploem & Tanke (*Introduction to fluorescence microscopy*, 1987), Rawlins (*Light microscopy*, 1992), Sanderson (*Biological microtechnique*, 1994), Slayter & Slayter (*Light and electron microscopy*, 1982).

Microscypha Syd. & P. Syd. (1919), Hyaloscyphaceae. 4, Europe. See Huhtinen (*Karstenia* 29: 45, 1990), Cantrell & Hanlin (*Mycol.* 89: 745, 1997; DNA), Hosoya & Otani (*Mycoscience* 38: 171, 1997; Japan), Raitviir (*Scripta Mycol.* 20, 2004).

Microsebacina P. Roberts (1993), Auriculariales. 2, Europe. See Roberts (*MR* 97: 473, 1993).

Microsomyces Thaxt. (1931), Laboulbeniaceae. 2, widespread. See Tavares (*Mycol. Mem.* 9: 627 pp., 1985), Benjamin (*Aliso* 11: 127, 1986).

Microspatha P. Karst. (1889) = *Gyalideopsis* fide Sérusiaux & De Sloover (*Veröff. geobot. Inst., Zürich* 91: 260, 1986), Lücking *et al.* (*Lichenologist* 37: 123, 2005).

Microsphaera Lév. (1851) ? = *Erysiphe* fide Braun & Takamatsu (*Schlechtendalia* 4: 3, 2000), Braun *et al.* (*The Powdery Mildews A Comprehensive Treatise*: 13, 2001; review), Takamatsu (*Mycoscience* 45: 147, 2004; phylogeny).

Microsphaeropsis Höhn. (1917), anamorphic *Paraphaeosphaeria*, Cpd.0eP.15. 29, widespread. Almost certainly polyphyletic. See Sutton (*Mycol. Pap.* 123, 1971), Morgan-Jones (*CJB* 52: 2575, 1974), Morgan-Jones & White (*Mycotaxon* 30: 177, 1987; ultrastr. conidiogenesis *M. concentricum*), Guarro *et al.* (*Medical Mycol.* 37: 133, 1999; etiological agent of human skin infection), Câmara *et al.* (*MR* 107: 516, 2003; teleomorph), Boerema *et al.* (*Phoma Identification Manual Differentiation of Specific and Infra-Specific Taxa in Culture*: 470 pp., 2004), Verkley *et al.* (*Stud. Mycol.* 50: 323, 2004).

Microsphaeropsis Sousa da Câmara, Oliveira & Luz (1936) nom. dub., anamorphic *Pezizomycotina*.

Microspora Velen. (1934), ? Helotiales. 1, former Czechoslovakia.

microsporangium, secondary sporangium formed from a zoospore cyst, either without any mitoses, or with very few mitoses.

microspore (1) a small spore, where there are spores of two sizes; (2) a spore from a microsporangium (q.v.).

Microsporella Höhn. (1918) ? = *Microsphaeropsis* Höhn. fide Sutton (*Mycol. Pap.* 141, 1977).

Microsporidia (**Microspora** V. Sprague 1977), Eukaryota. Earlier classified as *Protozoa* (q.v.), now usually as *Fungi* (q.v.). More than 1300 species and about 170 genera (Bulla & Cheng (Eds), 1976, 1977; Larsson, 1999; Wittner & Weiss (Eds), 1999; Canning & Vávra, 2000; Lom *et al.* (Eds), 2005). Supergeneric classification remains unclear. Eukaryotic, spore-forming, parasitic organisms lacking flagellae and peroxisomes. With polar vesicles (mitosomes) interpreted as remainders of mitochondria (Williams *et al.*, 2002; Vávra, 2005), mitochondrial enzymes (a chaperon protein, HSP70) (Germot *et al.*, 1997; Hirt *et al.*, 1997) and genes related to mitochondrial functions (alpha and beta subunits of PDH) (Fast & Keeling, 2001). With 70S ribosomes, chitin in the spore wall, and atypical Golgi apparatus (Ishihara & Haya-

shi, 1968; Cury *et al.*, 1980; Vávra & Larsson, 1999). Life cycle usually comprising vegetative reproduction (called merogony) and sporogony. Nuclei either isolated (monokaryotic) or coupled (diplokaryotic) with closed intranuclear pleuromitosis (Hollande, 1972). In some microsporidia diplokaryotic merogony is followed by a sporogony with isolated nuclei and with sexual processes and meiosis in the shift from diplokaryotic to monokaryotic condition at the beginning of sporogony (Becnel & Andreadis, 1999). Spores of various shapes, with a usually coiled polar filament with layered internal structure, which during hatching is ejected and reorganized to an infection tube through which the infectious cell (the sporoplasm) is injected into the host cell (Weidner 1976, 1982).

Microsporidians are obligate parasites of all groups of animals with a few species parasitizing protozoa. Some species have complex life cycles with 2 or 3 hosts, and producing 2 or 3 different types of spores. They most commonly infect insects, crustaceans and fish (Canning & Lom, 1986; Becnel & Andreadis, 1999). They have been extensively studied as biocontrol agents, and one species (*Nosema locustae*) is commercially available for the control of locusts and grasshoppers (Canning, 1981; Shah & Goettel (Eds), 1999). Of economic importance are among others *Nosema apis* (a cosmopolitan parasite of honey bees) and *Nosema bombycis* (a parasite of silk worms). At least 8 species of microsporidians cause disease in immuno-compromized humans (Kotler & Orenstein, 1999).

Early phylogenies that included microsporidians, when based on ultrastructure and SSU rRNA, had these organisms at the base of the Tree of Life (Cavalier-Smith, 1988; Patterson, 1994; Vossbrinck *et al.*, 1987). Studies of alpha- and beta-tubulin have indicated that microsporidians either are related to organisms higher in the phylogenetic tree (Canning, 1998; Edlind, 1998) or to the *Fungi* (Hirt *et al.*, 1997; Keeling & McFadden, 1998; Keeling *et al.*, 2000; van de Peer *et al.*, 2000). The last alternative is also supported by other genes.

In the official classifications by the Society of Protozoologists microsporidians have been ranked in the Subphylum *Cnidosporidia* of the Phylum *Protozoa* (Honigberg *et al.*, 1964), as the Phylum *Microspora* (Levine *et al.*, 1980) or included in (the Kingdom) *Opisthokonta* together with *Fungi*, *Metazoa* and some other organisms (Adl *et al.*, 2005). Microsporidians were for a period included in the Kingdom *Archezoa* (Cavalier-Smith, 1988, 1993) or split between the Infrakingdom *Alveolata* (Subphylum *Manubrispora* – Family *Metchnikovellidae*) and the Kingdom *Fungi* (Phylum *Microsporidia* – all other microsporidians) (Cavalier-Smith, 1998).

The recent classifications treat the supergeneric ranking differently and no classification can accommodate all established taxa (Sprague, 1977; Weiser, 1977; Sprague, 1982; Issi, 1986; Canning 1989; Sprague *et al.*, 1992).

Microsporidiopsis Schereschewsky (1925), Microsporidia. 1. See Schereschewsky (*Ark. Russk. Protistol. Obsć* 3: 137, 1925).

Microsporidium Balbiani (1884), Microsporidia. 8.

Microsporon (orthographic variant), see *Microsporum*.

Microsporonites K.P. Jain (1968), Fossil Fungi ? Fungi. 1 (Triassic), Argentina. See Pirozynski &

- Weresub in Kendrick (Ed.) (*The Whole Fungus* 1: 93, 1979).
- Microsporium** Gruby (1843), anamorphic *Arthroderma*, Hsy.≡ eH.2. 15 (on humans and other mammals, causing **microsporoses**), widespread. *M. audouinii* (tinea capitis in humans, esp. children), *M. canis* (ringworm in cats, dogs and humans). See Conant (*Arch. Derm. Syph. Chicago* 36: 781, 1937), Morace *et al.* (*Mycopathologia* 94: 53, 1986; serotyping by monoclonal antibodies), Vismer *et al.* (*Mycopathologia* 98: 149, 1987; ultrastr. conidia), Brasch (*Mycoses* 32: 33, 1989; polymorphic conidia), Tucker & Noble (*J. Med. Vet. Mycol.* 28: 117, 1990; protein profiles), Demange *et al.* (*J. Med. Vet. Mycol.* 30: 301, 1992; review), Morganti *et al.* (*European Journal of Epidemiology* 8: 340, 1992; morphology, biochemistry), Tucker (*Mycoses* 35: 147, 1992; biotypes), Kawasaki *et al.* (*Mycopathologia* 130: 11, 1995; phylogeny), Mancianti & Papini (*J. Mycol. Médic.* 7: 87, 1997; mating types), Kano *et al.* (*Mycoses* 41: 139, 1998; RAPDs), Simpanya *et al.* (*Mycoses* 41: 501, 1998; isozymes), Simpanya *et al.* (*Medical Mycology* 36: 255, 1998; isozymes, New Zealand), Gräser *et al.* (*Medical Mycology* 37: 105, 1999; phylogeny), Gräser *et al.* (*Medical Mycology* 38: 143, 2000; phylogeny, morphology), Kano *et al.* (*Veter. Pathol.* 78: 85, 2001; chitin synthase gene), Liu *et al.* (*Medical Mycology* 39: 215, 2001; PCR diagnostics), Kaszubiak *et al.* (*Infect. Genet. Evol.* 4: 179, 2004; population structure, evolution), Untereiner *et al.* (*Mycol.* 96: 812, 2004; phylogeny), Brilhante *et al.* (*Journal of Applied Microbiology* 99: 776, 2005; Brazil), Sharma *et al.* (*Antonie van Leeuwenhoek* 89: 197, 2006; phylogeny).
- Microstelium** Pat. (1899) = *Gomphillus* fide Lücking (*Bryologist* 110: 475, 2007).
- Microstella** K. Ando & Tubaki (1984), anamorphic *Agaricomycotina*, Hso.1bH.10. 1 (aquatic), Japan. See Ando & Tubaki (*TMSJ* 25: 34, 1984).
- Microsticta** Desm. (1849) = *Schizothyrium* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Microstoma** Auersw. (1860) = *Valsa* Fr. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Microstoma** Bernstein (1852), *Sarcoscyphaceae*. 3 or 8, widespread (esp. temperate). See Boedijn (*Sydowia* 5: 211, 1951), Otani (*TMSJ* 21: 149, 1980), Otani (*Rep. Tottori mycol. Inst.* 28: 251, 1990; Japanese spp.), Landvik *et al.* (*Nordic Jl Bot.* 17: 403, 1997; DNA), Harrington (*Mycol.* 90: 235, 1998), Harrington *et al.* (*Mycol.* 91: 41, 1999; phylogeny), Harada & Kudo (*Mycoscience* 41: 275, 2000), Wang (*Mycotaxon* 89: 119, 2004; Taiwan).
- Microstroma** Niessl (1861), *Microstromataceae*. 4, widespread. See von Arx (*Gen. Fungi Sporul. Cult.* Edn 3: 104, 1981), Begerow *et al.* (*CJB* 75: 2045, 1998), Begerow *et al.* (*MR* 105: 798, 2001).
- Microstromataceae** Jülich (1982), *Microstromatales*. 2 gen. (+ 2 syn.), 5 spp.
Lit.: Bauer *et al.* (*CJB* 75: 1273, 1997), Begerow *et al.* (*CJB* 75: 2045, 1998), Begerow *et al.* (*MR* 105: 809, 2001), Begerow *et al.* (*Mycol. Progr.* 1: 187, 2002), Beer *et al.* (*Stud. Mycol.* 55: 289, 2006).
- Microstromatales** R. Bauer & Oberw. (1997). Exobasidiomycetes. 3 fam., 4 gen., 10 spp. Fams:
- (1) **Microstromataceae**
 - (2) **Quambalariaceae**
 - (3) **Volvocisporiaceae**
- For *Lit.* see under fam.
- Microtetraspora** Thiemann, Pagani & Beretta (1968), *Actinobacteria*. q.v.
- Microthallites** Dilcher (1965), Fossil Fungi ? *Microthyriaceae*. 3 (Eocene, Miocene), India; USA. See Selkirk (*Proc. Linn. Soc. N. S. W.* 100: 70, 1975), Blanz (*Z. Mykol.* 44: 91, 1978; annellides in), Hansen (*Grana* 19: 67, 1980) = *Phragmothyrites* (Fossil fungi) fide.
- Microthecium** Corda (1842) = *Melanospora* Corda. See also *Sphaerodes*. fide von Arx (*Gen. Fungi Sporul. Cult.* Edn 3, 1981).
- Microthelia** Körb. (1855) nom. rej. = *Anisomeridium* fide Hawksworth & Sherwood (*Taxon* 30: 339, 1981), Hawksworth (*Bull. Br. Mus. nat. hist. Bot.* 14: 1, 1985; redisp. names).
- Microtheliomyces** Cif. & Tomas. (1953) = *Leptorhaphis* fide Aguirre-Hudson (*Bull. Br. Mus. nat. hist. Bot.* 21: 85, 1991).
- Microtheliopsidaceae** O.E. Erikss. (1981), ? *Dothideomycetes* (inc. sed.) (L). 1 gen. (+ 5 syn.), 1 spp.
Lit.: Eriksson (*Op. Bot.* 60, 1981), Lücking (*Mycotaxon* 51: 69, 1994), Aptroot (*Lichenologist* 30: 501, 1998), Aptroot (*Lichenologist* 30: 515, 1998), Lücking *et al.* (*Lichenologist* 30: 121, 1998).
- Microtheliopsisomyces** Cif. & Tomas. (1953) = *Microtheliopsis*.
- Microtheliopsis** Müll. Arg. (1890), *Microtheliopsidaceae* (L). 1, C. & S. America; Australasia. See Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952), Lücking (*Mycotaxon* 51: 69, 1994), Aptroot (*Lichenologist* 30: 515, 1998; posn).
- Microthia** Gryzenh. & M.J. Wingf. (2006), *Cryphonectriaceae*. 2, C. America; Azores. See Gryzenhout & Wingfield (*Stud. Mycol.* 55: 44, 2006).
- Microthyriaceae** Sacc. (1883), *Microthyriales*. 54 gen. (+ 40 syn.), 278 spp.
Lit.: Stevens & Ryan (*Ill. biol. monogr.* 17 no. 2: 1, 1939), Doidge (*Bothalia* 4: 273, 1942; S. Afr.), Swart (*TBMS* 87: 81, 1986), Kirk & Spooner (*MR* 92: 335, 1989), Spooner & Kirk (*MR* 94: 223, 1990), Holm & Holm (*Nordic Jl Bot.* 11: 675, 1991), Crous & Kendrick (*CJB* 72: 63, 1994), Hariharan *et al.* (*Lichenologist* 28: 294, 1996), Hosagoudar *et al.* (*Mycotaxon* 58: 489, 1996), Matzer (*Mycol. Pap.* 171: 202 pp., 1996), Ramaley (*Mycotaxon* 70: 7, 1999).
- Microthyriacites** Cookson (1947), Fossil Fungi, *Microthyriaceae*. 8 (Cretaceous, Tertiary), widespread. = *Phragmothyrites* (Fossil fungi) fide Selkirk (1975).
- Microthyriales** G. Arnaud (1918), ? *Dothideomycetes*. 3 fam., 62 gen., 323 spp. Superficial mycelium indistinct and often absent. Ascomata small, strongly flattened, superficial, with a central ostiole or slit(s); peridium brown, the upper wall composed of radiating rows of ± isodiametric cells, the basal layer hyaline, poorly developed or absent. Interascal tissue of pseudoparaphyses, often inconspicuous and/or deliquescing. Asci saccate, fissitunicate, without a clear ocular chamber, not blueing in iodine. Ascospores hyaline or brown, transversely septate, sometimes ciliate, without a sheath. Anamorphs hardly studied. Saprobic or epiphytic on leaves and stems, cosmop. Poorly known, many of the genera are likely to be artificial. The Order as circumscribed here is almost certainly polyphyletic, but the fams. have much shared morphology. Fams.:
- (1) **Aulographaceae**
 - (2) **Leptopeltidaceae**
 - (3) **Microthyriaceae**

- Lit.*: Doidge (*Bothalia* 4: 273, 1942; S. Afr.), Stevens & Ryan (*Ill. biol. monogr.* 17 (2), 1939).
- Microthyriella** Höhn. (1909) = *Schizothyrium* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Microthyrina** Bat. (1960) = *Microthyrium* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Microthyriolum** Speg. (1917) = *Ferrarisia* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Microthyris** Clem. (1931) = *Lichenopeltella*.
- Microthyrites** Pampal. (1902), Fossil Fungi. 1 (Miocene), Italy.
- Microthyrium** Desm. (1841), Microthyriaceae. Anamorph *Leptothyrium*. 57, widespread. See Ellis (*TBMS* 67: 382, 1977; key 13 Br. spp.), Doi & Uemura (*Bull. natn. Sci. Mus. Tokyo*, B 11: 127, 1985), Spooner & Kirk (*MR* 94: 223, 1990), Holm & Holm (*Nordic Jl Bot.* 11: 675, 1991), Ramaley (*Mycotaxon* 70: 7, 1999).
- Microtrichella** Maessen (1955) = *Arthromitus* fide Manier & Lichtwardt (*Annls Sci. Nat. Bot.*, sér. 12 9: 519, 1968).
- Microtrichophyton** (Castell. & Chalm.) Neveu-Lem. (1921) = *Trichophyton* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Microtyle** Speg. (1919), anamorphic *Pezizomycotina*, Cpd.1eH.?. 1, S. America. See Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2: 830, 1962).
- Microtypha** Speg. (1910) = *Arthrimum* fide Subramanian (*Hyphomycetes – an Account of Indian Species, except Cercosporae*, 1971).
- Microxiphium** (Harv. ex Berk. & Desm.) Thüm. (1879), anamorphic *Dennisiella*, Hsy.0eH.?. 2, widespread. See Hughes (*Mycol.* 68: 693, 1976), Reynolds & Gilbert (*Aust. Syst. Bot.* 18: 265, 2005; Australia).
- Microxyphiella** Speg. (1918), anamorphic *Pezizomycotina*, Cpd.1eH.?. 7, widespread (tropical). See Hughes (*Mycol.* 68: 788, 1976).
- Microxyphiomyces** Bat., Valle & Peres (1961) = *Tricharia Fée* fide Lücking *et al.* (*Lichenologist* 30: 121, 1998).
- Microxyphiopsis** Bat. (1963), anamorphic *Pezizomycotina*, Cpd.1eH.?. 2, Brazil. See Batista (*Quad. Lab. crittogam., Pavia* 31: 103, 1963).
- Microxyphium**, see *Microxiphium*.
- Micula** Duby (1858) ? = *Foveostroma* fide Sutton (*The Coelomycetes*, 1980).
- Micularia** Boedijn (1961), Elsinoaceae. 1, Java. See Boedijn (*Persoonia* 2: 67, 1961).
- Midotiopsis** Henn. (1902), Helotiales. 2, America (tropical).
- Midotis** Fr. (1828) ? = *Wynnella* fide Nannfeldt (*TBMS* 23: 239, 1939).
- migration pseudoplasmodium** (of *Acrasiales*), the migration stage after the massing of the myxamoebae (Raper, *J. agric. Res.* 50: 135, 1935).
- Mikronegeria** Dietel (1899), Mikronegeriaceae. 3 (on *Araucaria* (Araucariaceae), *Austrocedrus* (Cupressaceae) or *Phyllocladus* (Podocarpaceae) (0, I); on *Nothofagus* (Fagaceae or *Fuchsia* (Onagraceae) (II, III)), Argentina; Chile; New Zealand. See Butin (*Phytopath. Z.* 64: 242, 1969), Peterson & Oehrens (*Mycol.* 70: 321, 1978), Aime (*Mycoscience* 47: 112, 2006).
- Mikronegeriaceae** Cummins & Y. Hirats. (1983), Pucciniales. 4 gen. (+ 1 syn.), 13 spp.
Lit.: Sato & Sato (*TBMS* 85: 223, 1985), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003), Aime (*Mycoscience* 47: 112, 2006).
- miktohaplont**, a haplont made up of cells having genotypically different nuclei (Kniep, 1928); cf. isohaplont.
- Miladina** Svrček (1972), Pyronemataceae. Anamorph *Actinosporella*. 1, Europe; N. America. See Pfister & Korf (*CJB* 52: 1643, 1974), Descals & Webster (*TBMS* 70: 466, 1978), Yao & Spooner (*MR* 99: 1525, 1995), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny).
- mildew** (1) a plant disease in which the pathogen is seen as a growth on the surface of the host. A **powdery** ('true') - is caused by one of the *Erysiphaceae* (e.g. the American (*Sphaerotheca mors-uvae*) and European - (*Microsphaera grossulariae*) of *Ribes*); a **downy** ('false') - by one of the *Peronosporaceae* (the first may be controlled by sulphur, the second by copper fungicides); a **dark** -, or **black** -, by one of the *Meliolales* or *Capnodiaceae*; (2) the staining, and frequently the breaking up, of cloth and fibres, paint, etc., by fungi and bacteria (cf. mould); (3) a fungus causing (1) or (2).
- Milesia** F.B. White (1878), anamorphic *Milesina*. 25, widespread. Anamorph name for (II). Teleomorphs also found in *Phakopsora* (Phakops.). See Moss (*Ann. Bot.* 40: 813, 1926; morphology), Ono *et al.* (*MR* 96: 828, 1992), Berndt *et al.* (*CJB* 72: 1084, 1994; ultrastr.).
- Milesina** Magnus (1909), Pucciniastreaceae. Anamorph *Milesia*. 36 (on *Abies* (0, I; where known) (*Pinaceae*); on Pteridophyta (II, III)), widespread (temperate). (22 *Uredo*/*Milesia* species may belong here). See Faull (*Contr. Arnold Arbor.* 2, 1932), Faull (*J. Arnold Arbor.* 15: 50, 1934; as '*Milesia*'), Hiratsuka (*Revision of taxonomy of the Pucciniastreae*, 1958), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983), Ono *et al.* (*MR* 96: 828, 1992; expanded anamorph concept (*Milesia*, II) to include phakopsoraceous species on legumes), Rodríguez & Buriticá (*ASCOLFI Informa* 28: 12, 2002; Colombia), Wingfield *et al.* (*Australas. Pl. Path.* 33: 327, 2004; phylog.).
- Milesites** Ramanujam & Ramachar (1980), Fossil Fungi, Pucciniastreaceae. 1. See Ramanujam & Ramachar (*Records of the Geological Survey of India* 113: 81, 1980).
- Military use of fungi**. see Bioterrorism and fungi.
- milk-cap**, basidioma of *Lactarius* spp.
- Millardet** (Pierre Marie Alexis; 1838-1902; France). Student, University of Heidelberg and University of Freiberg; Professor of Botany, University of Strasbourg (1869); Professor of Botany, University of Nancy (1872); Professor of Botany, University of Bordeaux (1876). Noted for his work protecting vineyards from pests; invented Bordeaux mixture, the world's first commercial fungicide, and used it successfully against grape downy mildew (*Plasmopara viticola*). *Publs. Sur le traitement du mildew et du rot. Comptes Rendus Hebdomadaire des Séances de l'Académie des Sciences, Paris* (1885) *Biogs, obits etc.* Ayres (*Mycologist* 18: 23, 2004).
- Millerburtonia** Cif. (1951), anamorphic *Plagiostoma*, Cac.0fH.?. 1, Venezuela. See Ciferri (*Mycopath. Mycol. appl.* 6: 26, 1951).
- Milleria** Peck (1879) [non *Milleria* L. 1753, *Compositae*] = *Testicularia* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).

- Milleromyces** T.N. Taylor, Hass & W. Remy (1993), Fossil Fungi. 1 (Devonian), British Isles. See Taylor *et al.* (*Mycol.* **84**: 902, 1992).
- Milospium** D. Hawksw. (1975), anamorphic *Pezizomycotina*, Hso.0eP.1. 1 (on lichens), Europe. See Hawksworth (*Nova Hedwigia* **79**: 373, 1984), Hawksworth (*Taxon* **55**: 528, 2006; nomencl.).
- Milowia** Massee (1884) nom. dub. ? = *Thielaviopsis* fide Wakefield & Bisby (*TBMS* **25**: 63, 1941), Nag Raj & Kendrick (*Monograph of Chalara and allied genera*: 43, 1975).
- Milowiaceae** Nann. (1934) = *Ceratocystidaceae*.
- Miltidea** Stirt. (1898), *Miltideaceae* (L). 1, Australasia. See Hafellner (*Beih. Nova Hedwigia* **79**: 241, 1984), Lumbsch (*J. Hattori bot. Lab.* **83**, 1997), McCarthy & Mallett (*Flora of Australia* **56 A**, 2004).
- Miltideaceae** Hafellner (1984), *Lecanorales* (L). 1 gen., 1 spp.
Lit.: Lumbsch (*J. Hattori bot. Lab.* **83**: 1, 1997).
- Mimema** H.S. Jacks. (1931), ? *Uropyxidaceae*. 2 (on *Cassia*, *Dalbergia* (*Leguminosae*), S. America. See Dianese *et al.* (*MR* **98**: 786, 1994).
- Mimeomyces** Thaxt. (1912), *Laboulbeniaceae*. 16, widespread. See Nannfeldt (*Svensk bot. Tidskr.* **43**: 468, 1949).
- Mindoa** Petr. (1949), anamorphic *Pezizomycotina*, Cpt.1eH.?. 1, S. America.
- MINE**, Microbial Information Network Europe; see Genetic resource collections.
- Miniancora** Marvanová & Bär. (1989), anamorphic *Pezizomycotina*, Hso.1bH.15. 1 (aquatic), Canada. See Marvanová & Bärlocher (*Mycotaxon* **35**: 86, 1989).
- minimal medium**, the simplest chemically defined medium on which the wild type (prototroph) of a species will grow and which must be supplemented by one or more specific substances for the growth of auxotrophic mutants derived from the wild type.
- Minimedusa** Weresub & P.M. LeClair (1971), anamorphic *Agaricomycetes*. 1, Cuba. See Weresub & LeClair (*CJB* **49**: 2210, 1971), Diederich & Lawrey (*Mycol. Progr.* **6**: 61, 2007; phylogeny), Lawrey *et al.* (*Mol. Phylog. Evol.* **44**: 778, 2007; phylogeny).
- Minimelanolocus** R.F. Castañeda & Heredia (2001), anamorphic *Pezizomycotina*, Hso.?.?. 14, widespread. See Castañeda Ruiz *et al.* (*Cryptog. Mycol.* **22**: 7, 2001), Castañeda Ruiz *et al.* (*Mycotaxon* **85**: 231, 2003).
- Minimidochium** B. Sutton (1970), anamorphic *Pezizomycotina*, Hsp.0eH.15. 3, widespread (tropical). See Sutton (*CJB* **47**: 2095, 1969), Cabello *et al.* (*MR* **102**: 383, 1998; Argentina).
- Minksia** Müll. Arg. (1882), *Roccellaceae* (L). 4, widespread (tropical).
- Minostrocyta** Hjortstam & Ryvarden (2001), *Agaricomycetes*. 1, Colombia. See Hjortstam & Ryvarden (*Mycotaxon* **79**: 194, 2001).
- Mintera** Inácio & P.F. Cannon (2003), *Parmulariaceae*. 1, S. America. See Inácio & Cannon (*MR* **107**: 86, 2003).
- Minutoexcipula** V. Atienza & D. Hawksw. (1994), anamorphic *Pezizomycotina*, Hsp.1eP.19. 4 (lichenicolous), widespread. See Atienza & Hawksworth (*MR* **98**: 587, 1994), Hafellner (*Herzogia* **10**: 1, 1994), Atienza (*Biblthca Lichenol.* **82**: 141, 2001; Spain).
- Minutophoma** D. Hawksw. (1981), anamorphic *Pezizomycotina*, Cpd.0eH.15. 1 (on *Chrysothrix*), British Isles. See Hawksworth (*Bull. Br. Mus. nat. Hist. Bot.* **9**: 44, 1981).
- Mirandia** Toro (1934) nom. dub., Fungi. See Petrak (*Sydowia* **5**: 328, 1951), Müller & von Arx (*Beitr. Kryptfl. Schweiz* **11** no. 2, 1962) See.
- Mirandina** G. Arnaud ex Matsush. (1975), anamorphic *Helotiales*, Hso.0fH.10. 9, Europe; Papua New Guinea. See Hoog (*Stud. Mycol.* **26**: 1, 1985; synonymy with *Dactylaria*), Goh & Hyde (*MR* **101**: 1265, 1997).
- Mirannulata** Huhndorf, F.A. Fernández, A.N. Mill. & Lodge (2003), *Sordariomycetes*. 1, neotropics. See Huhndorf *et al.* (*Sydowia* **55**: 173, 2003).
- MIRCEN**. Microbial Resource Centre. Since 1975 a network of centres for information on the resources available for diverse aspects of microbiology has been established throughout the world under UNESCO (United Nations Educational, Scientific, and Cultural Organization)/UNEP (United Nations Environment Programme). The mycology MIRCEN is based at CABI Europe, Egham (formerly the site of IMI). See Kirsop & Da Silva (*in* Hawksworth & Kirsop (Eds), *Filamentous fungi*: 173, 1988), *MIRCEN NEWS*.
- Mirimyces** Nag Raj (1993), anamorphic *Pezizomycotina*, St.0eH.15. 1, Cuba. See Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*: 477, 1993).
- Miriquidica** Hertel & Rambold (1987), *Lecanoraceae* (L). 23, widespread (esp. arctic-alpine). See Rambold & Schwab (*Nordic J. Bot.* **10**: 117, 1990; rust-coloured spp.), Timdal (*Bryologist* **96**: 616, 1993), Rambold *et al.* (*Mycotaxon* **58**: 319, 1996; Mexico), Andreev (*Nov. sist. Niz. Rast.* **34**: 82, 2001; Russia), Owe-Larsson & Rambold (*Biblthca Lichenol.* **78**: 335, 2001; sorediate spp.), Andreev (*Biblthca Lichenol.* **88**: 15, 2004; Russia), Arup *et al.* (*Mycol.* **99**: 42, 2007; sister group relations with *Parmeliaceae*).
- Mischoblastia** A. Massal. (1852) = *Rinodina* fide Rambold *et al.* (*Pl. Syst. Evol.* **192**: 31, 1994), Marbach (*Biblthca Lichenol.* **74**, 2000).
- mischoblastiomorph** (of ascospores), ones similar to the polarilocular type but either without a septum or only with an incomplete septum.
- Mischolecia** M. Choisy (1931) = *Rinodina* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Misgomyces** Thaxt. (1900), *Laboulbeniaceae*. 4, widespread. See Tavares & Balazuc (*Mycol.* **69**: 1069, 1977), Tavares (*Mycol. Mem.* **9**: 627 pp., 1985), Santamaría (*Mycol.* **87**: 697, 1995).
- miso**, an oriental food product, used for soups and as a flavouring agent, composed of rice and cereals + soybeans fermented by *Aspergillus oryzae* and *Saccharomyces rouxii* (Hesseltine, *Mycol.* **57**: 168, 1965); see Fermented food and drinks.
- Mison** Adans. (1763) nom. rej. = *Phellinus* fide Donk (*Persoonia* **1**: 173, 1960).
- Mites**. Species of *Tyrophagus* and *Tarsonemus* sometimes infest fungus cultures. They are a serious problem as they transfer spores from culture to culture, causing cross-contamination that may be irredeemable and often introduce bacteria into the culture.
- To prevent mite invasion, work surfaces must be kept clean and cultures protected from aerial infestation by storage in cabinets or incubators. To clean work surfaces, wash with a non-fungicidal acaricide (0.2% v/v Actelic was used at IMI). Mites can be de-

tected by scrutiny of cultures at twice-weekly intervals; they appear as white objects, just detectable with the naked eye. Ragged colony margins or growth of contaminant fungi or bacteria forming trails may denote their presence. If mites are detected, contaminated cultures should be destroyed by autoclaving (121°C for 15 min.).

Where contamination is not severe and the original fungus is sporulating it will normally be possible to recover an uncontaminated culture. If mite-infested cultures cannot be reisolated, they can be stored at –18°C for 1–3 days before being subcultured. This procedure will kill both eggs and adult mites. Fungi which would not survive short-term cold storage may be covered with a layer of mineral oil and subcultured after 24 hours. However, this latter procedure does not kill the eggs.

A cigarette paper fastened on the necks of universal bottles or test-tubes provides an effective barrier against mites. The cigarette papers are sterilized by dry heat at 180°C for 2 h. and aseptically stuck to the rim of the bottle using a copper sulphate/gelatin glue (20 g gelatin; 2 g copper sulphate; 100 mls distilled water) (Snyder & Hansen, 1946).

Standing the cultures on liquid paraffin and treating the wool plugs with kerosene (crude, such as 'tractor vapourizing oil') has proved an effective control. See Area Leão *et al.* (*Mem. Inst. Oswaldo Cruz* 42: 559, 1946), Smith (*Mycol.* 59: 600, 1967). Cf. insects, invertebrates and lichens.

mitochondrion, membrane bound intracellular organelle containing enzymes and electron transport chains for oxidative respiration of organic acids and the concomitant production of ATP. Possesses DNA, messenger RNA and small ribosomes and thus capable of protein synthesis.

Mitochytridium P.A. Dang. (1911), ? Endochytriaceae. 2, Europe; N. America. See Couch (*J. Elisha Mitchell scient. Soc.* 51: 293, 1935).

Mitopeltis Speg. (1921), Micropeltidaceae. 1, S. America. See Petrak & Sydow (*Annls mycol.* 33: 169, 1935).

Mitoplastophora Codreanu (1966), Microsporidia. 1.

Mitosis in fungi. For reviews see Aist & Morris (*Fungal Genetics and Biol.* 27: 1, 1999), Fuller (*Internat. Rev. Cytology* 45: 113, 1976), Heath (*Mycol.* 72: 229, 1980).

mitosporangium, a thin-walled diploid sporangium of certain *Blastocladales* producing uninucleate diploid zoospores (**mitospores**) (Emerson, 1950); cf. meiosporangium.

mitospore (1) a spore from a mitosporangium (q.v.); (2) (of ascomycetes and basidiomycetes), any non-basidiosporous or -ascosporous propagule (see Kendrick & Watling, *in* Kendrick (Ed.), *The whole fungus* 2: 473, 1979). See Anamorphic fungi.

Mitosporic fungi, See Anamorphic fungi.

Mitosporium Clem. & Shear (1931) ≡ *Aciculosprium*.

Mitrasphaera Dumort. (1822) nom. rej. prop. = *Cordyceps* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

mitrate (mitriform), mitre-like in form.

Mitremyces Nees (1816) = *Calostoma* fide Stalpers (*in litt.*).

mitriform, see mitrate.

Mitrophora Lév. (1846) = *Morchella* fide Seaver (*North American Cup Fungi* (Operculates), 1928),

Eckblad (*Nytt Mag. Bot.* 15: 1, 1968), Wipf *et al.* (*Can. J. Microbiol.* 45: 769, 1999).

Mitrorhizopeltis Bat. & Cavalc. (1964) = *Tracylla* fide Nag Raj (*CJB* 53: 2435, 1975).

Mitrula Fr. (1821), Helotiales. 8, widespread (temperate). See Verkley (*Persoonia* 15: 405, 1994; ultrastr.), Wang *et al.* (*Am. J. Bot.* 92: 1565, 2005; phylogeny, life history), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).

Mitrula Pers. (1794) = *Heyderia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Mitrolinia Spooner (1987), Sclerotiniaceae. 1, southern hemisphere. See Spooner (*Bibliotheca Mycol.* 116, 1987).

Mitruliopsis Peck (1903) = *Spathularia* fide Durand (*Annls mycol.* 6: 387, 1908).

Mitteriella Syd. (1933), anamorphic *Schiffnerula*, Hso.≡ eP.10. 3, India; Uganda. See Hughes (*CJB* 61: 1727, 1984), Hosagoudar (*Zoos' Print Journal* 18: 1071, 2003).

Miuraea Hara (1948), anamorphic *Mycosphaerella*, Hso.≡ eH.?. 3, Asia. See Hara (*Manual of pests & diseases*: 779, 1948), Deighton (*Mycol. Pap.* 133: 3, 1973; relationship to *Cercospora*), Braun (*Monogr. Cercospora, Ramularia Allied Genera* (*Phytopath. Hyphom.*) 1: 218, 1995; key).

Mixia C.L. Kramer (1959), Mixiaceae. 1, Japan; USA. See Kramer (*Stud. Mycol.* 30: 151, 1987), Nishida *et al.* (*CJB* 73 Suppl. 1: S660, 1995; posn), Sjam-suridzal *et al.* (*J. gen. appl. Microbiol.* Tokyo 48: 121, 2002; phylogeny).

Mixiaceae C.L. Kramer (1987), Mixiales. 1 gen., 1 spp. *Lit.*: Kramer (*Stud. Mycol.* 30: 151, 1987), Nishida *et al.* (*CJB* 73 Suppl. 1: S660, 1995; posn), Sjam-suridzal *et al.* (*Mycoscience* 40: 21, 1999), Sjam-suridzal *et al.* (*J. gen. appl. Microbiol.* Tokyo 48: 121, 2002).

Mixiales R. Bauer, Begerow, J.P. Samp., M. Weiss & Oberw. (2006). Mixiomycetes. 1 fam., 1 gen., 1 spp. Fam.:

Mixiaceae.

For *Lit.* see under fam.

Mixiomycetes R. Bauer, Begerow, J.P. Samp., M. Weiss & Oberw. (2006). Pucciniomycotina. 1 ord., 1 fam., 1 gen., 1 spp. Ord.:

Mixiales

For *Lit.* see fam.

Mixtoconidium Etayo (1995), anamorphic *Pezizomycotina*, Cpd.1eH.19. 1 (on lichens), Spain. See Etayo (*Mycotaxon* 53: 425, 1995).

Mixtura O.E. Erikss. & J.Z. Yue (1990), Phaeosphaeriaceae. 1, S. America. See Eriksson & Yue (*Mycotaxon* 38: 201, 1990).

Miyabella S. Ito & Homma (1926) = *Synchytrium* fide Karling (*Synchytrium*, 1964).

Miyagia Miyabe ex Syd. & P. Syd. (1913), Pucciniaceae. 2 (on *Asteraceae*), Africa; Asia; Europe. See Hiratsuka (*TMSJ* 10: 89, 1969), Gjørnum *et al.* (*Lidia* 5: 83, 2000; Uganda) Probably belongs to *Puccinia*.

Miyakeomyces Hara (1913), Niessliaceae. 1 (on bamboo leaves), Japan. See Eriksson & Yue (*SA* 8: 9, 1989), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).

Miyoshia Kawam. (1907) [non *Miyoshia* Makino 1903, *Liliaceae*] ≡ *Miyoshiella*.

Miyoshiella Kawam. (1929), Chaetosphaeriales. Anamorph *Stanjehughesia*. 1 (from wood), Eurasia (temperate). See Réblová (*Mycotaxon* 71: 13, 1999),

Shenoy *et al.* (MR 110: 916, 2006; phylogeny).

mizaume, see Fermented food and drinks.

MLC, microbody-liquid globule complex; see *Chytridiales*.

Mniaecia Boud. (1885), Helotiaceae. 3 (on *Hepaticae*), Europe. See Purvis *et al.* (*Lichen Flora of Great Britain and Ireland*, 1992; key), Raspé & De Sloover (*Belg. Jl Bot.* 131: 251, 1998; Belgium), de Sloover (*Lejeunia* n.s. 166, 2001).

Mniopetalum Donk & Singer (1962) = *Rimbachia* fide Kuyper (*in litt.*).

Moana Kohlm. & Volkm.-Kohlm. (1989), Halosphaeriaceae. 1 (marine), Pacific. See Kohlmeyer & Volkman-Kohlmeyer (MR 92: 410, 1989).

Mobergia H. Mayrhofer & Sheard (1992), Physciaceae (L). 7, C. & N. America. See Mayrhofer *et al.* (*Bryologist* 95: 438, 1992), Grube & Arup (*Lichenologist* 33: 63, 2001; phylogeny).

Models of larger fungi. Early models were made by James Sowerby during 1796 and 1815 for his museum. These were later restored by Worthington G. Smith (q.v.) and are now at The Natural History Museum, London (see Tribe, *Bull. BMS* 15: 161, 1984). The Ware Collection of Glass Models of Plants, made by B. Blaschka in 1929, at the Botanical Museum of Harvard University include a series showing fungal diseases of fruit; the Department of Applied Biology, Cambridge University has a collection of glass models of macro- and microfungi made by W.A.R. Dillon Western (1899-1953) which were exhibited at the 50th Anniversary Meeting of the British Mycological Society (*TBMS* 30: 21, 1948). The longest more recent series of coloured pottery models (some 200) are those designed by the late Mr and Mrs Lovenzens of Lantz, Nova Scotia, of which there is a complete set in the Nova Scotia Museum, Halifax. Many larger fungi are visually very attractive and various artists who are also interested in mycology produce models, usually from clay, but also from wax, plaster of Paris or various resins, and often using silicone moulds. The 1987 British Mycological Society workshop on modelling larger fungi, led by Dr S. Diamandis, revived interest in production of such models, and the society maintains a collection as a travelling exhibition (Chattaway, *Making models of fungi. Association of British fungus groups journal* 6: 26, 2002). There are still, however, few if any museums with such models, and perhaps none with models showing microscopic structures of fungi greatly enlarged, although this medium is ideal for educational purposes.

Algorithms to produce images of fungi by computer models have been described by Desbenoit *et al.* (Interactive modelling of mushrooms. *Eurographics*, 2004), and animated 3D computerized images of fungi can be purchased from various internet sites. Although apparently mainly for use as components for realistic backgrounds in computer games, models are also being used in airflow studies of spore dispersal (Deering *et al.*, *Mycol.* 93: 732, 2001).

Modicella Kanouse (1936), Mortierellaceae. 2, N. & S. America. See Gerdemann & Trappe (*Mycol. Mem.* 5, 1974; key), Benny *et al.* in Sylvia *et al.* (Eds) (*Mycorrhizae in the next decade, practical applications and research priorities*: 311, 1987; syst. posn).

Moelleria Bres. (1896) [non *Moelleria* Scop. 1777, *Algae*] = *Moelleriella*.

Moelleriella Bres. (1897), Clavicipitaceae. Anamorph

Aschersonia-like. 40, pantropical. See Rogerson (*Mycol.* 62: 865, 1970), Sung *et al.* (*Stud. Mycol.* 57, 2007), Chaverri *et al.* (*Stud. Mycol.* 60, 2008; phylogeny, neotropics).

Moelleroclavus Henn. (1902), anamorphic *Xylaria*. 1, neotropics; Hawaii. See Clements & Shear (*Gen. Fung.*, 1931), Læssøe (*SA* 13: 43, 1994; ? synonym of *Xylaria*), Rogers *et al.* (MR 101: 345, 1997).

Moellerodiscus Henn. (1902), Rutstroemiaceae. 1, widespread. See Dumont (*Mycol.* 68: 233, 1976), Spooner (*Bibliotheca Mycol.* 116: 1, 1987), Johnston (*N.Z. Jl Bot.* 40: 105, 2002; New Zealand).

Moelleropsis Gyeln. (1939), Pannariaceae (L). 2, widespread (north temperate). See Maas (*Proc. Nova Scotia Int. Sci.* 37: 21, 1987), Jørgensen (*Cryptog. Mycol.* 21: 49, 2000; Europe), Lumbsch *et al.* (*Lichenologist* 37: 291, 2005; phylogeny), Wedin *et al.* (MR 109: 159, 2005; phylogeny), Carballal Durán & López de Silanes Vázquez (*Cryptog. Mycol.* 27: 69, 2006; Iberian peninsula).

Moeszia Bubák (1914) = *Cylindrocarpon* fide von Arx (*Gen. Fungi Sporul. Cult.*, 1970).

Moesziella Petr. (1927) = *Leptopeltis* fide Holm & Holm (*Bot. Notiser* 130: 215, 1977).

Moesziomyces Vánky (1977), Ustilaginaceae. 1 (on *Poaceae*), widespread. *M. bullatus* (syn. *M. penicillariae*), pearl millet seed smut. See Rao & Thacker (*TBMS* 81: 597, 1983), Vánky (*Nordic Jl Bot.* 6: 67, 1986), Mordue (*IMI Descr. Fungi Bact.*: no. 1245, 1995), Vánky & Vánky (*Lidia* 5: 157, 2002; southern Africa), Vánky (*Mycotaxon* 85: 1, 2003).

Moeszopeltis Petr. (1947) = *Leptopeltis* fide Holm & Holm (*Bot. Notiser* 130: 215, 1977).

Mohgaonidium Singhai (1974), Fossil Fungi, anamorphic *Pezizomycotina*. 1 (Eocene), India.

Mohortia Racib. (1909) = *Septobasidium* fide Couch (*The genus Septobasidium*, 1938).

Molecular biology. Techniques in molecular biology have made a major contribution to understanding of fungal biology and relationships (see Phylogeny; Bruns *et al.*, 1991; Bridge & Hawksworth, 1998; Moncalvo (in Xu (Ed.), *Evolutionary Genetics of Fungi*, 1, 2005), also opening new possibilities for their use. Various different molecular techniques are available, and the one(s) most appropriate for a particular task must be selected. Most are DNA based, and the DNA for study first has to be extracted; of the methods available those of Raeder & Broda (*Lett. App. Microbiol.* 1: 17, 1985) and Zolan & Pukkila (*Molec. Cell. Biol.* 6: 195, 1986) are now well-tested. The DNA can then be studied by a variety of methods:

DNA-DNA hybridisation involves the separation of the DNA from two fungi to be compared into separate strands and then noting the extent to which they can reassociate; the extent of successful pairing is expressed as % DNA relatedness; formerly used extensively in yeasts and mould-fungi (see Kurtzman, 1985) but now used predominantly in bacterial systematics studies.

DNA probes, labelled fragments of DNA that are used to identify particular regions of DNA in other organisms, including fungi. Typically, a DNA probe will be used to generate RFLPs (see below) from DNA digestions. DNA probes may be constructed for regions specific to individual species and can provide valuable identification tools (e.g. Dobrowolski &

O'Brien, *FEMS Microbiol. Letts* 113: 43, 1993), currently being harnessed to PCR (q.v.) technology for high throughput studies (e.g. Martin *et al.* *J. Clin. Microbiol.* 38: 3735, 2000).

mol % G + C (guanine + cytosine, GC) contents in the DNA are determined by thermal denaturation profiles and expressed as a percentage; widely used in the 1970s (see Kurtzman, 1985) but now largely replaced by more sensitive methods, and now only of historical interest; see base ratio.

RFLP (restriction fragment length polymorphisms), used on both nuclear and mitochondrial DNA involves the use of restriction enzymes (e.g. *HaeIII*, *MspI*) which cut the molecules into fragments at particular sites; the size of the fragments will vary, and these are then separated by electrophoresis (q.v.); electrophoresis of digested total cellular DNA produces a 'smear' of fragments of different sizes and polymorphisms associated with individual genes or gene clusters require hybridization to a labelled DNA probe (q.v.; e.g. Correll *et al.*, *Phytopath.* 83: 1199, 1993). In some instances, such as PCR products or purified mitochondrial DNA, RFLPs can be detected without probes (e.g. Varga *et al.*, *Can. J. Microbiol.* 40: 612, 1994). Fungal mitochondrial DNA is very rich in A+T which means that if (good quality) total fungal DNA from a given organism is digested using a G+C cutting enzyme such as *Hae III* [cuts at –GG'CC–], any bands of >1-2Kb may be presumed mitochondrial in origin [the chromosomal DNA will have been digested to form a background smear]; see Freeman *et al.* (*Exper. Mycol.* 17: 309, 1993) for rationale.

PCR (polymerase chain reaction), a series of heating and cooling steps that allow for amplification of DNA. DNA is melted and primers attached to the separated single strands; new complementary strands are formed from the primers by the addition of dNTPs in the presence of a thermostable DNA polymerase. Further heating melts this new dimer and the process is repeated through a number of cycles. This method has revolutionised the study of the biology of fungi and other organisms since its inception in the late 1980s. Numerous variations/modifications now exist on/from the basic PCR methodology, allowing investigation of specific genes or loci in a 'targeted' approach (i.e. where the sequence of the gene of interest or its flanking region is known), or alternatively a 'non-targeted' approach that allows population/taxon discrimination on the basis of complex banding patterns. Some of the most significant variations are listed below [see also: DNA fingerprinting; DNA sequencing]. Amplification products may be visualised by use of a suitable stain (normally ethidium bromide – although less toxic alternatives are now available – in the presence of UV light; see Electrophoresis).

reverse transcriptase (RT) PCR. Sometimes confused with real time PCR (see below), this method is used to investigate specific mRNAs by 'converting' the RNA (which is notoriously difficult to handle) 'back' into DNA (called 'cDNA'), using the enzyme reverse transcriptase. It has also been used as an aid to the study of gene expression; e.g. see Reddy & D'Souza (*in* Bridge *et al.* (Eds) *Applications of PCR in Mycology*, 1998: 207; gene expression in lignocellulose degradation in white rot fungi).

real time PCR is a powerful technique that is used

in quantification of DNA, gene expression studies, screening environmental samples, for diagnosis of certain disease genes and, increasingly, in food safety & biosecurity analyses. The technique uses double stranded DNA dyes or, for more accurate results, fluorescent reporter probes. See Nolan *et al.* (*Nat. Protoc.* 1: 1559, 2006; use in mRNA quantification), Nailis *et al.* (*BMC Mol. Biol.* 7: 25, 2006; use in *Candida albicans* gene expression studies), Kasai *et al.* (*J. Clin. Microbiol.* 44: 143, 2006; detection of *Candida*).

DNA microarrays are a valuable tool for identifying gene expression and for diagnosing particular diseases such as cancers (see Sambrook & Russell, *Molecular Cloning: A Laboratory Manual*, edn 3, 3: A10, 2001) and even medically important fungi (e.g. Leinberger *et al.*, *J. Clin. Microbiol.* 43: 4943, 2005). In the construction of a DNA microarray, relevant DNA fragments (e.g. PCR products) are fixed precisely, by robotic 'printing', to a glass slide (although other supports may be used). Alternatively, arrays of single-stranded oligonucleotides that correspond to known gene sequences may be constructed *in situ*. Either way, the microarrays operate as a form of DNA probe to cDNA targets derived from RNA samples which are mixed with the probe to determine the degree of hybridization. Detection is usually by high resolution laser scanning of fluorophore-labelled probes (see Sambrook & Russell, 2001). This can be viewed semi-quantitatively (see Kazan *et al.*, *Mol. Plant Pathol.* 2: 177, 2001). [see also *Genomics*].

Lit.: Bennett & Lasure (Eds) (*Gene manipulations in fungi*, 1985), Bennett & Lasure (Eds) (*More gene manipulations in fungi*, 1991), Brambl & Marzluf (Eds) (*The Mycota vol. III: Biochemistry and Molecular Biology* 1996), Bridge & Hawksworth (*Lichenologist* 30: 307, 1998; use in lichen systematics), Bridge *et al.* (Eds) (*Applications of PCR in Mycology*, 1998), Bridge *et al.* (Eds) (*Molecular Variability of Fungal Pathogens*, 1998), Bruns *et al.* (*Ann. Rev. Ecol. Syst.* 22: 525, 1991), Burnett (*Fungal Populations and Species*, 2003), Clutterbuck (*in* Gow & Gadd, *The growing fungus*: 255, 1995), Edel (*in* Frisvad *et al.* (Eds), *Chemical Fungal Taxonomy*: 51, 1998), Guthrie & Fink (Eds) (*Guide to yeast genetics and molecular biology*, [*Methods Enzym. Biol.* 194], 1991), Hawksworth (Ed.) (*Identification and characterization of pest organisms*, 1994), Hibbett (*Trans. mycol. Soc. Japan* 33: 533, 1992; use in systematics), Kinghorn & Turner (Eds) (*Applied molecular genetics of filamentous fungi*, 1992), Kück (Ed.) (*The Mycota vol. II: Genetics and Biotechnology* 1995), Moore (*Ant. van Leeuw.* 72: 209, 1997; use in systematics), Oliver (*in* Fox, *Principles of diagnostic techniques in plant pathology*: 153, 1993), Paterson & Bridge (*Biochemical techniques for fungi* [*IMI Techn. Handbk* 1], 1994), Reynolds & Taylor (Eds) (*The fungal holomorph*, 1993; examples use in systematics), Schots *et al.* (Eds) (*Modern assays for plant pathogenic fungi*, 1994), Rolfs *et al.* (Eds) (*Methods in DNA amplification*, 1994), Talbot (Ed.) (*Molecular and Cellular Biology: A practical approach*, 2001), Towner & Cockayne (*Molecular methods for microbial identification and typing*, 1993), Xu (Ed.), (*Evolutionary Genetics of Fungi*, 1, 2005).

Molgospaera Dumort. (1822) nom. dub., Pezizomycotina. Used for diverse perithecioid fungi.

- Molgosporidium** Thor (1930) nom. dub., ? Fungi.
- Molinea** Doub. & D. Pons (1975), Fossil Fungi, Assterinaceae. 1 (Cretaceous), Colombia.
- Moelleriella** G. Winter (1886), Elsinoaceae. 13 (on glandular hairs), widespread (tropical).
- Mölleropsis** (orthographic variant), see *Moelleropsis*.
- Molliardiomyces** Paden (1984), anamorphic *Sarcoscypha*, *Phillipsia*, Hso.0eH.10. 9, widespread. See Paden (*CJB* 62: 211, 1984), Paden (*Mycotaxon* 25: 165, 1986), Harrington (*Mycotaxon* 38: 417, 1990; N America), Hansen *et al.* (*Mycol.* 91: 299, 1999; phylogeny).
- Mollicamarops** Lar.N. Vassiljeva (2007), Boliniaceae. 1, E. Russia. Questionably distinct from *Camarops*. See Vasiljeva (*Mycotaxon* 99: 159, 2007).
- Mollicarpus** Ginns (1984), Polyporaceae. 1, S.E. Asia. See Ryvarden (*Gen. Polyp.*: 186, 1991).
- mollicute**, see mycoplasma.
- Mollisia** (Fr.) P. Karst. (1871) nom. cons., Helotiales. Anamorphs *Anguillospora*, *Casaresia*, *Phialophora*-like, *Sirocyphellina*. c. 121, widespread. Almost certainly polyphyletic. Molecular data separate this genus and its relatives from the *Dermateaceae*; it may possibly be best accommodated within the *Loramyce-taceae*. See Dennis (*Kew Bull.* 1950: 171, 1950), Thind & Sharma (*Biblthca Mycol.* 91: 221, 1983; India), Webster *et al.* (*Nova Hedwigia* 57: 483, 1993; aquatic anam.), Gminder (*Z. Mykol.* 62: 181, 1996), Gams (*Stud. Mycol.* 45: 187, 2000; anamorph), Nauta & Spooner (*Mycologist* 14: 65, 2000; UK), Harrington & McNew (*Mycotaxon* 87: 141, 2003; phylogeny), Pärtel & Raitviir (*Mycol. Progr.* 4: 149, 2005; ultrastr.), Gminder (*Czech Mycol.* 58: 125, 2006), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Mollisiaster** Kirschst. (1939) = *Microscypha* fide Arendholz (*in litt.*).
- Mollisiella** (W. Phillips) Massee (1895) = *Unguiculariopsis* fide Zhuang (*Mycotaxon* 32: 1, 1988), Huhtinen (*Karstenia* 29: 45, 1989).
- Mollisiella** Boud. (1885) = *Mollisia* fide Korf & Zhuang (*SA* 6: 139, 1987).
- Mollisina** Höhn. ex Weese (1926), Hyaloscyphaceae. 11, Europe; Asia. See Arendholz (*Blattbewohnenden Ascomyceten aus der Ordnung der Helotiales*, 1979), Arendholz & Sharma (*Mycotaxon* 20: 633, 1984), Hosoya & Otani (*Mycoscience* 38: 187, 1997; Japan), Raitviir (*Scripta Mycologica Tartu* 20, 2004).
- Mollisinopsis** Arendh. & R. Sharma (1984), Helotiaceae. 3, India. See Arambarri & Sharma (*Mycotaxon* 20: 660, 1984).
- Mollisiopsis** Rehm (1908), Helotiales. 7, Europe. See Dennis (*Persoonia* 2: 171, 1962), Graddon (*TBMS* 58: 153, 1972), Svrček (*Česká Mykol.* 41: 88, 1987), Nauta & Spooner (*Mycologist* 14: 65, 2000).
- Molybdoplaca** Nieuwl. (1916) = *Steinera*.
- Monacrosporiella** Subram. (1978) = *Arthrobotrys* fide Scholler *et al.* (*Sydowia* 51: 89, 1999).
- Monacrosporium** Oudem. (1885), anamorphic *Orbilia*, Hsy. = eP.10. c. 68 (on nematodes), widespread. See Subramanian (*J. Indian bot. Soc.* 42: 292, 1963; key), Cooke (*TBMS* 50: 517, 1967; key 7 nematode-trapping spp.), Cooke (*TBMS* 53: 475, 1969), Liu & Zhang (*MR* 98: 862, 1994; checklist of spp.), Rubner (*Stud. Mycol.* 39, 1996), Hagedorn & Scholler (*Sydowia* 51: 27, 1999; phylogeny), Scholler *et al.* (*Sydowia* 51: 89, 1999; synonym of *Arthrobotrys*), Li *et al.* (*MR* 107: 888, 2003), Meyer *et al.* (*Mycol.* 97: 405, 2005; phylogeny, morphology), Kim *et al.* (*Pl. Path. J.* 22: 174, 2006; Korea), Li *et al.* (*Mycol.* 97: 1034, 2005; phylogeny).
- Monadelphus**, see *Monodelphus*.
- monads** (*Monadineae*), a diverse group of amoebophilic *Protozoa* some of which were compiled by Saccardo (*Syll. Fung.* 7: 453, 1888) based on the monograph by Zopf [Die Pilzthiere oder Schleimpilze. *Encykl. Naturwiss.* 3(2): 1, 1884]. Also referred to as *Proteomyxa* (Lankester, *Encycl. Brit.*, 9 ed., 1885) or *Hydromyxa* Klein. Those studied belong in different groups of *Protozoa* but many do not appear to have been investigated recently.
- Monandromyces** R.K. Benj. (1999), Laboulbeniaceae. 11, widespread (esp. tropical). See Benjamin (*Aliso* 18: 71, 1999).
- monandrous** (of oospores), formed when only one functioning antheridium is present. Cf. polyandrous.
- Monascaceae** J. Schröt. (1894), Eurotiomycetidae (inc. sed.). 3 gen. (+ 5 syn.), 16 spp.
Lit.: Bridge & Hawksworth (*Lett. Appl. Microbiol.* 1: 25, 1985), Hocking (*Handbook of Applied Mycology* Vol. 3. Foods and Feeds: 69, 1991), Landvik & Eriksson (*SA* 12: 34, 1993; posn.), Cannon *et al.* (*MR* 99: 659, 1995), Pitt & Hocking (*Fungi and Food Spoilage* Edn 2: 593 pp., 1997), Udagawa & Baba (*Cryptog. Mycol.* 19: 269, 1998), Chaisrisook (*MR* 106: 298, 2002), Park & Jong (*Mycoscience* 44: 25, 2003).
- Monascella** Guarro & Arx (1986), ? Pyronemataceae. 1, Spain. See Guarro & Arx (*Mycol.* 78: 869, 1986), Stchigel *et al.* (*MR* 105: 377, 2001; phylogeny).
- Monascostroma** Höhn. (1918) = *Hendersonia* Berk. fide Holm & Holm in Laursen *et al.* (Eds) (*Arctic and Alpine Mycology* 2: 109, 1987), Menendez (*Darwiniana* 31: 351, 1992; Argentina).
- Monascus** Tiegh. (1884), Monascaceae. Anamorph *Basipetospora*. 14, widespread. *M. ruber* turns silage light red; *M. purpureus* produces ang-kak and other Asian foods and drinks. See Hawksworth & Pitt (*Aust. J. Bot.* 31: 51, 1983; key), Bridge & Hawksworth (*Lett. Appl. Microbiol.* 1: 25, 1985; biochem. tests), Wong & Chien (*Mycol.* 78: 713, 1986; ultrastr.), Nishikawa *et al.* (*J. gen. appl. Microbiol.* Tokyo 34: 467, 1988; proteinase), Nishikawa *et al.* (*J. Basic Microbiol.* 29: 369, 1989; fatty acids), Nishikawa *et al.* (*J. Basic Microbiol.* 33: 331, 1993; isozymes), Cannon *et al.* (*MR* 99: 659, 1995; key), Lakrod *et al.* (*MR* 104: 403, 2000; genetic variation), Chaisrisook (*MR* 106: 298, 2002; VCGs), Park & Jong (*Mycoscience* 44: 25, 2003; phylogeny), Park *et al.* (*Bot. Bull. Acad. sin. Taipei* 45: 325, 2004; phylogeny), Stchigel *et al.* (*Stud. Mycol.* 50: 299, 2004; key).
- monaxial**, having one individual stem or axis.
- Monera**. Kingdom embracing *Bacteria* and *Cyanobacteria* in the five-Kingdom system of Whittaker (1969); see Kingdoms of fungi for current treatment.
- Monerolechia** Trevis. (1857), Physciaceae (L). 1, widespread. See Hafellner (*Beih. Nova Hedwigia* 62, 1979), Marbach (*Biblthca Lichenol.* 74, 2000), Kalb (*Biblthca Lichenol.* 88: 301, 2004).
- Monilia** Bonord. (1851) nom. cons., anamorphic *Monilia*, Hso.0eH.3. c. 24, widespread. Formerly widely used by medical mycologists for *Candida*; see candidiasis. See Donk (*Taxon* 12: 266, 1963; nomencl.), Turian & Bianchi (*Arch. Mikrobiol.* 77: 262, 1971; conidiation), Anon. (*Taxon* 23: 419, 1974; nomencl.), Funk (*CJB* 65: 23, 1987; pleoanamorphism

- M. versiformis*), Holst-Jensen *et al.* (*Am. J. Bot.* **84**: 686, 1997; phylogeny), Leeuwen *et al.* (*MR* **106**: 444, 2002), Côté *et al.* (*Pl. Dis.* **88**: 1219, 2004; PCR diagnostics), Harada *et al.* (*J. Gen. Pl. Path.* **70**: 297, 2004; Japan), Harada *et al.* (*Mycoscience* **46**: 376, 2005; Japan), Takahashi *et al.* (*Mycoscience* **46**: 106, 2005; Japan).
- Monilia** Hill ex F.H. Wigg. (1780) nom. rej. prop. = *Monilia* Bonord. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Monilia** Link (1809) nom. rej. = *Monilia* Bonord. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Moniliaceae** Dumort. (1822) = Sclerotiniaceae.
- moniliaceous** (of mycelium, spores, etc.), hyaline or brightly coloured; mucedinaceous.
- Moniliales** = blastomycetes + hyphomycetes.
- moniliasis**, see candidiasis.
- Moniliella** Stolk & Dakin (1966), anamorphic *Tremelomyces*, Hso.0eP.3+38. 5, north temperate. See de Hoog (*Stud. Mycol.* **19**, 1979; key), Hoog & Smith in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 785, 1998).
- moniliform (monilioid)**, having swellings at regular intervals like a string of beads.
- Moniliger** Letell. [not traced] nom. dub. ? = *Penicillium* Link fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Moniliites** Babajan & Tasl. (1973), Fossil Fungi. 1 (Tertiary), former USSR.
- Monilinia** Honey (1928), Sclerotiniaceae. Anamorph *Monilia*. 28, widespread. See Byrde & Willets (*Brown Rot Fungi of Fruit*, 1977), Harada (*Bull. Fac. Agr. Hirosaki Univ.* **27**: 30, 1977; Japan), Willetts *et al.* (*J. gen. Microbiol.* **103**: 77, 1977; chemotaxonomy), Batra (*Mycotaxon* **8**: 476, 1979; N. Am.), von Arx (*Sydowia* **34**: 13, 1981; anamorphs), Buchwald (*Friesia* **11**: 287, 1987; key 12 spp.), Batra (*World species of Monilinia*, 1991), Holst-Jensen *et al.* (*Am. J. Bot.* **84**: 686, 1997; phylogeny, polyphyly, coevolution), Fulton *et al.* (*Eur. J. Pl. Path.* **105**: 495, 1999; mol. variation), van Leeuwen & van Kesteren (*CJB* **76**: 2042, 1999; morphometrics), Förster & Adaskaveg (*Phytopathology* **90**: 171, 2000; PCR detection), Ioos & Frey (*Eur. J. Pl. Path.* **106**: 373, 2000; infraspecific variation), Gernandt *et al.* (*Mycol.* **93**: 915, 2001; phylogeny), Lane (*Bulletin OEPP EPPO Bulletin* **32**: 489, 2002; synoptic key), Leeuwen *et al.* (*MR* **106**: 444, 2002), Baayen *et al.* (*Bulletin OEPP EPPO Bulletin* **33**: 281, 2003; diagnostic protocol), Côté *et al.* (*Pl. Dis.* **88**: 1219, 2004; PCR diagnostics), Harada *et al.* (*Mycoscience* **46**: 376, 2005; Japan), Takahashi *et al.* (*Mycoscience* **46**: 106, 2005; Japan), Wang *et al.* (*Mycol.* **98**: 1065, 2006; phylogeny).
- Moniliophthora** H.C. Evans, Stalpers, Samson & Benny (1978), Marasmiaceae. c. 10, tropical. *M. perniciosa* (syn *Crinipellis perniciosa*, witches' broom of cacao); *M. roreri* (frosty pod rot of cacao). See Evans (*Phytopath. Pap.* **24**: 1, 1981), Evans *et al.* (*Mycologist* **16**: 148, 2002), Evans *et al.* (*Pl. Path.* **52**: 476, 2003; phylogeny *C. roreri*), Aime & Phillips-Mora (*Mycol.* **97**: 1012, 2005).
- Moniliopsis** Ruhland (1908) = *Rhizoctonia* fide Roberts (*Rhizoctonia-Forming Fungi*: 239 pp., 1999).
- Monilites** Pampal. (1902), Fossil Fungi. 1 (Miocene), Italy.
- Monilochaetes** Halst. ex Harter (1916), anamorphic *Pezizomycotina*, Hsy.0eP.1. 1, widespread (tropical; esp. USA). *M. infuscans* on *Ipomoea batatas* (sweet potato scurf). See Rong & Gams (*Mycotaxon* **76**: 451, 2000).
- Monka** Adans. (1763) = *Verpa* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- mono-** (prefix), one.
- Monoblastia** Riddle (1923), Monoblastiaceae (L). 10, widespread (tropical). See Harris (*Some Florida lichens*, 1990), Aptroot (*Bryologist* **94**: 404, 1991), Eriksson (*SA* **11**: 178, 1993), Sérusiaux & Aptroot (*Nova Hedwigia* **67**: 259, 1998; Papua New Guinea), Aptroot *et al.* (*Biblthca Lichenol.* **97**, 2008; Costa Rica).
- Monoblastiaceae** Walt. Watson (1929), Pyrenulales (L). 6 gen. (+ 8 syn.), 133 spp.
Lit.: Harris (*Some Florida lichens*, 1990), Aptroot (*Bryologist* **94**: 404, 1991), Eriksson & Hawksworth (*SA* **11**: 178, 1993), Sérusiaux & Aptroot (*Nova Hedwigia* **67**: 259, 1998), Aptroot (*Lichenologist* **31**: 641, 1999), Etayo & Lücking (*Lichenologist* **31**: 145, 1999), Hyde & Wong (*MR* **103**: 347, 1999).
- monoblastic** (of a conidiogenous cell), producing a blastic conidium at one locus.
- Monoblastiopsis** R.C. Harris & C.A. Morse (2008), Pleosporales. 2, USA. See Harris & Morse (*Opuscula Philolichenum* **5**: 89, 2008).
- Monoblepharella** Sparrow (1940), Gonapodyaceae. 5, C. & N. America. See Sparrow (*Aquatic Phycomycetes* Edn 2: 721, 1960; key), Steciow & Arambarri (*Nova Hedwigia* **70**: 107, 2000; *Monoblepharella mexicana*), James *et al.* (*Mycol.* **98**: 860, 2006; phylogeny).
- Monoblepharidaceae** A. Fisch. (1892), Monoblepharidales. 1 gen. (+ 2 syn.), 12 spp.
Lit.: Perrott (*TBMS* **38**: 247, 1955), Noyes Mollicone & Longcore (*Mycol.* **86**: 615, 1994).
- Monoblepharidales** Sparrow (1942). Monoblepharidomycetes. 4 fam., 5 gen., 26 spp. Thallus hyphal with oogamous reproduction (the only chytrids with non-motile female gametes and smaller, motile, male gametes), or thallus simple and no sexual stage known; zoospores possessing a non-flagellated centriole parallel to the kinetosome, a striated disk extending part way around the kinetosome, microtubules arising from the striated disk and extending into the cytoplasm, rumposome backed by microbody, and numerous lipid globules; aquatic saprobes. Fams:
- (1) **Gonapodyaceae**
 - (2) **Harpochytriaceae**
 - (3) **Monoblepharidaceae**
 - (4) **Oedogoniomycetaceae**
- Lit.: Sparrow (1960: 713, in Ainsworth *et al.* (Eds), *The Fungi* **4B**: 85, 1973), Gauriloff *et al.* (*CJB* **58**: 2098, 1980; ultrastr.), Barr (1990), Mollicone & Longcore (*Mycol.* **86**: 615, 1994, **91**: 727, 1999; zoospore ultrastr.), James *et al.* (*Mycol.* **98**: 860, 2006; molecular phylogeny), Hibbett *et al.* (*MR* **111**: 109, 2007), and see under Families.
- Monoblepharidomycetes** J.H. Schaffn. (1909), Chytridiomycota. 1 ord., 4 fam., 5 gen., 26 spp. Ord.: **Monoblepharidales**
Lit.: James *et al.* (*Mycol.* **98**: 860, 2006; molecular phylogeny), and see under Order.
- Monoblephariopsis** Laib. (1927) = *Monoblepharis* fide Sparrow (*Aquatic Phycomycetes* Edn 2: 1187 pp., 1960).

- Monoblepharis** Cornu (1871), Monoblepharidaceae. 12, Europe; N. America. See Perrott (*TBMS* 38: 247, 1955), Sparrow (*Aquatic Phycomycetes* Edn 2: 727, 1960; key), James *et al.* (*Mycol.* 98: 860, 2006; phylogeny).
- monocarpic** (of *Exobasidium* infections), circumscribed and annual (Nannfeldt, 1981: 10), cf. polycarpic, surculiculous.
- monocentric** (of a chytrid thallus), having one centre of growth and development; see polycentric and cf. reproductocentric.
- monocephalic** (adj. **monocephalous**), 1-headed.
- Monocephalis** Bainier (1882) = Syncephalis fide Benjamin (*Aliso* 4: 321, 1959).
- Monoceras** Guba (1961) [non *Monoceras* Gothan 1909, fossil *Phanerogamae*] = Seimatosporium fide Sutton (*Mycol. Pap.* 97, 1964).
- Monochaetia** (Sacc.) Allesch. (1902), anamorphic *Amphisphaeriaceae*, Cac.≡ eP.19. 28, widespread. See Anon. (*Monograph of Monochaetia and Pestalotia*, 1961), Sutton (*The Coelomycetes*, 1980), Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993), Nag Raj & Mel'nik (*Mycotaxon* 50: 435, 1994; redispositions), Jeewon *et al.* (*Mol. Phylogen. Evol.* 25: 378, 2002; phylogeny), Jeewon *et al.* (*MR* 107: 1392, 2003; phylogeny).
- Monochaetiella** E. Castell. (1943), anamorphic *Pezizomycotina*, Cac.0eH.15. 1, widespread.
- Monochaetiellopsis** B. Sutton & DiCosmo (1977), anamorphic *Hypnotheca*, Cac.1eH.?. 2, widespread. See Punithalingam (*Nova Hedwigia* 54: 255, 1992; nuclei in conidial appendages).
- Monochaetina** Subram. (1961) = Bleptosporium fide Sutton (*Mycol. Pap.* 88, 1963).
- Monochaetinula** Muthumary, Abbas & B. Sutton (1986), anamorphic *Amphisphaeriaceae*, Cpd.≡ eP.19. 6, widespread (tropical). See Bianchinotti (*Mycotaxon* 39: 455, 1990; Argentina), Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993).
- Monochaetiopsis** L. Cai, R. Jeewon & K.D. Hyde (2003), anamorphic *Dyrithiopsis*, Cac.???. 1, China. See Jeewon *et al.* (*Mycol.* 95: 913, 2003).
- Monochaetites** Babajan & Tasl. (1973), Fossil Fungi. 1 (Tertiary), former USSR.
- Monochaetopsis** Pat. (1931), anamorphic *Pezizomycotina*. 1, N. Africa.
- Monochytrium** Griggs (1910) ? = Olpidium fide Fitzpatrick (*The lower fungi. Phycomycetes*, 1930).
- Monocillium** S.B. Saksena (1955), anamorphic *Niesslia*, *Hyaloseta*, Hso.0eH/1eP.15. c. 15, widespread. See Gams (*Cephalosporium-artige Schimmelpilze*, 1971; key 12 spp.), Gams & Turhan (*Mycotaxon* 59: 343, 1996), Girlanda & Luppi-Mosca (*Mycotaxon* 67: 265, 1998), Ramaley (*Mycotaxon* 79: 267, 2001).
- monoclinous**, having the antheridium on the oogonial stalk. Cf. androgynous.
- Monoconidia** Roze (1897) ? = Acremonium fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Monodelphus** Earle (1909) = Omphalotus fide Singer (*Agaric. mod. Tax.*, 1951).
- Monodia** Breton & Faurel (1970), anamorphic *Pezizomycotina*, Cpd.≡ eH.1. 1 (coprophilous), Chad. See Breton & Faurel (*Revue mycol.* Toulouse 35: 23, 1970), Nag Raj & DiCosmo (*Univ. Waterloo Biol. Ser.* 20, 1982).
- Monodictyites** Barlinge & Paradkar (1982), Fossil Fungi, anamorphic *Pezizomycotina*. 1 (Cretaceous), India.
- Monodictys** S. Hughes (1958), anamorphic *Dothideomycetes*, Hsp.#eP.1. 27, widespread. Certainly polyphyletic. See Rao & de Hoog (*Stud. Mycol.* 28: 25, 1986; key), Wedin (*Lichenologist* 25: 203, 1993; ultrastr.), Rodríguez *et al.* (*Nova Hedwigia* 72: 201, 2001; Cuba), Zhao & Zhang (*Mycosystema* 23: 324, 2004; China), Kukwa & Diederich (*Lichenologist* 37: 217, 2005; lichenicolous spp.), Day *et al.* (*Mycotaxon* 98: 261, 2006).
- Monodidymaria** U. Braun (1994), anamorphic *Pezizomycotina*, Hso.≡ eH.1. 5, Canada; India. See Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 2, 1998).
- Monodisma** Alcorn (1975), anamorphic *Pezizomycotina*, Hso.≡ eH.10. 1, widespread. See Alcorn (*TBMS* 65: 139, 1975).
- monoecism** (adj. **monoecious**), having the male and female sex organs on one thallus; cf. dioecism, heterothallism, homothallism.
- monogeocentric**, see reproductocentric.
- Monogrammia** F. Stevens (1917) = Titaea fide Damon (*J. Wash. Acad. Sci.* 42: 365, 1952).
- Monographella** Petr. (1924), Xylariales. Anamorph *Microdochium*. 6 (pathogenic on cereals), widespread. See Müller (*Revue Mycol.* Paris 41: 129, 1977; *M. nivalis*), Subramanian & Bhat (*Revue Mycol.* Paris 42: 293, 1978; ontogeny), Parkinson *et al.* (*TBMS* 76: 59, 1981; *M. albescentis*, rice leaf scald), Samuels & Hallett (*TBMS* 8: 473, 1983), Müller & Samuels (*Nova Hedwigia* 40: 113, 1984), Mahuku *et al.* (*MR* 102: 559, 1998; mol. diversity), Wang & Hyde (*Fungal Diversity* 3: 159, 1999), Winka & Eriksson (*Mycoscience* 41: 97, 2000), Jeewon *et al.* (*MR* 107: 1392, 2003; phylogeny).
- Monographos** Fuckel (1875) = Scirrhia fide Holm & Holm (*Bot. Notiser* 131: 97, 1978), Eriksson & Hawksworth (*SA* 11: 178, 1993).
- Monographus** Clem. & Shear (1931) ≡ Monographos.
- Monoicomycetes** Thaxt. (1900), Laboulbeniaceae. 48, widespread. See Tavares (*Mycol. Mem.* 9: 627 pp., 1985), Santamaría (*Mycotaxon* 50: 89, 1994), Santamaría (*MR* 100: 1179, 1996), De Kesel (*Sterbeekia* 25: 62, 2005; Belgium).
- monokaryon**, see haplont.
- monokaryotic**, having genetically identical haploid nuclei; cf. dikaryon.
- Monoloculia** Hara (1927) = Yoshinagaia fide Sivanesan & Hsieh (*MR* 99: 1295, 1995).
- Monolpidiaceae** A. Fisch. (1892) = Olpidiaceae.
- monomitic**, see hyphal analysis.
- monomorphic**, having one structure or form; not pleomorphic.
- monomycelial** (of an isolate), from one spore or hyphal tip.
- Monomyces** Battarra ex Earle (1909) = Tricholoma fide Singer (*Agaric. mod. Tax.*, 1951).
- Mononema** Balbiani (1889), ? Kickxellomycotina. 3, Africa; Europe. See Manier *et al.* (*Biol. Gabon.* 8: 323, 1972), Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*: 343 pp., 1986; posn).
- mononematous** (of conidiophores), solitary or in tufts or loose fascicles; cf. synnematus.
- monophagy** (adj. **monophagous**) (of *Chytridiales*), the condition of having the thallus in one host cell; the opposite of polyphagy, in which the thallus branches

- invade more than one host cell.
- monophialidic** (of a conidiogenous cell), having one locus through which conidia are produced. Cf. polyphialidic.
- monophyllous** (of foliose lichens), having a single leaf-like thallus.
- monoplanetism** (of zoospores in oomycetes), the condition of having one motile phase, with no resting period.
- Monoplochia** Westend. (1859) = *Coniothyrium* fide Saccardo & Trotter (*Syll. fung.* 22, 1913).
- monopodial**, a type of branching in which a persistent main axis gives off branches, one at a time and frequently in alternate or spiral series.
- Monopodium** Delacr. (1890) = *Acremoniella* fide Mason (*Mycol. Pap.* 3: 29, 1933).
- Monoporidicellaesporites** Frunzescu & Bacaran (1990), Fossil Fungi. 1. See Frunzescu & Bacaran (*Revue roum. Géol., Géophys. Géogr. Géol.* 34: table 1 + pl. 1, fig. 16, 1990).
- Monoporimonocellaesporites** Frunzescu & Bacaran (1990), Fossil Fungi. 1. See Frunzescu & Bacaran (*Revue roum. Géol., Géophys. Géogr. Géol.* 34: table 1 + pl. 1, fig. 7, 1990).
- Monoporimonodicellaesporites** Frunzescu & Bacaran (1990), Fossil Fungi. 1. See Frunzescu & Bacaran (*Revue roum. Géol., Géophys. Géogr. Géol.* 34: table 1 + pl. 1, figs 9, 10, 1990).
- Monoporimulticellaesporites** Frunzescu & Bacaran (1990), Fossil Fungi. 1. See Frunzescu & Bacaran (*Revue roum. Géol., Géophys. Géogr. Géol.* 34: table 1 + pl. 1, figs 23, 25, 1990).
- Monoporisorites** Hammen (1954), Fossil Fungi. 15 (Cretaceous, Tertiary), widespread.
- Monoporitetracellaesporites** Frunzescu & Bacaran (1990), Fossil Fungi. 1. See Frunzescu & Bacaran (*Revue roum. Géol., Géophys. Géogr. Géol.* 34: table 1 + pl. 1, figs 14, 15, 17, 1990).
- Monoporitricellaesporites** Frunzescu & Bacaran (1990), Fossil Fungi. 1. See Frunzescu & Bacaran (*Revue roum. Géol., Géophys. Géogr. Géol.* 34: table 1, 1990).
- Monopus** Theiss. & Syd. (1915) = *Rosenscheldiella* fide Hansford (*Mycol. Pap.* 15, 1946).
- Monopycnis** Naumov (1916) = *Cytospora* fide Petrak (*Annls mycol.* 23: 1, 1925).
- monoreproductocentric**, see reproductocentric.
- Monorhiza** Theiss. & Syd. (1915) = *Rhagadolobium* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Monorhizina** Theiss. & Syd. (1915), Microthyriaceae. 1, Sri Lanka.
- Monospermella** Speg. (1924) = *Psorotheciopsis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- monospermous**, 1-spored.
- Monospora** Metschn. (1884) [non *Monospora* Hochst. 1841, *Algae*] = *Metschnikowia*.
- Monosporascus** Pollack & Uecker (1974), Xylariales. 3 (thermophilic), widespread. See Hawksworth & Ciccarone (*Mycopathologia* 66: 147, 1978), Martyn *et al.* (*Phytopathology* 82: 1115, 1992; ascospores, germination), Uematsu *et al.* (*Ann. phytopath. Soc. Japan* 58: 354, 1992; Japan), Martyn *et al.* (*Phytopathology* 83: 1347, 1993), Lovic *et al.* (*Phytopathology* 85: 655, 1995; phylogeny), Waugh *et al.* (*MR* 105: 745, 2001; SEM), Collado *et al.* (*MR* 106: 118, 2002; Spain), Sales *et al.* (*Fitopatol. Brasil* 28: 567, 2003; Brazil).
- monospore**, used by Corner (*New Phytol.* 46: 195, 1947) for the one spore maturing on a 2-spored basidium normally bearing 2 dispores (q.v.).
- Monosporella** Keilin (1920) = *Metschnikowia*.
- Monosporella** S. Hughes (1953) = *Monotosporella*.
- monosporic** (adj. **monosporous**), 1-spored.
- Monosporidium** Barclay (1888), Phakopsoraceae. 4 (on *Euphorbiaceae*, *Lauraceae*, *Rubiaceae*), India; China; Japan. Telial aeciospores produce basidia on germination. See Thirumalachar & Kern (*Bull. Torrey bot. Club* 82: 102, 1955), Buriticá (*Rev. Acad. Colomb. Cienc.* 18 no. 69: 131, 1991), Ono (*Mycoscience* 43: 421, 2002; nuclear cycle).
- Monosporiella** Speg. (1918), anamorphic *Pezizomycotina*, Hso.0eH.?. 1, Argentina. See Deighton & Pirozynski (*Mycol. Pap.* 128, 1972).
- Monosporium** Bonord. (1851) nom. illegit., anamorphic *Pezizomycotina*. See Hughes (*CJB* 36: 727, 1958).
- Monosporonella** Oberw. & Ryvarden (1991) = *Oliveonia* fide Roberts (*Rhizoctonia-forming fungi*, 1999).
- Monostachys** Arnaud (1954) = *Chloridium* fide Gams & Holubová-Jechová (*Stud. Mycol.* 13, 1976).
- Monostichella** Höhn. (1916), anamorphic *Drepanopeziza*, Cac.0eH.15. 10, widespread. See von Arx (*Bibliotheca Mycol.* 24, 1970).
- monostichous**, in one line or series.
- Monothecium** Lib. [non *Monothecium* Hochst. 1842, *Acanthaceae*] [not traced] nom. nud. et nom. dub. = *Mastigosporium* fide Saccardo (*Syll. fung.* 4: 220, 1886).
- Monotospora** Corda (1837) nom. dub., *Pezizomycotina*. See Carmichael (*CJB* 40: 1137, 1962).
- Monotospora** Sacc. (1880) = *Acrogenospora*.
- Monotosporaceae** Vuill. (1912) = *Hysteriaceae*.
- Monotosporella** S. Hughes (1958), anamorphic *Pezizomycotina*. 1, widespread. See Ellis (*Mycol. Pap.* 72, 1959; synonymy with *Brachysporiella*), Rao & de Hoog (*Stud. Mycol.* 28: 6, 1986), Ranghoo *et al.* (*Mycoscience* 40: 377, 1999), Tsui *et al.* (*Mycol.* 93: 389, 2001).
- Monotoyella** Castell. & Chalm. (1913) nom. dub., anamorphic *Pezizomycotina*. See de Hoog & Hermanides-Nijhof (*Stud. Mycol.* 15: 186, 1977).
- monotretic**, see tretic.
- Monotretomyces** Morgan-Jones, R.C. Sinclair & Eicker (1987) = *Corynesporopsis* fide Sutton (*in litt.*).
- monotrichous** (**monotrichiate**) (of bacteria), having one polar flagellum.
- Monotrichum** Gäum. (1922), anamorphic *Pezizomycotina*, Hso.1eH.?. 1, Celebes; India. See Carmichael *et al.* (*Genera of Hyphomycetes*, 1980; relationships).
- Monotropomyces** Costantin & Dufour (1921) nom. dub., anamorphic *Pezizomycotina*. See de Hoog & Hermanides-Nijhof (*Stud. Mycol.* 15: 185, 1977).
- monotypic**, having only one representative, as a genus having only one species.
- monoverticillate** (of a penicillus), composed of phialides only.
- Montagne** (Jean Pierre François Camille; 1784-1866; France). A medic in Napoleon's army; in retirement, an amateur mycologist living in Paris. Noted for his work on fungi of Chile, Cuba, France and other countries, and on plant diseases, particularly as the author of *Botrytis infestans* (= *Phytophthora infestans*) the causal organism of potato late blight. *Publs. Centu-*

- ries des plantes cellulaires. *Annales des Sciences Naturelles Botanique* (1837-1860) [reprint 1970; see Stafleu, *Taxon* 19: 633, 1970]; Botanique. Plantes cellulaires. In R. de la Sagra [ed.] *Histoire Physique Politique et Naturelle de l'Île de Cuba* (1838-1842); Hongos I & II. In C. Gay [ed.] *Historia Física y Política de Chile. Botánica* (1853-1854); *Sylloge Generum Specierumque Cryptogamarum* (1856). *Biogs, obits etc.* Stafleu & Cowan (*TL-2* 3: 557, 1981).
- Montagnea** Fr. (1836), Agaricaceae. 5, widespread (subtropical dry areas). See Reid & Eicker (*S. Afr. J. Bot.* 57: 161, 1991), Hopple & Vilgalys (*Mol. Phylogen. Evol.* 13: 1, 1999; phylogeny), Stasinska & Prajs (*Polish Botanical Journal* 47: 211, 2002; *Montagnea arenaria* in Poland).
- Montagneaceae** Singer (1976) = Agaricaceae.
- Montagnella** Speg. (1881), Dothideomycetes. 9, widespread.
- Montagnellina** Höhn. (1912) ? = *Guignardia* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Montagnina** Höhn. (1910) = *Gibbera* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Montagnites** Fr. (1838) = *Montagnea*.
- Montagnula** Berl. (1896), Montagnulaceae. Anamorph *Aposphaeria*. 24, widespread. The systematic position is doubtful, and it is almost certainly polyphyletic. See Huhndorf (*Brittonia* 44: 208, 1992), Aptroot (*Nova Hedwigia* 60: 325, 1995; posn in *Phaeosphaeriaceae*), Ramaley & Barr (*Mycotaxon* 54: 75, 1995), Hyde *et al.* (*Nova Hedwigia* 69: 449, 1999; on palms), Barr (*Mycotaxon* 77: 193, 2001; fam. placement), Liew *et al.* (*Mycol.* 94: 803, 2002; phylogeny), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Montagnulaceae** M.E. Barr (2001), Pleosporales. 7 gen. (+ 8 syn.), 100 spp. In need of reappraisal using molecular methods.
Lit.: Barr (*Mycotaxon* 77: 193, 2001), Liew *et al.* (*Mycol.* 94: 803, 2002; phylogeny), Wang *et al.* (*MR* 111: 1268, 2007; phylogeny).
- Montemartinia** Curzi (1927) = *Chaetosphaeria* fide Kohlmeyer & Kohlmeyer (*Marine Mycology*, 1979).
- Montinia** A. Massal. (1855) [non *Montinia* Thunb. 1776, *Saxifragaceae*] = *Pyrenocarpon*.
- Montoyella** Castell. & Chalm. (1907) nom. dub., anamorphic *Pezizomycotina*. See de Hoog & Hermanides-Nijhof (*Stud. Mycol.* 15: 186, 1977).
- Moorella** P. Rag. Rao & D. Rao (1964), anamorphic *Pezizomycotina*, Hso.0-≡ hP.10. 1, India. See Rao & Rao (*Mycopathologia* 22: 51, 1964).
- Morakotiella** Sakay. (2005), Halosphaeriaceae. 1, Italy. See Sakayaroj *et al.* (*Mycol.* 97: 806, 2005).
- Moralesia** Urries (1956), anamorphic *Pezizomycotina*, St.1bH.?. 1, Canary Islands. See Urries (*An. Inst. bot. A.J. Cavanilles* 14: 167, 1956).
- Moravecchia** Benkert, Caillet & Moyne (1987), Pyrenomataceae. 2, Europe. See Caillet & Moyne (*Bull. Soc. Hist. nat. Doubs* 84: 9, 1991), Benkert & Kristiansen (*Z. Mykol.* 65: 33, 1999; Norway).
- Morchella** Dill. ex Pers. (1794), Morchellaceae. Anamorph *Costantinella*. c. 36, widespread (esp. temperate). The morels, important edible fungi. See Patrignani & Pellegrini (*Atti Accad. naz. Lincei R. Sed. solen. Cl. Sci., Fis., Mat. Nat.* 75: 161, 1983; ul-trastr.), Gessner *et al.* (*Mycol.* 79: 683, 1987; genetics), Yoon *et al.* (*Mycol.* 82: 227, 1990; population genetics), Amir *et al.* (*MR* 96: 943, 1992; growth in culture), Rohe (*Biblthca Mycol.* 146, 1992; genetics), Amir *et al.* (*MR* 97: 683, 1993; morphology, physiology), Jung *et al.* (*Mycol.* 85: 677, 1993; ELISA), Bunyard *et al.* (*Exp. Mycol.* 19: 223, 1995; phylogeny), Bunyard *et al.* (*Mycol.* 86: 762, 1994; RFLP analysis), Gessner (*CJB* 73 Suppl. 1: S967, 1995; genetics, systematics), Wipf *et al.* (*Appl. Environm. Microbiol.* 62: 3541, 1996; ITS sequences), Landvik *et al.* (*Nordic J. Bot.* 17: 403, 1997; phylogeny), Guzmán & Tapia (*Mycol.* 90: 705, 1998; Mexico), Parguey-Leduc *et al.* (*Cryptog. Bryol.-Lichénol.* 19: 277, 1998; asci, ascospores), Harrington *et al.* (*Mycol.* 91: 41, 1999; phylogeny), Wipf *et al.* (*Can. J. Microbiol.* 45: 769, 1999; ITS variation), Kellner *et al.* (*Organ. Divers. Evol.* 5: 101, 2005; phylogeny), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny).
- Morchellaceae** Rchb. (1834), Pezizales. 4 gen. (+ 8 syn.), 49 spp.
Lit.: Jacquetant (*Les Morilles*: 144 pp., 1984), Volk & Leonard (*MR* 94: 399, 1990), Amir *et al.* (*MR* 96: 943, 1992), Buscot (*Mycorrhiza* 4: 223, 1994), Bunyard *et al.* (*Mycol.* 86: 762, 1994), Bunyard *et al.* (*Exp. Mycol.* 19: 223, 1995), Landvik *et al.* (*Nordic J. Bot.* 17: 403, 1997), O'Donnell *et al.* (*Mycol.* 89: 48, 1997; phylogeny), Wipf *et al.* (*Cryptog. Mycol.* 18: 95, 1997), Guzmán & Tapia (*Mycol.* 90: 705, 1998), Parguey-Leduc *et al.* (*Cryptog. Bryol.-Lichénol.* 19: 277, 1998), Harrington *et al.* (*Mycol.* 91: 41, 1999), Wipf *et al.* (*Can. J. Microbiol.* 45: 769, 1999), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Moreaua** Liou & H.C. Cheng (1949), Anthracoideaceae. 31 (on *Cyperaceae*), widespread. See Vánky (*Mycotaxon* 74: 343, 2000), Vánky (*Mycotaxon* 81: 367, 2002), Vánky & McKenzie (*Fungal Diversity Res. Ser.* 8: 259 pp., 2002; New Zealand).
- morel**, the edible ascoma of *Morchella*; false -, see lorchel.
- Morella** Pérez Reyes (1964), ? Olpidiaceae. 1, USA. See Karling (*Bull. Torrey bot. Club* 99: 223, 1972).
- Morellus** Eaton (1818) = *Phallus*.
- Morenoella** Speg. (1885) = *Lembosia* fide von Arx & Müller (*Stud. Mycol.* 9, 1975), Goos (*Mycotaxon* 73: 455, 1999).
- Morenoina** Theiss. (1913), ? Asterinaceae. Anamorph *Sirothyriella*. 11, widespread. See Ellis (*TBMS* 74: 297, 1980; key Brit. spp.), Cannon (*TBMS* 86: 190, 1986; Pakistan), Hofmann & Piepenbring (*Fungal Diversity* 22: 55, 2006; Panama).
- Morfea** (G. Arnaud) Cif. & Bat. (1963) = *Polychaeton* fide Punithalingam (*Mycol. Pap.* 149, 1981), Reynolds (*Madroño* 45: 250, 1998).
- Morfea** Roze (1867) = *Polychaeton* fide Hughes (*Mycol.* 68: 792, 1976).
- Morganella** Zeller (1948), Agaricaceae. 9, widespread (esp. tropical). See Kreisel & Dring (*Feddes Repert.* 74: 109, 1967; key 7 spp.), Ponce de Leon (*Fieldiana, Bot.* 34: 27, 1971), Suárez & Wright (*Mycol.* 88: 655, 1996; S. Amer. spp.), Krüger & Kreisel (*Mycotaxon* 86: 169, 2003; *Morganella* subgen. *Apioperdon*), Kreisel & Karasch (*Mycologia Bavarica* 8: 9, 2005).
- moriform**, like a mulberry (*Morus*) fruit in form.
- Morilla** Quél. (1886) = *Morchella*.
- Morinia** Berl. & Bres. (1889), anamorphic *Amphisphaeriaceae*, Cac.#eP.?. 2, Europe; Asia. See

- Collado *et al.* (*Mycol.* **98**: 616, 2006).
- Moriola** Norman (1872), Morioloraceae ($\pm$ L). 4, Europe. See Bachman (*Nyt Mag. naturv.* **64**: 170, 1926), Eriksson (*Op. Bot.* **60**, 1981), Triebel (*Biblthca Lichenol.* **35**, 1989).
- Morioloraceae** Zahlbr. (1903), ? Dothideomycetes (inc. sed.) ($\pm$ L). 1 gen., 4 spp.
Lit.: Eriksson (*Op. Bot.* **60**, 1981), Clauzade & Roux (*Bull. Soc. bot. Centre-Ouest Nouv. sér.*, num. spec. **7**: 893 pp., 1985).
- Moriolomyces** Cif. & Tomas. (1953), Dothideomycetes. 1, Europe. See Eriksson (*Op. Bot.* **60**, 1981), Eriksson & Hawksworth (*SA* **9**: 27, 1991).
- Moriolopsis** Norman ex Keissl. (1927) nom. inval. = *Melanomma* fide Keissler (*Rabenh. Krypt.-Fl.* **9** 1(1), 1933).
- Morispora** Salazar-Yepes, Pardo-Card. & Buriticá (2007), Phragmidiaceae. Anamorph *Gerwasia*. 1, S. America. See Salazar Yepes, M.; Pardo Cardona, V.M.; Buriticá Céspedes, P. (*Caldasia* **29**: 105, 2007).
- Moristroma** A.I. Romero & Samuels (1991), ? Chaetothyriales. 1, widespread. See Romero & Samuels (*Sydowia* **43**: 228, 1991), Nordén *et al.* (*Mycol. Progr.* **4**: 325, 2005; phylogeny, morphology), Lee *et al.* (*Mycol.* **98**: 598, 2006; phylogeny).
- Morobia** E. Horak (1979) = *Lepiota* fide Kuyper (*in litt.*).
- Morochkovsky** (Semion Filimonovich; 1897-1962; Ukraine). Postgraduate student in mycology and plant pathology (1928-1931) then Research Officer (1931-1938), All Union Scientific Research Institute of the Sugar Beet Industry, Kiev; Senior Research Officer (1938-1939) then Head of the Department of Mycology (1939-1962), M.G. Kholodny Institute of Botany, Kiev. Greatly influenced by Jaczewski (q.v.). Investigated widespread sudden death of horses (1938-1939) [an extremely dangerous occupation when Stalin was purging Ukraine of so-called 'wreckers'], establishing the cause as toxins from fodder contaminated by *Stachybotrys*. Studied factors promoting growth of wild mushrooms to alleviate postwar hunger (1945-1948). Established the series [*Guide to the Identification of Fungi of Ukraine*] [in Ukrainian]. *Publs.* (with Zerova, Lavitska & Smit-ska) [*Handbook of the Fungi of Ukraine*] (1969) [in Ukrainian, published posthumously]. *Biogs, obits etc.* Smitskaya & Dudka ([*Mikologiya i Fitopatologiya*] **2**: 79, 1968, portrait [in Russian]).
- Moronopsis** Delacr. (1891) ? = *Cheirospora* fide Sutton (*Mycol. Pap.* **141**, 1977).
- Morosporium** Renault & Roche (1898), Fossil Fungi, anamorphic *Pezizomycotina*. 1 (Eocene), France.
- morph**, form.
- morphotype**, a group of morphologically differentiated individuals of a species of unknown or of no taxonomic significance.
- Morqueria** Bat. & H. Maia (1963) = *Cirsosia* fide von Arx & Müller (*Stud. Mycol.* **9**, 1975).
- Morrisiella** Saikia & A.K. Sarbhoy (1985), Chaetosphaeriaceae. See Sutton (*in litt.*), Shenoy *et al.* (*MR* **110**: 916, 2006; phylogeny).
- Morrisographium** M. Morelet (1968), anamorphic *Pezizomycotina*, Hsy. $\equiv$ eP.1. 7, widespread. See Illman & White (*CJB* **63**: 423, 1985; key), Murvanishvili & Svanidze (*Soobshch. Akad. Nauk Gruz.* **137**: 573, 1990).
- Morthiera** Fuckel (1870) = *Entomosporium* fide Saccardo (*Syll. fung.* **3**: 657, 1884).
- Mortierella** Coem. (1863), Mortierellaceae. c. 85 (mainly in soil), widespread. See Kuhlman (*Mycol.* **64**: 325, 1972), Kuhlman (*Mycol.* **67**: 678, 1975; zygospores), Gams (*Persoonia* **9**: 381, 1977; key spp. in cult.), Benjamin (*Aliso* **9**: 157, 1978), Ansell & Young (*TBMS* **91**: 221, 1988; zygospores), Chen (*Mycosystema* **5**: 23, 1992; Chinese spp.), Degawa & Tokumasu (*Mycoscience* **38**: 387, 1997; zygosporogensis), Kirk (*IMI Descr. Fungi Bact.* **131**, 1997), Degawa & Tokumasu (*Mycol.* **90**: 1040, 1998; n.spp. & zygospores), Degawa & Tokumasu (*MR* **102**: 593, 1998; zygospores), Watanabe *et al.* (*Mycoscience* **39**: 475, 1998), Watanabe *et al.* (*MR* **105**: 506, 2001; key homothallic spp.), Meyer & Gams (*MR* **107**: 339, 2003; delimitation of *Umbelloopsis*), Kwasna *et al.* (*MR* **110**: 501, 2006; phylogeny soil isolates), White *et al.* (*Mycol.* **98**: 872, 2006; phylogeny), Idnurm *et al.* in Heitman *et al.* (Eds.) (*Sex in Fungi*: 407, 2007; mating).
- Mortierellaceae** A. Fisch. (1892), Mortierellales. 6 gen. (+ 5 syn.), 93 spp.
Lit.: O'Donnell *et al.* (*Mycol.* **93**: 286, 2001), Voigt & Wöstemeyer (*Gene* **270**: 113, 2001), Corradi *et al.* (*Fungal Genetics Biol.* **41**: 262, 2004), Tanabe *et al.* (*Mol. Phylogen. Evol.* **30**: 438, 2004), Kwasna *et al.* (*MR* **110**: 501, 2006).
- Mortierellales** Caval.-Sm. (1998). Mucoromycotina. 1 fam., 6 gen., 93 spp. Fam.:
- Mortierellaceae**
Lit.: Cavalier-Smith (*Biol. Rev.* **73**: 203, 1998), White *et al.* (*Mycol.* **98**: 860, 2006; molecular phylogeny), Hibbett *et al.* (*MR* **111**: 109, 2007), and see under Family.
- Morularia** Nann. (1925) $\equiv$ *Heterobotrys*.
- mosaic fungus**, a network resembling disorganized dermatophyte mycelium sometimes seen in skin scales cleared in potassium hydroxide. An artifact, fide Weidman, who first described the effect in 1927, or the extracellular deposit of a dermatophyte (fide Dowding, *Arch. Derm. Chicago* **66**: 470, 1952).
- Moschomyces** Thaxt. (1894) = *Compsomyces* fide Tavares (*Mycol. Mem.* **9**, 1985).
- Moser** (Meinhard Michael; 1924-2002; Austria). Researcher, Federal Institute of Forestry Research, Imst, Tirol (1951-1968); Professor of Microbiology, Botanical Institute, Innsbruck (1968-1972); first Director, Institute of Microbiology, Innsbruck (1972-1991). Career began late because of years as a prisoner of war and then Soviet labour camp internee; developed techniques for inoculating trees with ectomycorrhizal fungi; outstanding European agaricologist, specializing in *Cortinarius*. *Publs.* *Kleine Kryptogamenflora von Mitteleuropa. Basidiomyceten. IIB. Die Röhrlinge, Blätter- und Bauch pilze (Agaricales und Gasteromycetales)* (1955); *Kleine Kryptogamenflora von Mitteleuropa. IIA. Ascomyceten (Schlauchpilze)* (1963). *Biogs, obits etc.* Horak, Peintner & Pöder (*Mycological Progress* **1**: 331, 2002); Horak, Peintner & Pöder (*MR* **107**: 506, 2003) [portrait].
- Moserella** Pöder & Scheuer (1994), ? Sclerotiniaceae. 1 (on roots), Austria. See Pöder & Scheuer (*MR* **98**: 1334, 1994).
- Mosigia** Fr. (1845) [non *Mosigia* Spreng. 1826, *Compositae*] = *Rimularia* fide Hertel & Rambold (*Biblthca Lichenol.* **38**: 145, 1990).
- Moss** (Stephen Thomas; 1943-2001; England). PhD,

Reading (1972); Research Associate, University of Kansas (1972-1973); Research Fellow (1974-1978) then Lecturer (1978-1981) then Senior Lecturer (1981-1988) then Reader (1988-2001), University of Portsmouth. Expert on Trichomycetes and marine fungi and noted electron microscopist; his teamwork skills made him an outstanding Secretary then President of the British Mycological Society, dying in office. *Publs. Biology of Marine Fungi* (1986). *Biogs, obits etc.* Dick (MR 108: 214, 2004).

Mossopisporites Kalgutkar & Janson. (2000), Fossil Fungi, anamorphic *Ascomycota*. 1, China. See Kalgutkar & Jansonius (*AASP Contributions Series* 39: 183, 2000).

Mothesia Oddo & Tonolo (1967) = *Claviceps* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

mould (1) a microfungus having a well-marked mycelium or spore mass, esp. an economically important saprobe; **anther** - of clover, *Botrytis anthophila*; **black** -, *Aspergillus niger*; **blue** -, *Penicillium*; of apple, *P. expansum*; of citrus, *P. italicum*; of tobacco, *Peronospora hyoscyami* (syn. *P. tabacina*; Shepherd, *TBMS* 55: 253, 1970), McKen (Blue mold of tobacco, 1989); **bread** -, *Chrysomilia sitophila*; also used of *Mucorales* on bread; **green** - of citrus, *Penicillium digitatum*; **grey** -, *Botrytis cinerea*; of snowdrop, *B. galanthina*; **pin** -, *Mucor* and other *Zygomycetes*; **plaster** -, brown, *Papulospora byssina*; white, 'Oospora' (q.v.) *fimicola*; **slime** -s, *Mycetozoa*; **snow** -s, low temp. tolerant pathogens growing on unfrozen soil surface below snow cover, causing diseases of winter cereals, grasses and forage legumes, *Monographella nivalis* (pink snow mould), *Sclerotinia borealis*, *Typhula* spp.; **sooty** -s, *Atichiaceae*, *Capnodiales*, etc.; **tomato leaf** -, *Fulvia fulva*; **water** -s, aquatic *Chytridiomycetes* and *Oomycetes*, esp. *Saprolegniales*; **white** - of sweet pea, *Hyalodendron album*; (2) see mildew (2). Ilman (*Mycol.* 62: 1214, 1970) advocated as American usage 'mould' for a fungus, 'mold' for a shape.

Mouliniea C.P. Robin (1853), *Pezizomycotina*. 1, Europe.

Mounting media. The appearance of microscopic structures of fungi differs greatly depending on the condition of the material and the mountant used. Ideally and if possible, microscopic examination of fungi should begin with material in a fresh living state and water as the mounting fluid (see Baral, *Mycotaxon* 44: 333, 1992; vital taxonomy); this will enable structures to be measured without problems of shrinkage, and their natural colour to be observed; it is also useful for observing gelatinous material and non-cellular appendages. Thereafter, if necessary or desired, other mountants including stains may be suitable. Various mounting fluids are available. Stains are often combined with clearing agents such as lactic acid, glycerol and chloral hydrate to produce temporary or permanent mounts. Lactophenol (Amann, 1896) was also formerly used, but is now not recommended because of its carcinogenic properties. See Dring in Booth (Ed.) (*Methods in microbiology* 4: 96, 1971), Tuite (*Plant pathological methods. Fungi & bacteria*, 1969). Many mountants are adversely affected by exposure to light and should be stored in a dark bottle.

Lactic acid in glycerol

Although less effective than lactophenol for clearing plant tissues, lactic acid has similar properties and can be used neat or combined with glycerol and water for routine examination of many fungi.

Lactic acid	25.0 ml
Glycerol	50.0 ml
Distilled water	25.0 ml

Cotton blue in lactic acid

This is widely used as a standard mountant which rapidly stains the cytoplasm of fungal cells. Permanent mounts can be prepared by sealing with nail varnish.

Cotton blue	0.01 g
Lactic acid (85%)	100.0 ml

Add cotton blue powder to lactic acid. Heat in a glass beaker and stir until dissolved. Allow to cool then filter to remove any sediment. Store in a dark bottle.

Erythrosin B in ammonia

An aqueous mountant which stains fungal cell walls, producing a clear outline of septation in spores and mycelium. It is particularly useful for examining hyaline structures and conidiogenesis in anamorphic fungi. This stain crystallizes within 48 hours and can only be used as a temporary mountant.

Erythrosin B	1.0 g
Ammonia	10.0 ml
Distilled water	90.0 ml

Mix ammonia and distilled water. Add erythrosin B and stir until dissolved.

Lactofuchsin

A red stain produced by combining acid-fuchsin with lactic acid (Carmichael, *Mycologia* 47: 611, 1955). This has a slightly better refractive index than cotton blue, enabling structures to be seen clearly and is particularly suitable for staining structures prior to photographing.

Acid-fuchsin	0.1 g
Lactic acid	100.0 ml

Polyvinyl alcohol in lactic acid

This mountant has a high refractive index (1.39) resulting in minimal distortion of structures, sets rapidly and requires no sealing, providing an excellent permanent mounting medium for examination of fungi. See Omar *et al.* (*Stain Technology* 53: 293, 1978).

Polyvinyl alcohol	1.66 g
Lactic acid	10.0 ml
Glycerol	1.0 ml
Distilled water	10.0 ml

Potassium hydroxide (KOH)

Used at 5-10%, potassium hydroxide is useful for softening and clearing fungal tissues. It is most commonly used as a pre-treatment for examining ascomycetes and anamorphic fungi with tough-walled fruit-bodies. After clearing, the KOH can be washed off with water using a dropper or pipette and replaced with a stain. A 5% solution is prepared as follows:

Potassium hydroxide	5.0 g
Distilled water	100.0 ml

Weigh out 5 g potassium hydroxide pellets. Add to distilled water in a glass beaker. Stir until dissolved.

Shear's mounting fluid

A colourless mounting fluid suitable for permanent preparations of myxomycetes, ascomycetes, rusts and smuts and particularly useful for microphotography. See Chupp (*Mycologia* 32: 269, 1940), Gams *et al.* (*CBS Course of mycology*, edn 3, 1987).

Potassium acetate	3 g
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glycerol	60 ml
Ethanol (95%)	90 ml
Distilled water	150 ml

Lugol's iodine

Used as an alternative to Melzer's iodine for testing the amyloid reaction in spores, asci and hymenium of ascomycetes and basidiomycetes. It is particularly useful for examining apical apparatus in asci of lichenised fungi, giving a clearer result than Melzer's iodine.

Iodine	1.0 g
Potassium iodide	2.0 g
Distilled water	100.0 ml

Prepare in a fume cupboard. Dissolve potassium iodide in distilled water in a glass beaker. Add iodine. Cover the beaker and leave to dissolve for 24 hours. Mix thoroughly.

Melzer's iodine

Mainly used for testing the amyloid reaction in sporulating structures of ascomycetes and basidiomycetes. (Melzer, *BSMF* 40: 78, 1924). Also clears and stains fungal tissues including cell walls and can be used for general examination of fungal structures. Pre-treatment of material with 5-10 % potassium hydroxide is recommended. Permanent mounts can be made by drawing off the reagent with filter paper, replacing with lactic acid or lactophenol and sealing with nail varnish.

Chloral hydrate	22.0 g
Iodine	0.5 g
Potassium iodide	1.5 g
Distilled water	20.0 ml

Prepare in a fume cupboard. Dissolve potassium iodide in distilled water. Add iodine and leave to dissolve for 24 hours. Add chloral hydrate and stir until dissolved. Mix thoroughly.

Water (distilled or tap)

See also stains.

mouse favus, a skin disease in humans (*Trichophyton quinckeanum*).

Moutoniella Penz. & Sacc. (1901), Rhytismataceae. 1, Java. See Sherwood (*Mycotaxon* 5: 1, 1977).

Mrakia Y. Yamada & Komag. (1987), Cystofilobasidiaceae. 4, Antarctica. See Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 1351, 2000; mol. phylogeny), Malosso *et al.* (*Polar Biology* 29: 552, 2006; maritime Antarctic soils).

Mrazekia L. Léger & E. Hesse (1916), Microsporidia. 6.

MSDN, Microbial Strain Data Network (Cambridge, UK); started 1985; see Krichevsky *et al.* (in Hawksworth & Kirsop, 1988: 31).

Mucedinaceae Link (1809) = Moniliaceae. (obsol.).

mucedinaceous, see moniliaceous.

mucedinous, white or pale in colour and mould-like; mucedinoid.

Mucedites C.E. Bertrand & Renault (1896), Fossil Fungi (mycel.) Fungi. 1 (Carboniferous), France.

Mucedo Pers. (1794) = *Mucor* Fresen.

Muchmoria Sacc. (1906) nom. dub., Fungi. See Hughes (*CJB* 36: 787, 1958).

Mucidula Pat. (1887) = *Oudemansiella* fide Singer (*Agaric. mod. Tax.*, 1951).

mucilaginous, sticky when wet; slimy.

Mucilopilus Wolfe (1979) = *Fistulinella* fide Kuyper (*in litt.*).

Muciporus Juel (1897) = *Tulasnella* fide Juel (*Ark. Bot.* 14: 1, 1914), Donk (*Persoonia* 4: 145, 1966).

Muciturbo P.H.B. Talbot (1989), Pezizaceae. Anamorph *Chromelosporium*. 3 (hypogeous), Australia. Probably close to *Ruhlandiella*. See Warcup & Talbot (*MR* 92: 95, 1989).

MUCL, Mycothèque de l'Université Catholique de Louvain (Louvain-la-Neuve, Belgium); founded 1894; an institute of the Catholic University of Louvain, with special funding for the genetic resource collection from the Belgian Science Policy Office.

Mucobasispora Mustafa & Abdul-Wahid (1990), anamorphic *Pezizomycotina*, Hso.0eP.35. 1 (from soil), Egypt; Russia. See Mustafa & Abdul-Wahid (*MR* 94: 131, 1990), Mel'nik *et al.* (*Nov. sist. Niz. Rast.* 28: 76, 1992).

Mucomassaria Petr. & Cif. (1932), Dothideomycetes. 1, C. America. See Petrak (*Sydowia* 13: 1, 1956).

Mucophilus Plehn (1920), ? Chytridiales. 1 (in *Cyprinus*), Germany.

Mucor Fresen. (1850) nom. cons., Mucoraceae. c. 50, widespread. See Benjamin & Mehrotra (*Aliso* 5: 235, 1963; azygosporic spp.), Zycha *et al.* (*Mucorales*, 1969), Mehrotra & Mehrotra (*Sydowia* 31: 94, 1974; azygosporic spp.), Schipper *et al.* (*Persoonia* 8: 321, 1975; zygosporic ornamentation), O'Donnell *et al.* (*CJB* 55: 2712, 1977; azygosporic ultrastr.), Schipper (*Stud. Mycol.* 17: 48, 1978; key 39 spp.), Stalpers & Schipper (*Persoonia* 11: 39, 1980; zygosporic ornamentation), James & Gauger (*Mycol.* 74: 744, 1982; genetics), Chen & Zheng (*Acta Mycol. Sin.* 1: 56, 1986), Hesseltine & Rogers (*Mycol.* 79: 289, 1987; zygosporic formation), Michailides & Spotts (*Mycol.* 80: 837, 1988; zygosporic germination), Ginman & Young (*MR* 93: 314, 1989; azygosporic ultrastr.), Schipper (*Stud. Mycol.* 31: 151, 1989), Bärtschi *et al.* (*MR* 94: 373, 1991; selective medium), Orlowski (*Microbiol. Rev.* 55: 234, 1991; dimorphism), Liou *et al.* (*Mycol. Monogr.* 6, 1993), Weitzman *et al.* (*J. Clin. Microbiol.* 31: 2523, 1993; mucormycosis), Nagy *et al.* (*Curr. Genet.* 26: 45, 1994; karyotype), Schipper & Samson (*Mycotaxon* 50: 475, 1994), Watanabe (*Mycol.* 86: 691, 1994; key homothallic spp.), Vágvölgyi *et al.* (*Can. J. Microbiol.* 42: 613, 1996), Zalar *et al.* (*Mycotaxon* 65: 507, 1996), Kirk (*IMI Descr. Fungi Bact.* 131, 1997), Michaelides *et al.* (*Mycol.* 89: 603, 1997; zygosporogenesis), Papp *et al.* (*Antonie van Leeuwenhoek* 72: 167, 1997; DNA polymorphism), O'Donnell *et al.* (*Mycol.* 93: 286, 2001; phylogeny), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny), Alves *et al.* (*Revista Brasileira de Botânica* 25: 147, 2002; Brazil), Tanabe *et al.* (*Mol. Phylogen. Evol.* 30: 438, 2004; phylogeny), Kwasna *et al.* (*MR* 110: 501, 2006; phylogeny soil isolates), White *et al.* (*Mycol.* 98: 872, 2006; phylogeny), Wöstemeyer & Schimek in Heitman *et al.* (Eds.) (*Sex in Fungi*: 431, 2007; trisporic acid & mating), Dávila López *et al.* (*Nucleic Acids Research* 36: 3001, 2008; spliceosomal RNA gene phylogeny), Nyilasi *et al.* (*Clin. Microbiol. Infect.* 14: 393, 2008; molecular identification).

Mucor L. (1753) nom. rej. = *Calicium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Mucor P. Micheli ex Fr. (1832) nom. rej. prop. = *Rhizopus* fide Kirk (*Taxon* 35: 371, 1986).

Mucoraceae Dumort. (1822), Mucorales. 25 gen. (+ 33 syn.), 129 spp.

Lit.: Ellis & Hesseltine (*Sabouraudia* 5: 59, 1966), Zycha *et al.* (*Mucorales*: 355 pp., 1969), Benny & Benjamin (*Aliso* 8: 301, 1975), Benny & Benjamin

- (*Aliso* 8: 391, 1976), Schipper (*Stud. Mycol.* 17: 1, 1978), Schipper (*Persoonia* 14: 133, 1990), Kimura *et al.* (*J. Med. Vet. Mycol.* 33: 137, 1995), Munipalli *et al.* (*J. Clin. Microbiol.* 34: 2601, 1996), Tanabe *et al.* (*Mol. Phylogen. Evol.* 30: 438, 2004), Iwen *et al.* (*J. Clin. Microbiol.* 43: 5819, 2005), Kwasna *et al.* (*MR* 110: 501, 2006), Liou *et al.* (*MR* 111: 196, 2007).
- Mucorales** Fr. (1832). Mucoromycotina. 9 fam., 51 gen., 205 spp. Asexual reproduction by multi-spored or few- (to one) spored sporangia (sporangiola), forcibly discharged in *Pilobolus*, sexual reproduction by zygospores; cosmop. saprobes (rarely mycoparasites), or few facultative parasites of plants or animals (incl. humans). Fams:
- (1) **Choanephoraceae**
 - (2) **Cunninghamellaceae**
 - (3) **Mucoraceae**
 - (4) **Mycotyphaceae**
 - (5) **Phycomycetaceae**
 - (6) **Pilobolaceae**
 - (7) **Radiomycetaceae**
 - (8) **Syncephalastraceae**
 - (9) **Umbelopsidaceae**
- Recent molecular evidence (Voigt *et al.*, 1999; O'Donnell *et al.*, 2001) has suggested that the traditional classification is highly artificial and the above can only be considered a temporary, pragmatic solution.
- Lit.*: Benny (PhD thesis, Claremont-Graduate School, USA, 1973, *CJB* 73(Suppl. 1): S725, 1995), Benny *et al.* (*Mycotaxon* 22: 119, 1985), Hesseltine & Ellis (*in* Ainsworth *et al.* (Eds), *The Fungi* 4B: 187, 1973), Zycha *et al.* (*Mucorales*, 1969), Benjamin (*in* Kendrick (Ed.), *The whole fungus*, 1979), Hesseltine (*Mycol.* 47: 344, 1955, 57: 149, 1965; *Mycologist* 5: 162, 1991; food fermentations), Kirk (*Mycol. Pap.* 152, 1984), Benny & Benjamin (*Mycol.* 83: 713, 1992; 85: 660, 1983), von Arx (*Sydowia* 35: 10, 1982), Scholer *et al.* (*Fungi pathogenic for humans and animals* 3A: 9, 1983), Newsham & Gauger (*Exp. Mycol.* 8: 314, 1984; heterokaryons), Mikawa (*in* Watanabe & Malla (Eds), *Cryptogams of the Himalayas* 1: 77, 1988), Arnold (*Rev. Jard. Bot. Nac. Univ. Habana* 12: 121, 1991), Zhou *et al.* (*Mycosystema* 4: 1, 1991; DNA base composition), Mikawa (*in* Nakaike & Malik (Eds), *Cryptogamic flora of Pakistan*: 119, 1992; 2: 65, 1993), Orłowski (*in* Wessels & Meinhardt (Eds), *The Mycota* 1: 143, 1994; dimorphism), Gooday (*in* Wessels & Meinhardt (Eds), *The Mycota* 1: 401, 1994; sex hormones), Richardson & Shankland (*in* Murray *et al.* (Eds), *Manual of clinical microbiology*, 6th ed, 1995; mucormycosis), Ellis (*in* Ajello & Hay, (eds), *Medical Mycology* 4), Collier *et al.* (eds, *Topley & Wilson's Microbiology and Microbial Infections*, ed. 9, p. 247, 1998), Voigt *et al.* (*J. Clin. Microbiol.* 37: 3957, 1999; phylogeny), O'Donnell *et al.* (*Mycologia* 93: 286, 2001; phylogeny), White *et al.* (*Mycol.* 98: 860, 2006; molecular phylogeny), Hibbett *et al.* (*MR* 111: 109, 2007), Dávila López *et al.* (*Nucleic Acids Research* 36: 3001, 2008; spliceosomal RNA gene phylogeny), and see under fams.
- Mucoralites** Patel (1979), Fossil Fungi, Zygomycetes. 1 (Tertiary), India.
- Mucoricola** Nieuwl. (1916) $\equiv$ Piptocephalis fide Benjamin (*Aliso* 4: 321, 1959).
- Mucorites** Mesch. (1898), Fossil Fungi. 1 (Carboniferous), France.
- mucormycosis**, strictly, a disease of humans or animals caused by one of the *Mucorales* (e.g. *Absidia corymbifera*) but sometimes also applied to infections caused by members of the *Entomophthorales*. Cf. phycomycosis, zygomycosis.
- Mucorodinium** K.M. Zalesky (1915), Fossil Fungi ? Mucorales. 1 (Permian), former USSR.
- Mucoromycotina** Benny (2007). Zygomycota. 3 ord., 61 gen., 325 spp. Ords:
- (1) **Endogonales**
 - (2) **Mortierellales**
 - (3) **Mucorales**
- Lit.*: James *et al.* (*Mycol.* 98: 860, 2006; molecular phylogeny), Hibbett *et al.* (*MR* 111: 109, 2007), Hoffmann *et al.* (*in* Gherbawy (Ed.) *Current Advances in Molecular Mycology*): in press, 2008).
- Mucoromycotina** K.M. Zalesky (1915), Fossil Fungi ? Mucorales. 1 (Permian), former USSR.
- Mucosetospora** M. Morelet (1972), anamorphic *Pezizomycotina*, St.0eH.1. 1, France. See Morelet (*Bulletin de la Société des Sciences naturelles et d'Archéologie de Toulon et du Var* 201: 4, 1972).
- mucronate**, pointed; ending in a short, sharp point. (Fig. 23.39).
- Mucronella** Fr. (1874), Clavariaceae. 8, widespread. See Corner (*Ann. Bot. Mem.* [A monograph of Clavaria and allied genera] 1, 1950), Stalpers (*Stud. Mycol.* 40: 93, 1996; key).
- Mucronia** Fr. (1849) [non *Mucronea* Benth. 1836, *Polygonaceae*] $\equiv$ Mucronella.
- Mucronoporus** Ellis & Everh. (1889) $\equiv$ Onnia.
- Mucrosporium** Preuss (1851) = Cladobotryum fide de Hoog (*Persoonia* 10: 33, 1978).
- Muda** Adans. (1763) nom. dub., ? Rhodophyta. may alternatively be a member of the Fungi, (L).
- Muellerella** Hepp (1862), Verrucariaceae. c. 16 (on lichens and *Hepaticae*), widespread (esp. north temperate). See Hawksworth (*Bot. Notiser* 132: 283, 1979), Döbbeler & Triebel (*Bot. Jahrb. Syst.* 107: 503, 1985; on *Hepaticae*), Matzer (*Nova Hedwigia* 56: 203, 1993).
- Muellerellomyces** Cif. & Tomas. (1953) $\equiv$ Muellerella.
- Muellerites** L. Holm (1968), ? Chaetothyriales. Anamorph *Aureobasidium*-like. 1 (on *Juniperus*), Europe. See Casagrande (*Phytopath. Z.* 66: 97, 1969), Müller & Magnuson (*Arctic and Alpine Mycology* II: 3, 1987).
- Muelleromyces** Kamat & Anahosur (1968), Phyllachoraceae. 1 (from leaves), India. See Kang *et al.* (*Fungal Diversity* 2: 135, 1999).
- mu-erh**, the edible cultivated *Auricularia* sp., esp. *A. polytricha* (China) and *A. auricula* (Japan) (Chang & Hayes, 1978).
- Muhria** P.M. Jørg. (1987) = Stereocaulon Hoffm. fide Myllys *et al.* (*Taxon* 54: 605, 2005), Högnabba (*MR* 110: 1080, 2006; phylogeny).
- Muiaria** Thaxt. (1914), anamorphic *Pezizomycotina*, Hso.#eP.1. 4 (on *Insecta*), Africa; Borneo. See Weir & Blackwell (*Insect-Fungal Associations Ecology and Evolution*: 119, 2005).
- Muiogone** Thaxt. (1914), anamorphic *Pezizomycotina*, Hsp.#eP.1. 1 (on *Insecta*), Africa. See Weir & Blackwell (*Insect-Fungal Associations Ecology and Evolution*: 119, 2005).
- Muirella** R. Sprague (1959), anamorphic *Pezizomycotina*, Hsp.#eH.10. 1, USA. See Braun (*Monogr. Cercospora, Ramularia Allied Genera* (Phytopath.

- Hyphom.*) 1, 1995).
- Mukagomyces** S. Imai (1940) = *Tuber fide* Trappe (*Mycotaxon* 9: 247, 1979), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Mukhakesa** Udaiyan & V.S. Hosag. (1992) nom. inval., Xylariales. 1 (wood, aquatic), India. See Kang *et al.* (*Fungal Diversity* 2: 135, 1999).
- Mukorites** Grüss (1931), Fossil Fungi. 1.
- Müller** (Emil; 1920-2008; Switzerland). Graduate in agriculture, Swiss Institute of Technology (1944); Agricultural Advisor, Plantahof Agricultural School, Grisons Canton (1944-1948); PhD, Swiss Institute of Technology (1949); Curator of Fungal Collections (1954-1966) then Lecturer (1966-1970) then Professor (1970-1973) then Regius Professor (1973 onwards), Swiss Institute of Technology (1954 onwards). An outstanding systematist, specializing in the ascomycetes (he was affectionately nicknamed 'Ascus'), collaborating with Ahmad (q.v.) and Arx (q.v.) and producing more than 200 papers; Managing Editor of *Sydowia* for many years. *Publs.* (with Arx) *Die Gattungen der amerosporen Pyrenomyceten. Beiträge zur Kryptogamenflora der Schweiz* (1954); (with Arx) *Die Gattungen der didymosporen Pyrenomyceten. Beiträge zur Kryptogamenflora der Schweiz* (1962); (with Loeffler) *Mycology. An Outline for Science and Medical Students* (1971) [English translation, 1976]; (with Arx) *Pyrenomycetes: Meliolales, Coronophorales, Sphaeriales*. In Ainsworth, Sparrow & Sussman [eds] *The Fungi. An Advanced Treatise* 4A (1973). *Biogs, obits etc.* Petrini (*Sydowia* 52: v, 2000); Petrini & Horak (*Sydowia* 38: 400, 1985) [portrait].
- Müller Argoviensis** (Jean; 1828-1896; Switzerland). Student, Zürich (up to 1857); Curator, de Candolle Herbarium (1851-1869); Curator, Delessert Herbarium, Geneva (1869-1896); Director, Geneva Botanic Garden (1870-1874); Professor of Botany, Geneva (1871-1889). Carried out important work on tropical lichens, particularly from Cuba; published over 100 papers on lichen-forming fungi including many new species [reprint *Gesammelte Lichenologische Schriften*, 2 vols, 1967]. Most specimens in G, other material in BM and M. *Publs.* *Lichenologische Beiträge. I-XXV. Flora* (1874-1891). *Biogs, obits etc.* Briquet (*Bulletin de l'Herbier Boissier* 4: 111, 1896); Grummann (1974: 633); Stafleu & Cowan (*TL-2* 3: 628, 1981).
- multi-** (prefix), a great number; many; much.
- multiallelic** (of an incompatibility system), having more than 2 alleles per locus; cf. biallelic.
- Multicellaesporites** Elsik (1968), Fossil Fungi. 42 (Tertiary), widespread.
- Multicellites** Kalgutkar & Janson. (2000), Fossil Fungi, anamorphic *Ascomycota*. 1, widespread. See Kalgutkar & Jansonius (*AASP Contributions Series* 39: 189, 2000).
- Multicladium** K.B. Deshp. & K.S. Deshp. (1966), anamorphic *Pezizomycotina*, Hso.0bP.?. 1, India. See Deshpande & Deshpande (*Mycopath. Mycol. appl.* 30: 185, 1966).
- Multiclavula** R.H. Petersen (1967), Clavulinaceae. 13 (3 L; some assoc. with *Myxomycetes* and *Musci*), widespread. See Petersen (*Am. midl. Nat.* 77: 205, 1967; key), Oberwinkler (*Dtsch. bot. Ges.* N.F. 4: 139, 1970), Petersen & Kan tvilas (*Aust. J. Bot.* 34: 217, 1986), Poelt & Obermayer (*Herzogia* 8: 289, 1990; bulbil diaspores).
- multifid**, having division into a number of parts or lobes.
- Multifurca** Buyck & V. Hofstetter (2008), Russulaceae. 5, USA; India; Thailand; New Caledonia. See Buyck *et al.* (*Fungal Diversity* 28: 15, 2008).
- multiguttulate**, containing many oil-like drops.
- Multipatina** Sawada (1928), anamorphic *Pezizomycotina*, Hso.?.?. 1, Taiwan. *M. citricola* ('leaf felt' of citrus).
- multi-perforate**, of a septum with many pores connecting compartments. See Cole & Samson (*Patterns of development in conidial fungi*, 1979). (Fig. 22D).
- multiseptate**, having a number of septa.
- multisporous**, having a number of spores.
- multivesicular bodies**, small vesicles limited by a membrane which in *Sclerotinia fructigena* originate from the endoplasmic reticulum and are possibly related to extracellular enzyme secretion (Calonge *et al.*, *J. gen. Microbiol.* 55: 177, 1969).
- Mundkur** (Balchendra Bhavanishankar; 1896-1952; India). Student, Presidency College, Madras (c. 1920); Assistant Mycologist, Cotton Research Scheme, Dharwar, Bombay (1922-1928); PhD, Iowa State College of Agriculture, Iowa, USA (1929-1931); Assistant Mycologist, Division of Mycology, Indian Agricultural Research Institute, first in Pusa and later in Delhi (1931-1947); Deputy Director of Plant Diseases, Directorate of Plant Protection, Quarantine and Storage (1947); Professor of Botany, Poona University (after 1947). Noted for work on rusts and smuts. *Publs. Fungi and Plant Disease* (1949), (with M.J. Thirumalachar) *Ustilaginales of India* (1952). *Biogs, obits etc.* Joshi *et al.* (*Review of Tropical Plant Pathology* 7: 91, 1993); Mehta (*Indian Phytopathology* 5: 1, 1953) [bibliography, portrait]; Stafleu & Cowan (*TL-2* 3: 660, 1981).
- Mundkurella** Thirum. (1944), Urocystidaceae. 5 (on *Araliaceae*), S. & E. Asia; N. Amer.; New Zealand. See Savile (*Mycol.* 67: 273, 1975), Vánky (*MR* 94: 269, 1990; key), Vánky *et al.* (*N.Z. J. Bot.* 37: 329, 1999; key).
- Munk pores**, Small (c. 1 µm) pores, each surrounded by a ring of thickening, between cells of the ascoma wall in the *Nitschkeaceae*.
- Munkia** Speg. (1886), anamorphic *Hypocreales*, St.0eH.?. 2, S. America. See Marchionatto (*Rev. argent. Agron.* 7: 172, 1940), Bischoff *et al.* (*Mycol.* 96: 1088, 2004; placement).
- Munkiella** Speg. (1885), Polystomellaceae. Anamorph *Lasmenia*. 3, S. America.
- Munkiellaceae** Luttr. (1973) = Polystomellaceae.
- Munkiodothis** Theiss. & Syd. (1915) = *Rehmiodothis fide* Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Munkovalsaria** Aptroot (1995), ? *Dacampiaceae*. Anamorph *Lecythophora*-like. 3, widespread (esp. tropical). See Aptroot (*Nova Hedwigia* 60: 325, 1995).
- Murangium** Seaver (1951), Patellariaceae. 1, N. America. See Kutorga & Hawksworth (*SA* 15: 1, 1997).
- Murashkinskija** Petr. (1928) = *Mytilinidion fide* Barr (*SA* 6: 144, 1986).
- Muratella** Bainier & Sartory (1913) = *Cunninghamella fide* Hesseltine (*Mycol.* 47: 344, 1955).
- Murciasporidium** Thor (1930), Fungi. 1 (in mites), Spitzbergen.
- Muribasidiospora** Kamat & Rajendren (1968), Exobasidiaceae. 3, India. See Rajendren (*Mycol.* 61:

1159, 1969), Rajendren (*Mycopathologia* 41: 287, 1970; culture) = *Exobasidium* (*Exobasid.*) fide, Donk (*Persoonia* 8: 33, 1974).

Muribasidiaceae Kamat & Rajendren (1969) = *Exobasidiaceae*.

muricate, rough with short, hard outgrowths.

Muricopeltis Viégas (1944), *Micropeltidaceae*. 1, Brazil. See Petrak (*Sydowia* 5: 341, 1951).

Muricularia Sacc. (1877) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).

muriculate, delicately muricate.

muriform (of spores), see dictyospore.

muriform cell, a thick-walled, dark, muriform cell (frequently referred to as a sclerotic cell or body), found in tissues affected by chromoblastomycosis (Matsumoto *et al.*, *Mycol.* 76: 244, 1984).

Murogenella Goos & E.F. Morris (1965) = *Coryneum* fide Sutton (*TBMS* 86: 1, 1986).

Muroia I. Hino & Katum. (1958), *Lophiostomataceae*. 1, Japan. See Hino & Katumoto (*J. Jap. Bot.* 33: 79, 1958).

Murrill (William Alphonso; 1869-1957; USA). Student, Randolph-Macon College, Ashland, Virginia (1887-1891); Assistant Cryptogamic Botanist, Cornell (up to 1890); Assistant Curator (1904-1909) then Assistant Director (1908-1919) then Curator & Supervisor of Public Instruction (1919-1924), New York Botanic Garden; after a period of ill-health (1924-1926), employed during semi-retirement, University of Florida, Gainesville (1926 onwards). A leading agaricologist; first editor of *Mycol.* (1909-1924); author of more than 500 papers and articles; he also identified and named the causal organism of chestnut blight. His specimens of hymenomycetes (more than 70,000) are in the fungal reference collection of New York Botanic Garden. *Publs. Agaricaceae. North American Flora* (1910-1916); *Agaricaceae of tropical North America. Mycol.* (1911-1918 [reprint 1971]). *Biogs, obits etc.* Halling (An annotated index to species and infraspecific taxa of Agaricales & Boletales described by W.A. Murrill. *Memoirs of the New York Botanic Garden* 40: 1, 1980); Stafleu & Cowan (*TL-2* 3: 672, 1981); Weber (*Mycol.* 53: 543, 1961) [bibliography, portrait]; Weber (*Mycologia Index*, 1968); see also the website: Smith-Vikos (*William Alphonso Murrill (1869-1957)* <http://sciweb.nybg.org/science2/hcol/intern/murrill1.asp>).

Murrilloporus Ryvarden (1985) = *Heterobasidion* fide Stalpers (*Stud. Mycol.* 40: 59, 1996).

Musaespora Aptroot & Sipman (1993) = *Trypetheliopsis* fide Aptroot (*in litt.*), Lücking & Sérusiaux (*Nordic J. Bot.* 16: 661, 1996), Aptroot *et al.* (*Bibliotheca Lichenol.* 64, 1997), Aptroot *et al.* (*Bibliotheca Lichenol.* 97, 2008; Costa Rica).

muscardine fungus (green), *Metarhizium anisopliae*; - (yellow), *Paecilomyces farinosus*. Pathogens of silkworms and other insects.

muscaridin, and **muscarin(e)**, toxic quaternary ammonium compounds from *Amanita muscaria*; muscarin also from *Inocybe patouillardii*.

muscazone, an insecticidal toxin from *Amanita muscaria*. Cf. tricholomic acid.

Muscia Gizhitsk. (1929), ? Helotiales. 1, former USSR.

Muscicola Velen. (1934), Helotiales. 1, Europe. See Svrček (*Česká Mykol.* 43: 65, 1989).

muscicolous, growing on *Musci*; see Bryophilous fungi.

muscimol, see pantherine.

Muscodor Worapong, Strobel & W.M. Hess (2001), anamorphic *Xylariaceae*. 3, widespread (tropical). See Worapong *et al.* (*Mycotaxon* 79: 71, 2001), Daisy *et al.* (*Mycotaxon* 84: 39, 2002), Worapong *et al.* (*Mycotaxon* 81: 463, 2002), Sopalun *et al.* (*Mycotaxon* 88: 239, 2003; Thailand), Ezra *et al.* (*Microbiology Reading* 150: 4023, 2004).

mushroom (1) an agaric (or a bolete), basidioma, esp. an edible one; (2) any agaric; a macrofungus with a distinctive fruiting body which can be either hypogeous or epigeous, large enough to be seen with the naked eye and to be picked by hand (Chang & Miles, *Mycologist* 6: 65, 1992). Cf. toadstool.

mushroom bodies (entom.), corpora pedunculata, paired lobes of neurophile in dorsal brain of insects.

Mushroom cultivation. Apart from the button mushroom, *Agaricus bisporus*, several other species are now cultivated, but still only very few at a commercial scale, e.g. enokitake (*Flammulina velutipes*), lawyer's wig or shaggy-mane mushroom (*Coprinus comatus*), lion's mane mushroom (*Hericium erinaceus*), maitake (*Grifola frondosa*), oyster mushrooms (*Pleurotus* spp.), padi straw mushroom (*Volvariella volvacea*), reishi (*Ganoderma lucidum*), shimeji (*Hypsizygus tessulatus*), shii-take (*Lentinula edodes*), snow-fungus (*Tremella fuciformis*); most are cultivated for their culinary, but some for their medicinal or psychotropic value; the market is substantial.

Cultivation of the button mushroom starts from a master culture which is used to inoculate spawn. Well-composted horse manure is used as substratum (or sometimes 'artificial compost'). Gypsum and superphosphate may be added before or during decomposition and the compost has to be turned occasionally. Mushrooms do not need light but for the best results they have to be kept at an even temperature and the beds may be in any place meeting these conditions. Indoor beds, where space is limited, such as those in special houses ('sheds'), are frequently of the 'flat' type and are made up of a 15-23 cm layer of compost in boxes or trays; those outdoors are generally made as ridges about 75 cm high. In place of the old method of using natural, 'virgin' spawn to make the 'brick' spawn for spawning the beds, 'pure culture' spawn (made by inoculating a sterile compost with cultures from spores or tissues of a good type of mushroom) is now used for inoculating bricks of horse manure, cow manure, and rich soil, or, better, the beds themselves. Spawning is done when the temperature has become 80°F or less and some 10 days later, when the spawn is 'running', the bed is covered ('cased') with an inch of soil and, if necessary, a layer of straw in addition. Mushrooms are first seen 6-8 weeks after spawning and basidioma production is stimulated by bacteria (Hayes *et al.*, *Ann. appl. Biol.* 64: 177, 1969). A bed may go on producing for 4 months; the mean weight of mushrooms is about 6 kg for every m² of bed, though higher weights are not uncommon. Cultivation of other commercial species can be more complex: *Tremella fuciformis*, for example, which grows on wood, derives its nutrition as a parasite from ascomycetes in the wood, and not from the wood itself.

Lit.: Chang *et al.* (Eds) (*Mushroom biology and mushroom products*, 1993), Ware (*Bull. Min. Agric., Lond.* 34, edn 4, 1938), Lambert (*Fmr's Bull. US Dep. Agric.* 1875, 1941; *Bot. Rev.* 4: 397, 1938),

- Maher (Ed.) (*Mushroom Science 13, Science and cultivation of edible fungi*, 1991), Stamets (*Growing gourmet and medicinal mushrooms*, 1993), Stoller (*Pl. Physiol.* 18: 397, 1943; artificial composts), Atkins (*Mushroom growing today*, edn 5, 1966), Singer & Harris (*Mushrooms and truffles*, 1987), Chang & Hayes (Eds) (*The biology and cultivation of edible mushrooms*, 1978; compr. review).
- Mushroom parasites*: *Mycogone pernicioso* (white mould, wet bubble; *IMI Descr.* 499), *Verticillium lamellicola* (dry bubble, brown spot, mole; flock), *V. fungicola*, *Cladobotryum dendroides* (mildew or cobweb diseases; *IMI Descr.* 498, *Fusarium solani*, *Myceliophthora* (q.v.). See also Hawksworth (in Cole & Kendrick (Eds), *The biology of conidial fungi* 1: 171, 1981), Jeffries & Young (*Interfungal parasitic relationships*, 1994).
- Mushroom losses are sometimes caused by the presence of other fungi which inhibit the development of the mushrooms (mushroom weeds). Examples of such fungi ('invaders') are: *Xylaria vaporaria* (= *X. pedunculata*), *Scopulariopsis fimicola* (see *Oospora*) and *Papulospora byssina* (white and brown plaster moulds), *Diehliomyces microsporus* (q.v.), *Clitocybe dealbata*, *Clitopilus augeana*; see also cat's ear. Recent sanitary techniques have eliminated some of these species from commercial production, leading to concern over the conservation status of the mushroom weed itself (Minter, *Descriptions of Fungi and Bacteria*, 1714, 2007).
- Mushroom pests*: see Ware (*loc. cit.*; *J.S.-E. agric. Coll., Wye* 31: 15, 1933 *et seq.*).
- mushroom stones**, mushroom-like effigies perhaps associated with Mayan religious cults, mainly S. Am. (see Lowy, *Mycol.* 63: 983, 1971).
- mushroom sugar**, see trehalose.
- Musicillium** Zare & W. Gams (2007), anamorphic *Plectosphaerellaceae*. 1, pantropical. See Zare *et al.* (*Nova Hedwigia* 85: 463, 2007).
- musiform**, banana-shaped (basidiospores in *Exobasidium*, fide Nannfeldt, *Symb. bot. upsala.* 23: 27, 1981).
- must** (1) unfermented or fermented grape juice; new wine; (2) = mould.
- mutagen**, a chemical or physical agent which promotes or increases the mutation rate.
- mutant**, a strain that differs by an induced or natural mutation of at least one genetic locus.
- Mutatoderma** (Parmasto) C.E. Gómez (1976), *Corticaceae*. 4, widespread. See Gómez (*Boln Soc. argent. Bot.* 17: 346, 1976).
- muticate** (adj. **muticous**), having no point; not sharp at the ends.
- Mutinus** Fr. (1849) nom. cons., *Phallaceae*. 12, widespread. See Guez & Nagasawa (*Nippon Kingakukai Kaiho* 41: 75, 2000; Japan).
- mutualism**, persistent and intimate association between organisms of different size in which the larger organism (the host) utilizes novel or enhanced properties possessed by the smaller partner(s) (symbionts), e.g. lichens, mycorrhizas. See Douglas & Smith (in Smith, *Pap. Proc. R. Soc. Tasmania* 123: 1, 1989), symbiosis.
- Muyocopron** Speg. (1881), *Microthyriaceae*. 7, widespread (tropical). See Hyde (*Sydowia* 49: 1, 1997).
- myc-** (**mycet-**, **myceto-**, **myco-**) (prefix), pertaining to fungi.
- Mycacodium** Reinke (1895) nom. inval. = *Acolium* (Ach.) Gray fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- mycangium** (pl. **mycangia**), a sac or cup-shaped fungal repository of ectodermal origin located in or on an ambrosia beetle (Batra, *Trans. Kansas Acad. Sci.* 66: 226, 1963).
- Mycardothelium**, see *Arthothelium*.
- Mycarthonia** Reinke (1895) ? = *Arthonia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Mycarthopyrenia** Keissl. (1921) = *Arthopyrenia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Mycarthothelium** Vain. (1928) = *Arthothelium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Mycasterotrema** Räsänen (1943) = *Asterotrema*.
- Mycastrum** Raf. (1813) = *Scleroderma* fide de Toni in Saccardo (*Syll. fung.* 7: 134, 1888).
- Mycaureola** Maire & Chemin (1922), *Physalacriaceae*. (parasitic on *Rhodophyceae*). See Binder *et al.* (*Am. J. Bot.* 93: 547, 2006; evolutionary relationships).
- Mycelia sterilia** Maire & Chemin (1922), *Physalacriaceae*. (parasitic on *Rhodophyceae*). See Binder *et al.* (*Am. J. Bot.* 93: 547, 2006; evolutionary relationships).
- mycelial cord**, a discrete filamentous aggregation of hyphae which, in contrast to a rhizomorph (q.v.), has no apical meristem; syrtotia. Thompson & Rayner (*TBMS* 78: 193, 1982) prefer not to use 'mycelial strand' for such structures.
- mycelial muff**, a subterranean hyphal system surrounding a living root (Buscott & Roux, *TBMS* 89: 249, 1987).
- Myceliochytrium** A.E. Johanson (1945), *Actinobacteria*. See Sparrow (*Aquatic Phycomycetes* Edn 2: 1187 pp., 1960), Karling (*Chytriomyc. Iconogr.*, 1977).
- Myceliophthora** Costantin (1892), anamorphic *Arthroderma*, *Ctenomyces*, Hso.0eH/1eP.1/3/10/13. 9, widespread (temperate). Also used for anamorphs of *Corynascus*, *Arthroderma*. *M. lutea* (vert-de-gris disease ('mat disease') of mushrooms in culture). See van Oorschot (*Stud. Mycol.* 20, 1980; key), Currah (*Mycotaxon* 24: 1, 1985), Guarro & Figueras (*Int. J. Mycol. Lichenol.* 3: 135, 1986), Stchigel *et al.* (*MR* 104: 879, 2000).
- Mycelites** W. Roux (1887), *Fossil Fungi* ? *Fungi*. 1 (Devonian – Recent), widespread.
- Mycelithe** Gasp. (1841), anamorphic *Polyporus*. 1. See Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974).
- Mycelium** nom. dub., anamorphic *Fungi*. auct. (obsol.). The name *M. radialis* has been used for certain mycorrhizal fungi.
- mycelium**, a mass of hyphae; the thallus of a fungus; 'spawn'; **mycelioid**, like mycelium. See Jennings & Rayner (Eds) (*The ecology and physiology of the fungal mycelium*, 1984), Gregory (*TBMS* 82: 1, 1984; review).
- Myceloblastanon** M. Ota (1924) = *Candida* fide Diddens & Lodder (*Die anaskosporogenen Hefen* 2, 1942), von Arx (*Gen. Fungi Sporul. Cult.* Edn 3, 1981; anamorph of *Pichia*).
- myceloconidium**, see stylospore.
- Myceloderma** Ducomet (1907), anamorphic *Pezizomycotina*, Hso.0eP/#eP.1. 1 (with pycnothyrial state), Europe.
- Mycena** (Pers.) Roussel (1806), *Mycenaceae*. Anamorph *Decapitatus*. c. 500, widespread. *M. citricolor*

on coffee, etc. is luminous (see Buller, 6). The genus is largely polyphyletic but a new classification has not yet been proposed. See Kühner (*Le Genre Mycena*, 1938), Smith (*North American species of Mycena* [reprint 1971], 1947), Métrod (*Les Mycènes de Madagascar*, 1949), Pearson (*Naturalist* Hull: 41, 1955; key Br. spp.), Haluwyn (*Docums Mycol.* 5: 17, 1972; ecology), Charbonnel (*Docums Mycol.* 7: 26, 1977; microsc. char.), Pegler (*Kew Bull. Addit. Ser.* 6, 1977; key 12 E. Afr. spp.), Maas Geesteranus (*Persoonia* 11: 93, 1980; subdiv.), Maas Geesteranus (*Proc. K. Ned. Akad. Wet. C* 86: 401, 1983; sect. *Sacchariferae*, *Basipedes*, *Bulbosae*, *Clavulares*, *Exiguae*, *Longisetae*), Maas Geesteranus (*Proc. K. Ned. Akad. Wet. C* 87: 131, 1984; sect. *Viscipellies*, *Amictae*, *Supinae*, 87: 413; sect. *Filipedes*), Maas Geesteranus (*Proc. K. Ned. Akad. Wet. C* 88: 339, 1985; sect. *Mycena*), Maas Geesteranus (*Proc. K. Ned. Akad. Wet. C* 89: 83, 1986; sect. *Lucentae*, *Carolineses*, *Monticola*), Maas Geesteranus (*Proc. K. Ned. Akad. Wet. C* 89: 159, 1986; sect. *Polyadelphia*, *Saetulipedes*), Maas Geesteranus (*Proc. K. Ned. Akad. Wet. C* 89: 279, 1986; sect. *Intermediae*, *Rubromarginatae*), Maas Geesteranus (*Proc. K. Ned. Akad. Wet. C* 91: 129, 1988; sect. *Fragilipedes*), Maas Geesteranus (*Proc. K. Ned. Akad. Wet. C* 91: 377, 1988; sect. *Lactipedes*, *Sanguinolentae*, *Galactopoda*, *Crocatae*), Maas Geesteranus (*Proc. K. Ned. Akad. Wet. C* 92: 89, 1989; sect. *Hygrocyboideae*), Maas Geesteranus (*Proc. K. Ned. Akad. Wet. C* 93: 163, 1990; sect. *Adonidae*, *Aciculae*, *Oregonenses*), Treu & Agerer (*Mycotaxon* 38: 279, 1990; culture), Maas Geesteranus (*Proc. K. Ned. Akad. Wet. C* 94: 81, 1991; sect. *Hiemales*, *Exornatae*), Emmett (*Mycologist* 6: 72, 114, 164, 1992), Maas Geesteranus (*Mycenas of the Northern Hemisphere*, 1992), Emmett (*Mycologist* 7: 4, 1993; Br. spp., list & key), Desjardin (*Bibliotheca Mycol.* 159: 1, 1995; sect. *Sacchariferae*, worldwide), Maas Geesteranus & Horak (*Bibliotheca Mycol.* 159: 143, 1995; Papua New Guinea, New Caledonia spp.), Desjardin *et al.* (*Fungal Diversity* 11: 69, 2002; sect. *Longisetae*), Grgurinovic (*Fungal Diversity Res. Ser.* 9: 329 pp., 2003; Australia), Miersch & Rönisch (*Z. Mykol.* 69: 123, 2003; sect. *Filipedes*), Robich (*Mycena d'Europa*: 728 pp., 2003; Eur. spp.), Lodge *et al.* (*Mem. N. Y. bot. Gdn* 89: 131, 2004; sect. *Hygrocyboideae* in Dominican Republic), Miersch *et al.* (*Feddes Repert.* 115: 43, 2004; key Eur. corticolous species), Robich (*Persoonia* 19: 1, 2006; key sect. *Fragilipedes* N hemisph.).

Mycenaceae Overeem (1926), Agaricales. 10 gen. (+ 35 syn.), 705 spp.

Lit.: Benny *et al.* (*Mycotaxon* 22: 119, 1985), Corner (*Gdns' Bull.* Singapore 39: 103, 1986), Maas Geesteranus (*Verh. K. Akad. Wet.* tweede sect. 1: 571 pp., 1992), Maas Geesteranus & Horak (*Bibliotheca Mycol.* 159: 208, 1995), Jin *et al.* (*Mycotaxon* 79: 7, 2001), Jin *et al.* (*Mycol.* 93: 309, 2001), Desjardin *et al.* (*Fungal Diversity* 11: 69, 2002), Grgurinovic (*Fungal Diversity Res. Ser.* 9: 329 pp., 2003), Lodge *et al.* (*Mem. N. Y. bot. Gdn* 89: 131, 2004).

Mycenastraceae Zeller (1948) = Agaricaceae.

Mycenastrum Desv. (1842), Agaricaceae. 1, widespread. See Heim (*Revue Mycol.* Paris 36: 81, 1971; Patouillard's spp.), Homrich & Wright (*Mycol.* 65: 779, 1973), Miller *et al.* (*Mycol.* 97: 530, 2005).

Mycenella (J.E. Lange) Singer (1938), Tricholomataceae. 10, widespread (temperate). See Boekhout

(*Persoonia* 12: 425, 1985; key Eur. spp.), Kühner (*Mycol. helv.* 3: 331, 1989; alpine spp.), Grgurinovic (*Victorian Naturalist* 110: 65, 1993; Australia), Robich (*Rivista di Micologia* 40: 365, 1997; *Mycenella margaritisporea*), Komorowska (*Polish Botanical Journal* 50: 83, 2005; Poland).

Mycenitis, see *Mycetinis*.

Mycenoporella Overeem (1926) c *Mycena* fide Kuyper (*in litt.*).

Mycenopsis Velen. (1947) ? = *Mycena* fide Kuyper (*in litt.*).

Mycenula P. Karst. (1889) = *Mycena* fide Singer (*Agaric. mod. Tax.*, 1951).

Mycepimyce Nieuwl. (1916) = *Sphaerellopsis* Cooke fide Sutton (*Mycol. Pap.* 141, 1977).

Mycerema Bat., J.L. Bezerra & Cavalc. (1963), Schizothyriaceae. Anamorph *Plenotrichaius*-like. c. 2, widespread (tropical). See Farr (*Mycol.* 79: 97, 1987).

Myces Paulet (1808) = *Fungus* Tourn. ex Adans.

mycetal, a fungus or a lichen (obsol.).

Myceteae, See *FUNGI*.

Mycetes (obsol.), (1) *Fungi*. (2) **mycetes**, a general term (obsol.) for minute vegetable organisms or microbes. Hence **mycetology** = mycology; schizomycetes = bacteria; etc.

-mycetes (suffix), indicating the rank of a fungal class (see Classification).

Mycetinis Earle (1909), Marasmiaceae. 8, widespread. See Wilson & Desjardin (*Mycol.* 97: 667, 2005).

Mycetism (**mycetismus**) (poisoning by larger fungi). This is of common occurrence and has a long history. Some people are allergic (see Allergy) or intolerant to mushrooms and illness may result from eating decayed or mouldy specimens, but serious poisoning is usually the result of eating fungus fruitbodies which contain toxins. About 6 species are both common and deadly poisonous. Symptoms vary from a slight stomach upset to death. It is important to identify the fungus consumed by the patient, as there are several different categories of poisoning. These include:

(1) *Cyclopeptide poisoning* (see amatoxins, phalotoxins) (by *Amanita phalloides*, *A. virosa*, *A. verna*). Symptoms first occur 4-6 h or more after ingestion. Early gastroenteric symptoms may obscure hepatic and renal damage. This, the most dangerous type, is responsible for most deaths by mushroom poisoning in Eur. and N. Am. but, where early treatment can be made, chances of recovery have been enhanced by the introduction of antiserum therapy and dialysis. Orellanine and Cortinarins (from *Cortinarius* spp.) have an incubation period of 2-20+ days and cause renal failure (see Muchelot & Tebbett, *MR* 94: 289, 1990).

(2) *Haemolytic poisoning* (*A. rubescens*, *A. vaginata*). Characterized by anaemia resulting from consumption of raw or undercooked mushrooms containing thermolabile haemotoxins.

(3) *Muscarine poisoning* (*A. muscaria*, *A. pantherina*). Early symptoms, within 2 h, include increased perspiration, salivation, dehydration, and nausea.

(4) *Coprine poisoning* (*Coprinus atramentarius*). See antabuse.

(5) *Psychotropic poisoning*. Hallucinations and delirium 2-4 h after ingestion. (a) Ibotenic acid, muscimol group (*A. muscaria*, *A. pantherina*): sleep, torpidity, or coma in extreme cases; (b) Indole group

(psilocin, psilocybin): stimulates psychic perception, see Hallucinogenic fungi.

(6) Gastroenteric irritants (*Entoloma sinuatum*, *Paxillus involutus*, *Agaricus xanthoderma*, *Boletus satanas*, *Hebeloma crustuliniforme*, many *Tricholoma* spp., *Hypholoma fasciculare*, several *Lactarius* and *Russula* spp.).

The ascomycete *Gyromitra esculenta* contains gyromitrin (q.v.) which causes gastroenteric discomfort, followed by hepatic and renal attack. This is the only fungus poisoning known to induce fever. The ascoma is edible if used without the cooking water or after drying.

Lit.: Dujarric de la Rivière & Heim (*Les champignons toxiques*, 1938; 600 refs), Heim (*Champignons toxiques et hallucinogènes*, 1963; edn 2, 1978), Arietti & Tomasi (*Funghi velenosi*, 1969), Duffy & Vergeer (*California toxic fungi*, 1977), Lincoff & Mitchell (*Toxic and hallucinogenic mushroom poisoning. A handbook for physicians and mushroom hunters*, 1977), Rumack & Salzman (Eds) (*Mushroom poisoning: diagnosis and treatment*, 1978), Pegler & Watling (*Bull. BMS* 16: 66, 1982; Br. toxic fungi), Ammirati *et al.* (*Poisonous fungi of the Northern United States and Canada*, 1985), Bresinsky & Besl (*Giftpilze mit einer Entführung in die Pilzbestimmung*, 1985 [Engl. transl. *A colour atlas of poisonous fungi*, 1990]), Oldridge *et al.* (*Wild mushroom and toadstool poisons*, 1989). See also amatoxins, Ergot, Mycotoxicoses, phallotoxins.

mycetismus, see Mycetism.

mycetobionts, fungus-dependent, used of obligate fungus-feeding arthropods.

mycetocyte, see mycetosome.

Mycetodium A. Massal. (1856) ≡ *Gomphillus*.

mycetology, see *Mycetes*.

mycetoma (maduramycosis, madura foot), a disease, esp. tropical, of humans, mostly adult males, of the foot or other part, usually acquired during agricultural work, resulting in tumefactions and characterized by mycotic granules ('grains') in the infected tissues. Although a clinical entity, many different fungi (**eumycetoma**) and actinomycetes (**actinomycetoma**) are involved. Mycetomas can be roughly classified according to whether the grains are white or yellow (*Aspergillus* spp., *Nocardia madurae*, *Pseudallescheria boydii*, etc.), red (*Streptomyces pelletieri*, *S. somaliensis*) or black (*Madurella mycetomatis*, etc.). See Mahgoub & Murray (*Mycetoma*, 1973).

Mycetophagites Poinar & R. Buckley (2007), Fossil Fungi, Basidiomycota. 1.

mycetophagy, see mycophagy.

mycetophiles, fungus-loving, facultative fungus-feeding arthropods.

mycetophilous, see mycophilic.

mycetosome, a sac-like structure in the gut of Anobiid beetles lined with cells (**mycetocytes**) containing yeast cells.

Mycetosporidium L. Léger & E. Hesse (1905), ? Fungi. 2 (on insects), Europe. See Tate (*Parasitology* 32: 462, 1940).

mycid, a secondary effect (manifested as eczema, urticaria, etc.) which is an allergic reaction to spores or toxin of a dermatophyte; dermatophytid. Cf. mycosis (2). A mycid may be a trichophytid (caused by *Trichophyton*); microsporid (*Microsporum*); epidermophytid (*Epidermophyton*).

-mycin (suffix), the recommended ending for names coined for antibiotics derived from actinomycetes.

Mycinema C. Agardh (1824) nom. dub. = *Corticium* Pers. fide Saccardo (*Syll. fung.* 326 6: 614, 1888).

myco- (prefix), pertaining to fungi.

Mycoacia Donk (1931), Meruliaceae. 15, widespread. See Ragab (*Mycol.* 43: 459, 1951), Eriksson & Ryvarden (*Cortic. N. Europ.* 4: 873, 1976; key Eur. spp.), Hjortstam & Ryvarden (*Syn. Fung.* 18: 20, 2004).

Mycoaciella J. Erikss. & Ryvarden (1978), Meruliaceae. 5, widespread. See Hjortstam *et al.* (*Kew Bull.* 45: 303, 1990; key), Hjortstam & Ryvarden (*Syn. Fung.* 18: 20, 2004).

Mycoalvimia Singer (1981), Tricholomataceae. 1, Brazil. See Singer (*Mycol.* 73: 504, 1981).

Mycoamaranthus Castellano, Trappe & Malajczuk (1992), Boletaceae. 3, Australasia; Africa; S.E. Asia. See Castellano *et al.* (*Aust. Syst. Bot.* 5: 613, 1992), Lumyong *et al.* (*Mycol. Progr.* 2: 323, 2003).

Mycoarachis Malloch & Cain (1970), Bionectriaceae. Anamorph *Acremonium*-like. 1 (coprophilous), widespread. See Valldosera & Guarro (*Nova Hedwigia* 47: 231, 1988), Rehner & Samuels (*CJB* 73 Suppl. 1: S816, 1995; phylogeny), Ogawa *et al.* (*Mycol.* 89: 756, 1997; phylogeny), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999; posn), Suh & Blackwell (*Mycol.* 91: 836, 1999; phylogeny).

Mycoarctium K.P. Jain & Cain (1973), ? Pezizales. 2 (coprophilous), Canary Islands; USA. See Korf & Zhuang (*Mycotaxon* 40: 79, 1991), van Brummelen (*Persoonia* 16: 425, 1998; posn).

Mycoarthopyrenia Cif. & Tomas. (1953) nom. illegit. ≡ *Arthopyrenia*.

Mycoarthris Marvanová & P.J. Fisher (2002), anamorphic *Hyaloscyphaceae*. 1, Great Britain. See Marvanová *et al.* (*Nova Hedwigia* 75: 258, 2002), Baschien *et al.* (*Nova Hedwigia* 83: 311, 2006; phylogeny).

Mycobacidia Rehm (1890) = *Arthrorhaphis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Mycobacillaria Naumov (1915), anamorphic *Pezizomycotina*, Hso. ≡ eP.1/10. 1, former USSR.

Mycobanche Pers. (1818) ≡ *Mycogone*.

Mycobilimbia Rehm (1890), ? Lecanorales (L). c. 26, widespread. See Awasthi & Mathur (*Proc. Indian Acad. Sci. Pl. Sci.* 97: 481, 1987; key 3 spp. India), Hafellner (*Herzogia* 8: 53, 1989; key 8 spp. Eur.), Pietschmann (*Nova Hedwigia* 51: 521, 1990; asci), Sarrión *et al.* (*Lichenologist* 35: 1, 2003; Spain), Buschbom & Mueller (*Mol. Phylogen. Evol.* 32: 66, 2004; phylogeny), Kantvilas *et al.* (*Lichenologist* 37: 251, 2005; S Hemisphere), Naesborg *et al.* (*MR* 111: 581, 2007; phylogeny).

mycobiont, the fungal component of a lichen (Scott, *Nature* 179: 486, 1957); cf. phycobiont, photobiont.

mycobiota (1) the total fungal inventory of the area under consideration (e.g. all the species present); (2) the fungal mass present (e.g. in a soil sample).

Mycoblastaceae Hafellner (1984), Lecanorales (L). 1 gen. (+ 3 syn.), 10 spp.

Lit.: Śliwa (*Fragm. flor. geobot.* 41: 491, 1996), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Arup *et al.* (*Mycol.* 99: 42, 2007; sister group relations with *Parmeliaceae*), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny).

Mycoblastomyces Cif. & Tomas. (1953) ≡ *Mycoblas-*

- tus.
- Mycoblastus** Norman (1853) nom. cons., Mycoblastaceae (L). 10, widespread. See Anders (*Hedwigia* 68: 87, 1928), James (*Lichenologist* 5: 114, 1971; key 4 Br. spp.), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Arup *et al.* (*Mycol.* 99: 42, 2007; sister group relations with *Parmeliaceae*).
- Mycobonia** Pat. (1894) nom. cons., Gloeophyllaceae. 1, widespread (tropical). See Martin (*Mycol.* 31: 247, 1939), Corner (*Beih. Nova Hedwigia* 78: 102, 1984; key).
- Mycoboniaceae** Jülich (1982) = Gloeophyllaceae.
- Mycobystrovia** Goujet & Locq. (1979), Fossil Fungi (mycel.) Fungi. 1 (Devonian), Europe.
- Mycocalia** J.T. Palmer (1961), Agaricaceae. 7, widespread. See Burnett & Boulter (*New Phytol.* 62: 217, 1963; mating systems), Jeppson (*Agarica* 6: 228, 1985; key), Malaval (*Docums Mycol.* 32: 19, 2002), Sarasini (*Gasteromiceti Epigei*: 406 pp., 2005).
- Mycocaliciaceae** Alf. Schmidt (1970), Mycocaliciales. 6 gen. (+ 4 syn.), 99 spp.
Lit.: Tibell (*Nova Hedwigia* Beih. 79: 597, 1984), Hutchison (*Mycol.* 79: 786, 1987), Tibell (*Nordic Jl Bot.* 10: 221, 1990), Tibell (*Nordic Jl Bot.* 13: 331, 1993), Tibell (*Ann. bot. fenn.* 33: 205, 1996), Tibell (*Symb. bot. upsal.* 32: 291, 1997; anams), Wedin & Tibell (*CJB* 75: 1236, 1997), Peterson & Rikkinen (*Mycol.* 90: 1087, 1998), Tibell (*Biblhca Lichenol.* 71: 107 pp., 1998; S. Am.), Selva & Tibell (*Bryologist* 102: 377, 1999), Rikkinen & Poinar (*MR* 104: 7, 2000), Tibell & Wedin (*Mycol.* 92: 577, 2000), Angeles Vinuesa *et al.* (*MR* 105: 323, 2001).
- Mycocaliciales** Tibell & Wedin (2000), (±L). Mycocaliciomycetidae. 2 fam., 8 gen., 108 spp. Thallus immersed, often absent. Ascomata stalked, brown or black. Asci cylindrical, uniformly thin-walled or thick-walled at least at the apex, evanescent or not. Ascospores brown, smooth or ornamented, sometimes in a mazaedial mass. Mainly saprobic on wood or bark, some lichenicolous, fungicolous or ? lichen-forming. Fams.:
- (1) **Mycocaliciaceae**
 - (2) **Sphinctrinaceae**
- Lit.*: Geiser *et al.* (*Mycol.* 98: 1051, 2006), Tibell & Wedin (*Mycol.* 92: 577, 2000), Wedin & Tibell (*CJB* 75: 1236, 1997).
- Mycocaliciomycetidae** Tibell (2007), Eurotiomycetes. Ord.:
- Mycocaliciales**
 For *Lit.* see fam.
- Mycocalicium** Vain. (1890), Mycocaliciaceae. Anamorph *Phialophora*-like. 11, widespread (esp. temperate). See Samuels & Buchanan (*N.Z. Jl Bot.* 21: 163, 1983; anamorph), Tibell (*Beih. Nova Hedwigia* 79: 597, 1984), Tibell (*Nordic Jl Bot.* 10: 221, 1990; anamorphs), Vinuesa *et al.* (*MR* 105: 323, 2001; ITS), Tibell & Vinuesa (*Taxon* 54: 427, 2005; phylogeny), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny), Muñiz & Hladun (*Lichenologist* 39: 205, 2007; Spain).
- Mycocandida** Langeron & Talice (1932) = *Candida* fide Diddens & Lodder (*Die anaskosporogenen Hefen* 2, 1942).
- Mycocarpon** S.A. Hutch. (1955), Fossil Fungi ? Ascomycota. 5 (Carboniferous), Europe; USA. See Baxter (*Paleont. Contrib. Univ. Kansas* 77, 1975), Pirozynski (*Ann. Rev. Phytopath.* 14: 237, 1976).
- mycocecidium**, see cecidium.
- Mycocentrodochium** K. Matsush. & Matsush. (1996), anamorphic *Pezizomycotina*, Hso.???. 1, Japan. See Matsushima & Matsushima (*Matsush. Mycol. Mem.* 9: 34, 1996).
- Mycocentrospora** Deighton (1972), anamorphic *Pleosporales*, Hso.≡ fH.10. 9, widespread. See Constantinescu (*Revue Mycol. Paris* 42: 105, 1978; conidial polymorphism), Braun (*Mycotaxon* 48: 275, 1993; reassessment), Braun (*Monogr. Cercosporaella, Ramularia Allied Genera (Phytopath. Hyphom.)* 1: 224, 1995; key), Marvanová (*Czech Mycol.* 49: 7, 1996; aquatic spp.), Stewart *et al.* (*MR* 103: 1491, 1999; phylogeny), Goodwin *et al.* (*Phytopathology* 91: 648, 2001; ITS seq. data; affinity with *Pleosporales*).
- Mycochaetophora** Hara & Ogawa (1931), anamorphic *Pezizomycotina*, Hso.0fH.?. 1, Japan.
- Mycochlamys** S. Marchand & Cabral (1976), anamorphic *Pezizomycotina*, Hso.0eP.10. 1 (from soil), Argentina. See Marchand & Cabral (*Boln Soc. argent. Bot.* 17: 66, 1976).
- Mycociferria** Tomas. (1953) ≡ Ciferriolichen.
- Mycocitrus** Möller (1901), Bionectriaceae. Anamorph *Acremonium*-like. 1 (on living bamboo stems), Asia (tropical). See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Mycocladius** Beauverie (1900), Syncephalastraceae. 4, widespread (esp. tropical). See Hesseltine & Ellis (*Mycol.* 56: 569, 1964), Mirza *et al.* (*Mucorales of Pakistan*, 1979), Vánová (*Česká Mykol.* 45: 25, 1991), Santos *et al.* (*Rev. Iberoam. Micol.* 22: 174, 2005; preservation, zygosporangium formation), Hoffman *et al.* (*MR* 111: 1169, 2007; phylogeny, classification).
- Mycoclelandia** Trappe & G.W. Beaton (1984), Pezizaceae. 2 (hypogaeous), Australia. See Trappe & Beaton (*TBMS* 83: 536, 1984), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- mycoclena** (orig. 'micoclena'), term coined by Peyronel (1922) for the 'fungus mantle' of an ectotrophic mycorrhiza having a loose structure; cf. mycoderm.
- Mycocoelium** Kütz. (1843) nom. dub., ? Fungi.
- Mycocoenogonium** Cif. & Tomas. (1954) = *Coenogonium* Ehrenb. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- mycocoenosis**, the complete assemblage of fungi within a certain plant community and its environment, or in the absence of green plants another defined habitat; see mycosociology, phytosociology.
- Mycoconiocybe** Reinke (1895) nom. inval. ? = *Coniocybe* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Mycocoscoma** Bref. (1912), Ustilaginales. 1, Europe.
- Mycocryptospora** J. Reid & C. Booth (1987), Dothideomycetes. 1, Germany. See Reid & Booth (*CJB* 65: 1333, 1987).
- Mycodendron** Masee (1891) nom. dub., Agaricomycetes. 'basidiomycetes' ? based on an abnormal polypore (see Donk, *Fungus* 28: 13, 1958).
- mycoderm**, coined by Ziegenspeck (1929) for a compact, tissue-like, ectotrophic mycorrhiza; cf. mycolena.
- Mycoderma** Desm. (1827) nom. illegit. = *Pichia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995) but see Wu *et al.* (*FEMS Yeast Res.* 6: 305, 2006; phylogeny).
- Mycoderma** Pers. (1822) nom. dub., *Pezizomycotina*.
- mycodextran**, an unbranched polysaccharide from *Aspergillus niger*, etc. (Barker *et al.*, *J. chem. Soc.*

- 1957: 2488, 1957); nigeran; see Bobbitt & Nordin (*Mycol.* 70: 1201, 1979; as phylogenetic marker).
- Mycodidymella** C.Z. Wei, Y. Harada & Katum. (1998), Pleosporales. Anamorphs *Blastostroma*, *Mycopappus*-like. 1 (on *Aesculus*), Japan. See Wei *et al.* (*Mycol.* 90: 334, 1998), Suto & Suyama (*Mycoscience* 46: 227, 2005).
- mycoecology**, ecology of fungi; see Ecology.
- Mycoëmia** Kurihara, Degawa & Tokum. (2004), Kickxellaceae. 1, Japan. See Kurihara *et al.* (*MR* 108: 1143, 2004).
- Mycoenterolobium** Goos (1970), anamorphic *Pezizomycotina*, Hso.#eP.1. 1 (conidia flattened and fan-shaped), widespread (tropical). See Goos (*Mycol.* 62: 171, 1970).
- Mycofalcella** Marvanová, Om-Kalth. & J. Webster (1993), anamorphic *Pezizomycotina*, Hso.???. 1, British Isles. See Marvanová *et al.* (*Nova Hedwigia* 56: 402, 1993).
- mycoflora**, see mycobiota (a more appropriate term as fungi are not plants).
- mycofungicides**, see Mycopesticides.
- Mycogala** Rostaf. ex Sacc. (1884) = *Orbicula* fide Hughes (*Mycol. Pap.* 42, 1951).
- Mycogalopsidaceae** Gjurašin (1925) = *Pyronemataceae*.
- Mycogalopsis** Gjurašin (1925), *Pyronemataceae*. 1, Europe.
- Mycogelidiaceae** W.Y. Zhuang (2007), *Basidiomycota* (inc. sed.). 1 gen., 1 spp. See Zhuang & He (*Mycosystema* 26: 339, 2007).
- Mycogelidium** W.Y. Zhuang (2007), *Mycogelidiaceae*. 1, China. See Zhuang & He (*Mycosystema* 26: 339, 2007).
- Mycogemma** K.M. Zalessky (1915), Fossil Fungi. 1 (Carboniferous), former USSR.
- mycogenous**, coming from, or living on, fungi.
- mycogeography**, study of the geographical distribution of fungi (q.v.).
- Mycoglaena** Höhn. (1909), *Dothideomycetes*. c. 10, Europe; N. America. See Riedl (*Öst. bot. Z.* 119: 41, 1971; key 6 spp.), Harris (*Mich. Bot.* 12: 3, 1973), Holm & Holm (*Nordic Jl Bot.* 11: 675, 1991).
- Mycogloea** L.S. Olive (1950), *Agaricostilbales*. Anamorph *Kurtzmanomyces*. 7, widespread. See McNabb (*TBMS* 48: 187, 1965), Kirschner *et al.* (*Antonie van Leeuwenhoek* 84: 109, 2003; anam.).
- Mycogone** Link (1809), anamorphic *Hypomyces*, Hso.1eH.1. 10, widespread. See Mushroom diseases. See Holland *et al.* (*TBMS* 85: 730, 1985; germination), Pöldmaa (*Stud. Mycol.* 45: 83, 2000; phylogeny).
- mycohaemia (mycohemias)**, a condition in which fungi are present in the blood stream.
- mycoherbicide** (1) a herbicide derived from a fungus; (2) a preparation of fungal spores used in the biocontrol of weeds (see Mycopesticides).
- myco-heterotrophic**, See Leake (*New Phytologist* 127: 171, 1994), Domínguez & Sérsic (*Mycologia* 96: 1143, 2004).
- Mycohypallage** B. Sutton (1963), anamorphic *Deshpandiella*, St.≡ eP.1. 1, Africa; Sri Lanka. See Sutton (*Mycol. Pap.* 88: 4, 1963).
- mycoin**, see patulin.
- mycoinsecticide**, a fungus used to control insects; see Entomogenous fungi, Mycopesticide.
- Mycokidstonia** D. Pons & Locq. (1981), Fossil Fungi. 1, France.
- Mycokluyveria** Cif. & Redaelli (1947) = *Pichia* fide von Arx *et al.* (*Stud. Mycol.* 14: 1, 1977), Wu *et al.* (*FEMS Yeast Res.* 6: 305, 2006; phylogeny).
- Mycolachnea** Maire (1937) = *Humaria* Fuckel fide Wu & Kimbrough (*Int. J. Pl. Sci.* 153: 128, 1992), Eriksson & Hawksworth (*SA* 11: 179, 1993).
- Mycolangloisia** G. Arnaud (1918) = *Actinopeltis* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- mycolatry**, the worship of fungi (introduced by Wasson, 1980).
- Mycolecidia** P. Karst. (1888) ? = *Dactylospora* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Mycolecis** Clem. (1909) ? = *Dactylospora* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Mycoleptodiscus** Ostaz. (1968), anamorphic *Omnidemtus*, Hsp.0-1eH.15. 16, widespread. *M. indicus* on vanilla. See Bezerra & Ram (*Fitopatol. Brasil* 12: 717, 1986), Sutton & Alcorn (*MR* 94: 564, 1990; key), Alcorn (*Aust. Syst. Bot.* 7: 591, 1994; incl. review of appressoria), Cannon & Alcorn (*Mycotaxon* 51: 483, 1994; teleomorph), Ando (*Czech Mycol.* 49: 1, 1996; Australia), Watanabe *et al.* (*Mycoscience* 38: 91, 1997; Dominican Republic).
- Mycoleptodon** Pat. (1897) = *Steccherinum* fide Donk (*Persoonia* 3: 199, 1964).
- Mycoleptodonoides** M.I. Nikol. (1952), *Meruliaceae*. 4, former USSR. See Nikolajeva (*Bot. Mater. Otd. Sporov. Rast. Bot. Inst. Komarova Akad. Nauk S.S.S.R.* 8: 117, 1952).
- Mycoleptorhaphis** Cif. & Tomas. (1953) = *Leptorhaphis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Mycolevis** A.H. Sm. (1965), *Albatrellaceae*. 1, N. America. *Basidioma* gasteroid. See Fogel (*Mycol.* 68: 1097, 1976), Albee-Scott (*MR* 111: 653, 2007; phylogenetic placement).
- Mycolindtneria** Rauschert (1988) = *Lindtneria* fide Rauschert (*Feddes Repert.* 98: 660, 1988).
- mycoliths**, sand grains bound together with mycelium, forming structures 5-6 cm long, esp. by *Melanospora tulasnei*.
- Mycological Society of America**. Founded in 1932; recognized as the Committee for North America within the International Mycological Association (q.v.); structure comprises individual and corporate members, and an elected executive; organizes annual meetings. Publications: *Inoculum*, *Mycologia*. Website: www.msafungi.org.
- mycologist**, one engaged in the pursuit of mycology.
- mycology**, the scientific study of fungi.
- mycolysis**, the lysis of a fungus.
- Mycomalus** Möller (1901), *Hypocreales*. 1, Brazil. See Shao *et al.* (*Taxonomy of Fungi*, 1984), Bischoff *et al.* (*Mycol.* 96: 1088, 2004).
- Mycomater** Fr. (1825) nom. dub., anamorphic *Fungi*. Based on mycelium fide Fries (*Summ. veg. Scand.*, 1849).
- Mycomedusa** R. Heim (1966) = *Favolaschia* fide Pegler (*Kew Bull. Addit. Ser.* 6, 1977).
- Mycomedusiospora** G.C. Carroll & Munk (1964), *Lasiochaeriaceae*. 1, Brazil; Costa Rica. See Carroll & Munk (*Mycol.* 56: 91, 1964).
- Mycomelanea** Velen. (1947), ? *Helotiales*. 1, former Czechoslovakia.
- Mycomelaspilea** Reinke (1895) ? = *Melaspilea* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).

Mycomicrothelia Keissl. (1936), Arthopyreniaceae ($\pm$ L). 44, widespread (esp. tropical). See Hawksworth (*Bull. Br. Mus. nat. hist. Bot.* 14: 43, 1985; key 25 spp.), Aptroot (*Bibliotheca Lichenol.* 44, 1991), Aptroot (*Nova Hedwigia* 60: 325, 1995), Sérusiaux & Aptroot (*Bryologist* 101: 144, 1998), Sipman & Aptroot (*Lichenologist* 37: 307, 2005; gen. limits), Aptroot *et al.* (*Bibliotheca Lichenol.* 97, 2008; Costa Rica).

Mycomyces Wyss-Chod. (1927), anamorphic *Pezizomycotina*. 1 (on humans), Europe.

Mycomycophytes, see *Mycophytes*.

mycomyringitis, a fungal inflammation of the eardrum.

mycomysticism, mystical state induced by eating hallucinogenic fungi.

Myconeesia Kirschst. (1936) = *Anthostomella* See Læssøe (*SA* 13: 43, 1994; ? synonym of *Xylaria*), Læssøe & Spooner (*Kew Bull.* 49: 1, 1994), Lu & Hyde (*Fungal Diversity Res. Ser.* 4, 2000).

myconematicides, see *Mycopesticides*.

Myconymphaea Kurihara, Degawa & Tokum. (2001), Kickxellaceae. 1, Japan. See Kurihara *et al.* (*MR* 105: 1398, 2001).

Mycopandora Velen. (1947) = *Unguicularia* fide Svrček (*Česká Mykol.* 40: 215, 1986).

Mycopappus Redhead & G.P. White (1985), anamorphic *Redheadia*, Sc.#eH-P.42. 2, north temperate. The genus is clearly polyphyletic, with disparate teleomorph links. See Redhead & White (*CJB* 63: 1430, 1985), Suto & Kawai (*Mycoscience* 41: 55, 2000), Suto & Suyama (*Mycoscience* 46: 227, 2005; teleomorph), Takahashi *et al.* (*Mycoscience* 47: 388, 2006; Japan).

Mycopara Bat. & J.L. Bezerra (1960), anamorphic *Pezizomycotina*, Cpd.0eH.15. 1 (on *Dimorפוריopsis*), USA. See Batista & Bezerra (*Publicações Inst. Micol. Recife* 286: 17, 1960).

mycoparasitism, the parasitism of one fungus by another (the **mycoparasite**); preferable to hyperparasitism which has been used for the same phenomenon; see *Fungicolous fungi*.

mycopathology, the study of disease caused by fungi.

Mycopographa Vain. (1921) ? = *Opegrapha* Ach. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Mycopopon Boise (1987), Melanommataceae. 2, widespread (neotropics). See Boise (*SA* 6: 167, 1987), Boise (*Mycotaxon* 52: 303, 1994; nomencl.), San Martín González (*Acta Bot. Mexicana* 35: 9, 1996), Bhattacharya *et al.* (*Mol. Biol. Evol.* 17: 937, 2000; posn).

Mycopesticides. Are mass-produced, usually commercially formulated and marketed products based on fungi which are pathogens, parasites or antagonists, of arthropod pests (mycoinsecticides), plant parasitic nematodes (myconematicides), weeds (mycoherbicides) or crop pathogens (mycofungicides), applied inundatively, like a chemical pesticide (Hall & Mann (Eds), *Biopesticides: use and delivery*, 1998). Mycopesticides have also been used to further political and military objectives, for example against illegal cultivation of drug plants like coca; such uses are generally secretive, and have raised public concerns (editorial, A very unholy war, *New Scientist* 2203: 3, 1999; website: www.mycoherbicide.info; see also *Biological control*, *Bioterrorism and fungi*, *Mycotoxins*).

The potential of mycoinsecticides was first investi-

gated more than 100 years ago when *Metarhizium anisopliae* was applied against weevil pests in the former USSR (Steinhaus, *Hilgardia* 26: 107, 1965). A mycopesticide using *Metarhizium anisopliae* has been developed for control of termites (Milner, in Lomer & Prior, *Biological control of locusts and grasshoppers* 200, 1992), scarab beetles (Rath, in Glare & Jackson, *Use of pathogens in scarab pest management*, 217, 1992) and black vine weevils (Wolfram, in *Proc. V Int. Colloq. Invert. Path. & Microb. Contr.* 2, 1990). *Metarhizium anisopliae* has been field tested against locusts and grasshoppers in Africa (Lomer & Prior, 1992; Driver *et al.*, *MR* 104: 134, 2000; Cherry *et al.*, *Biocontrol Science & Technology* 9: 35, 1999) and is currently marketed as Green Muscle[®]; see <http://www.lubilosa.org/>. *Beauveria bassiana* has been extensively employed against a range of crop pests but mainly at the semi-commercial or cottage-industry level, under the trade name Boverin[™] in the former USSR (Ferron, in Burge, *Microbial control of pests and plant diseases 1970-1980*, 45, 1981), and in a commune-produced system in China (Hussey & Tinsley, in Burge, 1981: 785). *Beauveria brongniartii* has been mass-produced and aerially applied against cockchafer pests in Switzerland and, despite problems with fungal stability and formulation (Zimmermann, in Glare & Jackson, 1992), is now a registered product (Engerlingspiz[®]).

The first commercial mycoinsecticides became available in the 1980s and were based on strains of *Verticillium lecanii* for aphid (Vertalec[™]) and whitefly (Mycotal[™]) control in glasshouses (Quinlan, in Burge, *Fungi in biological control systems* 19, 1988). *Aschersonia aleyrodis* has also been assessed for control of whitefly pests (Samson & Rombach, in Hussey & Scopes, *Biological pest control* 34, 1985). Production and marketing problems are discussed by Samson *et al.* (*Atlas of entomopathogenic fungi*, 1988) and Prior & Moore (*Biocontrol News Inf.* 14: 31, 1993).

Few myconematicides have been commercialized and, because of problems with quality control, inconsistent performance, potential health hazards and uneconomic application rates, none is currently available on the market (Stirling, *Biological control of plant parasitic nematodes*, 1991). Previous commercial or semi-commercial products have been based on: *Arthrobotrys robusta* (Royal 300[®]), *A. superba* (Royal 350[®]) and *Verticillium chlamydosporium* (Kerry *et al.*, *Ann. appl. Biol.* 105: 509, 1984; Kerry, in Brown & Kerry, *Principles and practice of nematode control in crops*, 233, 1987).

The use of mycoherbicides is a relatively recent concept but a number of products are already on the market: COLLEGO (*Colletotrichum gloeosporioides* f.sp. *aeschynomenes* for control of northern joint-vetch, DeVine (*Phytophthora palmivora*) for control of milkweed vine; CASST (*Alternaria cassiae*) for control of sicklepod; Bio Mal (*C. gloeosporioides* f.sp. *malvae*) against round-leaved mallow; BioChon (*Chondrostereum purpureum*) for stump treatment of woody invasives (DeJong, *Mycologist* 14: 58, 2000); while several others are in the final stages of commercialization (Charudattan, in Burge (Ed.), *Fungi in biological control systems* 86, 1988; TeBeest & Templeton, *Plant Disease* 69: 6, 1985; Charudattan, in TeBeest (Ed.), *Microbial control of weeds*, 24,

1991). Although most are readily culturable, necrotrophic pathogens, marketing of the rust *Puccinia canaliculata*, as a formulated product ('Dr Biosedge') for control of yellow nutsedge has been proposed (Phatak, *Proc. I. Int. Weed Control Conf.* 388, 1992). Considerable research is now being concentrated on fermentation technology and formulation to improve performances of potential mycoherbicides (*Pl. Prot. Quart.* 7 (4): 30 pp., 1992; Auld, *Crop Protection* 12: 477, 1993); Burge (Ed., *Formulation of microbial biopesticides*, 1998); Green *et al.* (in Boland & Kuykendall (Eds), *Plant – microbe interactions and biological control*: 249, 1997).

The first mycofungicide, and indeed one of the first commercially available mycopesticides, arose from the pioneering work of Rishbeth (*Ann. appl. Biol.* 52: 63, 1963) who investigated the potential of *Phlebia gigantea* for control of butt rot of conifers caused by *Heterobasidion annosum* (Deacon, *Microbial control of plant pests and diseases*, 1983; Campbell, *Biological control of microbial plant pathogens*, 1989). Most work has concentrated on *Trichoderma* and *Gliocladium* as antagonists; reviewed by Lynch & Ebben (*J. appl. Bact. Symp. Suppl.* 1986, 115), Papavizas (*Ann. Rev. Phytopath.* 23: 23, 1985), Whipps & Lumsden (Eds) (*Biotechnology of fungi for improving plant growth* 1989) and Whipps (*Aspects Appl. Biol.* 24: 211, 1990). Apart from Binab T, based on *T. viride*, for control of forest diseases, GlioGard™ (now SoilGard™) based on *Trichoderma virens* has been marketed recently for control of *Rhizoctonia solani* and *Pythium ultimum* in horticultural crops (Mink & Walker, in Lumsden & Vaughn (Eds), *Pest management: biologically based technologies*, 398, 1993).

Mycophaga F. Stevens (1924) ? = *Hyaloderma* fide Pirozynski (*Kew Bull.* 31: 595, 1977).

mycophage (1) a mycophagist; (2) a phage-like antibacterial substance produced by certain actinomycetes.

mycophagist, an eater of fungi.

mycophagy (adj. **mycophagous**), (1) the use of fungi as food; mycetophagy; (2) the lysis of a fungus by a phage.

Mycopharus Petch (1926) = *Lysurus* fide Dring (*Kew Bull.* 35: 1, 1980).

mycophilic (1) fond of fungi (or mushrooms); mycetophilous; see Fungicolous fungi; (2) growing on fungi.

mycophobia, fear of mushrooms.

mycophthorous (of a fungus), parasitic on another fungus; see mycoparasitism.

Mycophycias Kohlm. & Volkm.-Kohlm. (1998) = *Stigmidium* fide Kohlmeyer & Volkmann-Kohlmeyer (*SA* 16: 2, 1998), Aptroot (*CBS Biodiversity Series* 5, 2006).

mycophycobiosis, an obligate symbiosis between a systemic (inhabitant) marine fungus and a marine alga in which the alga is the exhabitant and dominates (Kohlmeyer & Kohlmeyer, *Bot. Mar.* 15: 109, 1972), e.g. *Mycosphaerella ascophylli* on *Ascophyllum nodosum*; cf. Lichens.

Mycophycophila Cribb & J.W. Cribb (1960) = *Chadefaudia* fide Müller & von Arx in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 87, 1973).

Mycophycophyta. Phylum name used by Margulis (*Symbiosis in cell evolution*, edn 2, 1993) for all lichens regardless of the systematic position of either the fungal, algal or cyanobacterial partners; i.e. embracing

lichen-forming *Ascomycota* and *Basidiomycota* as well as their photosynthetic partners. ≡ *Lichenes*. See Lichens.

Mycophycophytes, see *Mycophytes*.

Mycophyta, see *Eumycetes*.

Mycophytes (obsol.) = Mycomycophytes (i.e. non-lichenized fungi) + Mycophycophytes (i.e. lichenized fungi) (Marchand, *Énumération méthodique des Mycophytes*, 1896).

Mycoplacographa Reinke (1895) ? = *Lithographa* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

mycoplasma, a symbiotic phase of rust fungus and host protoplasm (Eriksson; now taken as an error); see also mycoplasma.

mycoplasma (1) an intimate relationship between plant-invading fungi or other microorganisms and their host cells (Frank, *Ber. Deutsch. bot. Ges.* 7: 332, 1889) (obsol.); (2) bacterium-like organisms without a cell wall living inside cells of a host, mollicutes (Krass & Gardner, *Internat. J. Syst. Bact.* 23: 62, 1973).

Mycoporaceae Zahlbr. (1903), ? Dothideomycetes (inc. sed.). 1 gen. (+ 3 syn.), c. 28 spp.

Lit.: Harris (*Mich. Bot.* 12: 3, 1973), Coppins & James (*Lichenologist* 11: 27, 1979), Eriksson (*Op. Bot.* 60, 1981), Lumbsch (*Pl. Biol.* 1: 321, 1999).

Mycoporellum Müll. Arg. (1884), Dothideomycetes. 7, widespread. See Riedl (*Sydowia* 15: 257, 1962).

Mycoporis Clem. (1909), Dothideomycetes. 1, Austria.

Mycoporopsis Müll. Arg. (1885), Dothideomycetes (?L). 6, widespread. See Riedl (*Sydowia* 16: 215, 1963).

Mycoporum Flot. ex Nyl. (1855) nom. cons., Mycoporaceae (±L). c. 28, widespread. See Harris (*Mich. Bot.* 12: 3, 1973), Coppins & James (*Lichenologist* 11: 27, 1979), Lumbsch (*Pl. Biol.* 1: 321, 1999; development), Aptroot *et al.* (*Biblotheca Lichenol.* 97, 2008; Costa Rica).

Mycoporum G. Mey. (1825) nom. rej., Pyrenulales.

mycoprotein, fungal protein, e.g. 'Quorn' (q.v.); commercially processed mycelium of non-pathogenic *Fusarium venenatum* (also sometimes and formerly called *Fusarium graminearum* A35) for human consumption (Newark, *Nature* 287: 6, 1980); see Gray & Staff (*Econ. Bot.* 21: 341, 1966), Trinci (*MR* 96: 1, 1992).

Mycopyrenium Hampe ex A. Massal. (1860) = *Thelotrema* fide Zahlbruckner (*Catalogus Lichenum Universalis* 2, 1923).

Mycopyrenula Vain. (1921) = *Pyrenula* Ach. (1809) fide Harris (*Mem. N. Y. bot. Gdn* 49, 1989).

Mycorhizonium F.E. Weiss (1904), Fossil Fungi (mycorrhizal) Fungi. 1 (Cretaceous), British Isles.

Mycorhynchella Höhn. (1918) = *Ceratocystis* fide Sutton (*Mycol. Pap.* 141, 1977).

Mycorhynchidium Malloch & Cain (1971), Pyxidioraceae. 1 (coprophilous), Kenya. See Malloch & Cain (*CJB* 49: 850, 1971).

Mycorhynchus Sacc. & D. Sacc. (1906) = *Pyxidiorhiza* fide Lundqvist (*Bot. Notiser* 133: 121, 1980).

Mycorrhaphiaceae Jülich (1982) = *Steccherinaceae*.

Mycorrhaphium Maas Geest. (1962), Meruliaceae. 3, USA; Europe; Africa. See Ryvarden (*Mem. N. Y. bot. Gdn* 49: 344, 1989; key), Mossebo & Ryvarden (*Mycotaxon* 88: 229, 2003; Africa).

Mycorrhiza (pl. **mycorrhizas**, **mycorrhizae**) (fungus root). A symbiotic, non-pathogenic or feebly or

weakly pathogenic association of a fungus and the roots of a plant. Found in most, perhaps 85% of plant species. The resulting dual organism (cf. lichen) was first described in detail by Frank (1895) who observed it on the roots of the major tree species of temperate forests. Frank (1887) then recorded two types of mycorrhiza, which he called: (a) **ectotrophic** (the characteristic mycorrhiza of temperate and boreal forest trees with different basidiomycetes esp. spp. of *Amanita*, *Boletus*, *Cortinarius*, *Russula*, *Suillus*, and some ascomycetes, e.g. *Tuber*), in which the fungus forms a sheath on the surface of the root from which hyphae extend outward into the soil and inwards between the outer cortical cells with which they interface to form a 'Hartig net'; and: (b) **endotrophic** (e.g. of orchid-basidiomycete and ericoid-ascomycete associations) in which the fungal hyphae enter the cortical cells of the root, enveloped by the plasmalemma of host.

The mycorrhiza now known to be most widely distributed both through the plant kingdom (see Trappe, in Safir *et al.*, 1987), and geographically, is a type of endo-association formed by *Glomeromycota* and called vesicular-arbuscular (VA, or VAM). In this, the penetrating hyphae produce finely branched haustorial branches (arbuscules) or coils (pelotons) and vesicles (Schlicht, 1889; Gallaud, 1905; Mosse, 1956). The taxonomic status of VA fungi is reviewed by Morton & Benny (*Mycotaxon* 37: 471, 1990). VA mycorrhizas are known from the fossil record going back at least 400 million years (Remy *et al.*, *Proc. nat. acad. sci.* 91: 11841, 1994).

Current classifications of mycorrhizal types avoid use of the suffix 'trophic' and recognize the following categories: **Ectomycorrhiza**, **Vesicular-arbuscular** (occasionally simply 'arbuscular'; **AM**), **Ericoid**, **Orchid**, **Arbutoid** and **Monotropoid** (Lewis, *Biol. Rev.* 48: 261, 1973; Read, *CJB* 61: 985, 1983).

For the fungal partner, the main benefit is usually constant access to a supply of carbohydrates produced by the plant partner's photosynthesis. For the plant partner, the benefit is an enhanced supply of mineral nutrients from the soil, taken up by the hyphae of the fungal partner. These, being more narrow than root hairs, have a larger surface area through which mineral absorption can take place, and can approach more closely to a mineral nutrient source, thereby steepening the diffusion gradient by which the nutrients may move. Mycorrhizal associations are therefore particularly beneficial for plants growing on nutrient poor soils. Fungal partners are known which trap insects and thereby enhance the supply of nitrogen for the plant partner (Klironomos & Hart, *Nature* 410: 651, 2001).

Early development of some plants, especially those with very small seeds (e.g. orchids) is completely dependent upon establishment of a successful fungal association. This dependence may be retained where, as in *Monotropaceae*, and some members of *Orchidaceae* and *Gentianaceae*, plants lack chlorophyll throughout their lives, and hence continue to require all carbon and most mineral supplies from their fungal symbiont. In green plants the main function of the association differs according to mycorrhizal type. Enhancement of phosphorus (P) supply to the plant is characteristic of VA associations, that of nitrogen (N) of ericoid associations, while both N and P supplies

can be supplemented by ecto, ectendo and probably orchid associations. The global distribution of mycorrhizal types largely reflects these functional attributes, selection favouring plants with VA fungi in primarily P limited tropical and temperate grasslands, ectomycorrhizal plants in predominantly N and P limited temperate and boreal forests, and ericoid plants in N-limited tundra (Read, *Experientia* 47: 376, 1991). In each of these circumstances the associated plants show differing levels of responsiveness depending upon the extent of nutrient limitation and the structure of their root systems. Those with 'fibrous' root systems, e.g. grasses, are less responsive than those with coarsely branched so called 'magnolioid' roots (Baylis, see Sanders *et al.*, 1975).

In the past 50 years, many plantations of northern-hemisphere conifers have been established on poor soils in southern hemisphere countries, and mycorrhizal fungi known to enhance their growth have been deliberately introduced with them. Concern has been voiced that this can lead to carbon depletion, thereby contributing to rather than ameliorating climate change (Chapela *et al.*, *Soil biol. biochem.* 33: 1733, 2001).

Lit.: Agerer (*Colour atlas of ectomycorrhizae*, 1991), Allen (*Ecology of ectomycorrhizae*, 1990), Currah & Zelmer (*Rep. Tottori mycol. Inst.* 30: 43, 1992; key 15 gen. with orchids), Declerk *et al.* (Eds) (*In vitro culture of mycorrhizas*, 2005), De Roman *et al.* (*MR* 109: 1063, 2005; revision of ectomycorrhiza descriptions since 1961), Frank (*Ber. dtsch bot. Ges.* 3: 128, 1885; 5: 248, 1887), Gallaud (*Rev. Gen. Bot.* 17: 5, 1905), Gianinnazzi & Schüepp (Eds) (*Impact of arbuscular mycorrhizas on sustainable agriculture and natural ecosystems*, 1994), Harley (*Biology of mycorrhiza*, 1959, edn 2, 1970), Harley & Harley (*A check-list of mycorrhiza in the British flora*, 1987; *New Phytol. Suppl.* 105), Harley & Smith (*Mycorrhizal Symbiosis*, 1983), Kapulnik & Douds (*Arbuscular mycorrhizas: physiology and function*, 2000), Kelly (*Mycotrophy in plants*, 1950), Khalil *et al.* (*Soil Biol. Biochem.* 26: 1587, 1994; recovery VAM spores from soil), Marks & Kozlowski (Eds) (*Ectomycorrhizae their physiology and ecology*, 1973), Mejstřík *et al.* (Eds) (*Agric., Ecosyst. Environ.* 28-29, 1990; Eur. Congr. Mycorr.), Melin (*Untersuchungen über die Bedeutung der Baummycorrhiza*, 1925), Morton (*Mycotaxon* 32: 267, 1988; checklist 126 VA spp.), Mosse (*Ann. Bot. Lond.* 20: 349, 1956), Norris *et al.* (Eds) (*Techniques for the study of mycorrhiza. Methods in Microbiology* 23 & 24, 1991), Peterson *et al.* (*Mycorrhizas: anatomy and cell biology*, 2004), Read *et al.* (Eds) (*Mycorrhizas in ecosystems*, 1992), Safir (Ed.) (*Ecophysiology of VA mycorrhizal plants*, 1987), Sanders *et al.* (Eds) (*Endomycorrhiza*, 1975), Schlicht (*Landwirtsch. Jahrb.* 18: 478, 1889), Sieverding (*VA mycorrhiza management in tropical agroecosystems*, 1991), Trappe (*Bot. Rev.* 28: 538, 1962; fungus & tree lists, 407 refs.), Varma & Hoch (Eds) (*Mycorrhiza: structure, function, molecular biology and biochemistry*, 1995); see also the journal *Mycorrhiza* (1991-).

Mycosarcoma Bref. (1912) = *Ustilago* fide Vánky (*in litt.*).

mycosclerid, see cystidium.

mycose, see trehalose.

mycosin, a nitrogenous substance like animal chitin in the cell wall of fungi.

mycosis (pl. **mycoses**), (1) a fungus disease of humans, animals, or, rarely, plants (e.g. tracheomycosis). Mycoses are frequently named after the part attacked (**broncho-**, respiratory tract; **dermato-**, skin; **onycho-**, nails; **oto-**, ear; **pneumo-**, lungs), or the pathogen **blasto-** (q.v.) (*Blastomyces*); **coccidioido-**, coccidioidal granuloma (*Coccidioides immitis*); (2) the first limited infection of a dermatophyte; cf. mycid. Nomenclature, see Odds (*J. med. vet. Mycol.* 30: 21, 1992). See AIDS, Medical and veterinary mycology.

Mycosisymbrium Carris (1994) = *Scolecobasidiella* fide Sutton (*in litt.*).

mycosocieties (1) communities of fungi occurring in a special habitat; see Winterhoff (1992), mycosociology; (2) mycological societies (see Societies and organizations).

Mycosociology, the study of fungal communities. Some communities of lichens and plants have a long tradition of being named using rules developed for plant communities (Barkman *et al.*, *Vegetatio* 67: 145, 1986), and this form of name has also sometimes been used for other fungi, e.g. the association *Clitocybo-Phellodonetum nigrae* (Smarda, *Acta Nat. Acad. Sci. Bohemoslov.* 7, 1973).

Darimont (*Inst. roy. Sci. nat. Brussels, Mém.* 170, 1975), introduced a separate system for fungi in which the basic unit was the **sociomycie** (the name for which terminates in '-ecium', e.g. *Amanitecium muscaria*) ($\pm$ = 'association') which are grouped (in ascending order) as 'alliances' ('-ecion'; *Boletecion scabri*), 'orders' ('-ecia'; *Boleto-Amanitecia*), and 'classes' ('-ecia'; *Cortinario-Boletacea*).

The number of works explicitly on this topic remains small, but includes studies in southern Chile (Valenzuela *et al.*, *Mycotaxon* 72: 217, 1999). Issues relating to mycosociology were reviewed by Hawksworth & Mueller in Dighton *et al.*, *The fungal community: its organization and role in the ecosystem*, 2005).

See also Benkert (*Boletus* 2: 37, 1978; synopsis approach, bibliogr.), Winterhoff (Ed.) (*Fungi in vegetation science [Handbook of Vegetation Science* 19(1)], 1992), mycocoenosis, mycosynusium, Phytosociology.

Mycosphaerangium Verkley (1999), Helotiales. 3 (from dead wood), USA. See Verkley (*Stud. Mycol.* 44: 180 pp., 1999).

Mycosphaerella Johanson (1884), *Mycosphaerellaceae*. Anamorphs many, esp. *Cercospora*, *Cercosporidium*, *Passalora*, *Pseudocercospora*, *Ramularia* and *Septoria*. c. 647, widespread. A large genus with enormously varied anamorphs. Several large groups have been removed (e.g. *Davidiella*, *Teratosphaeria*, but it may well require further subdivision. See von Arx (*Sydowia* 3: 28, 1949; anamorph gen.), von Arx (*Proc. K. ned. Akad. Wet. Ser. C, Biol. Med. Sci.* 86: 15, 1983; anamorph gen.), Evans (*Mycol. Pap.* 153, 1984; on *Pinus* (now as *Eruptio*)), Sivanesan (*Bitunicate Ascomycetes and their Anamorphs*, 1984), Niyo *et al.* (*Mycol.* 78: 202, 1986; ultrastructure), Corlett (*Mycotaxon* 31: 59, 1988; on *Brassicaceae*), Corlett (*Mycol. Mem.* 18: 328 pp., 1991; nomenclator), Corlett (*Mycotaxon* 53: 37, 1995; catalogue names), Crous (*Mycol. Mem.* 21: 170 pp., 1998; spp. on *Eucalyptus*), Fröhlich & Hyde (*Sydowia* 50: 171, 1998; spp. on palms), Crous (*MR* 103: 607, 1999; spp. on *Myrtaceae*), Crous & Corlett (*CJB* 76: 1523, 1998; spp. on *Platanus*), Silva-Hanlin

& Hanlin (*MR* 103: 153, 1999; DNA), Stewart *et al.* (*MR* 103: 1491, 1999; DNA), Crous *et al.* (*Stud. Mycol.* 45: 107, 2000; review), Taylor & Crous (*MR* 104: 618, 2000; on *Proteaceae*), Verkley & Priest (*Stud. Mycol.* 45: 123, 2000; *Septoria anams.*), Crous *et al.* (*MR* 105: 425, 2001; ITS of spp. on *Myrtaceae*), Crous *et al.* (*Mycol.* 93: 1081, 2001; phylogeny), Goodwin *et al.* (*Phytopathology* 91: 648, 2001; phylogeny), Milgate *et al.* (*Forest Pathology* 31: 53, 2001; on *Eucalyptus*), Crous & Mourichon (*Sydowia* 54: 35, 2002; on banana), Kuijpers & Aptroot (*Nova Hedwigia* 75: 451, 2002; long-spored spp.), Linde *et al.* (*Petria* 12: 95, 2002; population structure), Sivanesan & Shivas (*MR* 106: 355, 2002; Australia), Braun *et al.* (*Mycol. Progr.* 2: 3, 2003; exclusion of *Davidiella*), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003; anamorphs), Crous *et al.* (*Sydowia* 55: 136, 2003; separation from *Sphaerulina*), Hayden *et al.* (*Pl. Path.* 52: 703, 2003; on banana), Taylor *et al.* (*MR* 107: 653, 2003; phylogeny on *Proteaceae*), Zhan *et al.* (*Fungal Genetics Biol.* 38: 286, 2003; *M. graminicola* genetics), Crous *et al.* (*CBS Diversity Ser.* 2, 2004; anamorphs), Crous *et al.* (*Stud. Mycol.* 50: 195, 2004; on *Eucalyptus*), Crous *et al.* (*Stud. Mycol.* 50: 457, 2004; on *Acacia*), Verkley *et al.* (*MR* 108: 1271, 2004; typification), Hayden *et al.* (*Phytopathology* 95: 489, 2005; genetics), Aptroot (*CBS Diversity Ser.* 5, 2006; monogr.), Crous *et al.* (*Stud. Mycol.* 55: 99, 2006; on *Eucalyptus*), Hunter *et al.* (*Stud. Mycol.* 55: 147, 2006; on *Eucalyptus*), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogenetic posn), Crous *et al.* (*Stud. Mycol.* 58: 1, 2007; phylogeny), Arzanlou *et al.* (*Persoonia* 20: 19, 2008; on *Musa*).

Mycosphaerellaceae Lindau (1897) nom. cons., Capnodiales. 53 gen. (+ 70 syn.), 6033 spp.

Lit.: Scharen & Sanderson (*Septoria of Cereals* Proceedings of the Workshop held August 2-4, 1983, at Montana State University, Bozeman, Montana: 37, 1985), Corlett (*Mycol. Mem.* 18: 328 pp., 1991), Johanson *et al.* (*Pl. Path.* 43: 701, 1994), Cannon *et al.* (*MR* 99: 353, 1995), David (*Mycol. Pap.* 172: 157 pp., 1997), Crous (*Mycol. Mem.* 21: 170 pp., 1998), Caten (*Septoria on Cereals* A Study of Pathosystems: 26, 1999), Crous (*MR* 103: 607, 1999), Crous & Corlett (*CJB* 76: 1523, 1998), Cunfer & Ueng (*Ann. Rev. Phytopath.* 37: 267, 1999), Stewart *et al.* (*MR* 103: 1491, 1999), Taylor *et al.* (*Ann. Rev. Phytopath.* 37: 197, 1999), Crous *et al.* (*Stud. Mycol.* 45: 107, 2000), Verkley & Priest (*Stud. Mycol.* 45: 123, 2000), Crous *et al.* (*Mycol.* 93: 1081, 2001), Braun *et al.* (*Mycol. Progr.* 2: 8, 2003), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003), Hunter *et al.* (*MR* 108: 672, 2004), Verkley *et al.* (*Mycol.* 96: 558, 2004), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).

Mycosphaerellales P.F. Cannon (2001) = Capnodiales.

Mycosphaerellopsis Höhn. (1918) = *Didymella* fide Barr (*Mycotaxon* 60: 433, 1996).

Mycospongia Velen. (1939) nom. dub., ? Agaricales. ? 'gasteromycetes'.

Mycospraguea U. Braun & Rogerson (1993), anamorphic *Pezizomycotina*, Cac. = eH.1. 1, USA. See Braun (*Cryptog. bot.* 4: 108, 1993).

mycostasis (adj. **mycostatic**), inhibition of fungal growth; fungistasis (fungistatic); sporostasis; **mycostatic** in soil, see Dobbs *et al.* (*Nature* 172: 197, 1953), Parkinson & Waid (Eds) (*The ecology of fungi*, 130, 1960).

mycostatin, trade name for nystatin.

Mycostevensonia Bat. & Cif. (1962) = *Treubiomyces* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).

Mycosticta Höhn. (1918), anamorphic *Pezizomycotina*, ?0eH.?. 1, Europe.

Mycostigma Jülich (1976), ? *Atheliaceae*. 1, Europe. See Jülich (*Persoonia* 8: 432, 1976).

mycostratum, see *perisporium*; Spore wall.

Mycosylva M.C. Tulloch (1973), anamorphic *Pezizomycotina*, Hsy.0eH.3. 3, Europe; Asia (esp. temperate). See Samson & Hintikka (*Karstenia* 14: 133, 1974).

mycosymbiont, see *mycobiont*.

mycosymbiosis, symbiosis of two or more fungi (Vainio, 1921; cf. *Gonidiomyces*).

mycosynusium (pl. -iae), a part of the total number of fungal communities in a site or region studied; e.g. **macrofungussynusiae** (only macromycetes considered); see Winterhoff (1992), *mycosociology*.

Mycosyringaceae R. Bauer & Oberw. (1997), *Urocystidales*. 1 gen., 4 spp.

Lit.: Vánky (*Cryptog. Stud.* 1: 159 pp., 1987), Vánky (*Mycoscience* 37: 173, 1996), Bauer & Oberwinkler (*Mycotaxon* 64: 303, 1997), Bauer *et al.* (*CJB* 75: 1273, 1997), Piepenbring *et al.* (*Protoplasma* 204: 170, 1998), Vánky (*MR* 102: 513, 1998), Vánky (*Mycol. Balcanica* 1: 175, 2004).

Mycosyrinx Beck (1894), *Mycosyringaceae*. 4 (on *Vitaceae*), pantropical. See Mordue (*Mycopathologia* 103: 171, 1988), Vánky (*Mycoscience* 37: 173, 1996; key).

Mycota, See *FUNGI*.

mycothallus (pl. -lli), a mutualistic symbiosis of a fungus with a hepatic (liverwort) or fern gametophyte (Boullard, *Syllogeus* 19: 1, 1979; in Pirozynski & Hawksworth (Eds), *Coevolution of fungi with plants and animals*: 107, 1988).

Mycothamnion Kütz. (1843) nom. dub., ? *Fungi*.

mycotheca, a distributed set of dried specimens of fungi.

Mycothele Jülich (1976), ? *Gloeophyllaceae*. 1, New Zealand. See Jülich (*Persoonia* 8: 452, 1976).

Mycothelocarpon Cif. & Tomas. (1953) nom. illegit. = *Thelocarpon*.

Mycothyridium E. Müll. (1973) = *Thyridium* Nitschke fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Mycothyridium Petr. (1962), *Dothideomycetes*. 36, widespread. See Petrak (*Sydowia* 15: 288, 1972), Eriksson & Hawksworth (*SA* 13: 191, 1994; nomencl.).

mycotic (esp. of disease), caused by fungi.

Mycotodea Kirschst. (1936), *Pezizomycotina*. 14 (on *Musci*), widespread. See Hawksworth (*SA* 8: 71, 1989; posn).

mycotope, a major fungal association of a particular type of woodland (Darimont, 1975); see *mycosociology*.

Mycotorula H. Will (1916) = *Syringospora* fide von Arx *et al.* (*Stud. Mycol.* 14: 1, 1977).

Mycotoruloides Langeron & Talice (1932) = *Syringospora* fide von Arx *et al.* (*Stud. Mycol.* 14: 1, 1977).

Mycotoxicoes. Literally fungus poisonings, but in current use limited to poisoning of animals and esp. humans, usually by feed and food products contaminated (and sometimes rendered carcinogenic) by toxin-producing microfungi, also by contact with toxin-containing microfungi in particular environments (e.g. sick-building syndrome). See aflatoxins,

citreoviridin, citrinin, fumonisins, islanditoxin, lupinosis, luteoskyrin, lysergic acid, maltoryzine, ochratoxin, patulin, roridins, rubratoxin, satratoxins, slaframine, sporidesmin, sterigmatocystin, tremorgen, trichothecenes, zearalenone. The difficult issue of fungi and fungal toxins as weapons was reviewed by Paterson (*MR* 110: 1003, 2006). See also *Biological control*, *Bioterrorism and fungi*, *Mycopesticides*.

Lit.: Reviews: Assouline-Dayan *et al.* (*J. Asthma* 39: 191, 2002), Forgacs & Carll (*Adv. vet. Sci.* 7: 272, 1962), Wheeler & Luke (*Ann. Rev. Microbiol.* 17: 223, 1963), Wright (*Ann. Rev. Microbiol.* 22: 269, 1968). Books: Betina (*Mycetotoxins*, 1989), Castegnaro *et al.* (Eds) (*Mycotoxins, endemic nephropathy and urinary tract tumours*, 1991), Champ *et al.* (Eds) (*Fungi and mycotoxins in stored products*, 1992). Chelkowski (Ed.) (*Fusarium mycotoxins*, 1989), Chelkowski (Ed.) (*Mycotoxin research. Fusarium* 7(I & II), 1991), Chelkowski (Ed.) (*Cereal grain mycotoxins, fungi and quality in drying and storage*, 1991), Cole (Ed.) (*Modern methods in the analysis structural elucidation of mycotoxins*, 1986), Cole & Cox (Eds) (*Handbook of toxic fungal metabolites*, 1981), Desjardins (*Fusarium mycotoxins: chemistry, genetics and biology*, 2006), Hui *et al.* (Eds, *Foodborne Diseases Handbook* 3, 2001), Joffe (*Fusarium species; their biology and toxicology*, 1986), Kadis (Ed.) (*Microbial toxins*, 6, *Fungal toxins*, 1971), Krogh (Ed.) (*Mycotoxins in food*, 1987), Logrieco *et al.* (*Mycotoxins in plant disease*, 2002), Matossian (*Poisons of the past*, 1989), Moreau (*Moisissures toxiques dans l'alimentation*, 1968; edn 2, 1974, 2938 refs), O'Neill *et al.* (Eds) (*Relevance of human cancer of N-Nitroso compounds, tobacco and mycotoxins*, 1991), Sinha & Bhatnagar (Eds) (*Mycotoxins in agriculture and food safety*, 1998), Wogan (Ed.) (*Mycotoxins in foodstuffs*, 1965), Wylie & Morehouse (Eds) (*Mycotoxic fungi, mycotoxins, mycotoxicoses. An encyclopaedic handbook* 1, *Mycotoxic fungi and chemistry of mycotoxicoses*, 1977; 2, *Mycotoxicoses of domestic and laboratory animals, poultry, and aquatic invertebrates and vertebrates*, 1978; 3, *Mycotoxicoses of man and plants; mycotoxin control and regulatory aspects*, 1978), Smith & Henderson (*Mycotoxins and animal foods*, 1991), Smith & Moss (Eds) (*Mycotoxins*, 1985), Steyn (Ed.) (*The biosynthesis of mycotoxins*, 1980), Upadhyay (*Advances in microbial toxin research and its biotechnological exploitation*, 2002), Xu *et al.* (*Epidemiology of mycotoxin producing fungi*, 2003). See also *phytoalexins*.

mycotoxicosis, one of the *Mycotoxicoses* (q.v.).

mycotoxin, see *toxin*.

Mycotribulus Nag Raj & W.B. Kendr. (1970), anamorphic *Pezizomycotina*, St.0eH.4. 1, pantropical. See Nag Raj & Kendrick (*CJB* 48: 2219, 1970).

mycotroph, a fungus which obtains its nutrients from another fungus; cf. *mycoparasitism* and see *Fungi on fungi*.

mycotrophein, a 'growth factor' from fungi needed by a mycoparasite (Waley & Barnett, *Mycol.* 55: 209, 1963).

mycotrophic (of plants), having mycorrhiza.

Mycotypha Fenner (1932), *Mycotyphaceae*. 3, widespread. See Young (*J. gen. Microbiol.* 55: 243, 1969; *sporangium ultrastr.*), Benny & Benjamin (*Aliso* 8: 391, 1976), Brain & Young (*Microbios* 25: 93, 1979; *ultrastr.*), Benny *et al.* (*Mycotaxon* 22: 119, 1985;

- key), Edelmann & Klomparens (*MR* 99: 539, 1995; ultrastr), O'Donnell *et al.* (*Mycol.* 93: 286, 2001; phylogeny), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny).
- Mycotyphaceae** Benny & R.K. Benj. (1985), Mucorales. 1 gen., 3 spp.
Lit.: Benny *et al.* (*Mycotaxon* 22: 119, 1985; key), Forst & Prillinger (*Z. Mykol.* 54: 139, 1988).
- Mycousteria** M.L. Farr (1986), anamorphic *Pezizomycotina*, Cpt.0eP.?. 2, Brazil. See Farr (*Mycol.* 78: 280, 1986).
- Mycovellosiella** Rangel (1917) = *Passalora* fide Deighton (*Mycol. Pap.* 137, 1974), Liu & Guo (*Mycosystema* 1: 241, 1988; 21 spp. from China), Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 2, 1998), Crous (*MR* 103: 607, 1999; on *Myrtaceae*), Crous *et al.* (*Stud. Mycol.* 45: 107, 2000; review), Crous *et al.* (*Mycol.* 93: 1081, 2001; phylogeny), Crous *et al.* (*MR* 105: 425, 2001; on *Myrtaceae*), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003; nomenclator).
- mycoviruses**, see Viruses in fungi.
- Mycowinteria** Sherwood (1986), Protothelenellaceae. 1, widespread (temperate). See David (*SA* 6: 217, 1987), Sherwood-Pike (*Mycotaxon* 28: 137, 1987), Aptroot & Iperen (*Nova Hedwigia* 67: 481, 1998; New Guinea).
- Mydonosporium** Corda (1833) = *Cladosporium* fide Saccardo (*Syll. fung.* 4: 354, 1886).
- Mydonotrichum** Corda (1831) = *Helminthosporium* fide Saccardo (*Syll. fung.* 4: 407, 1886).
- Myelochroa** (Asahina) Elix & Hale (1987), Parmeliaceae (L). 22, widespread (esp. north-east Asia). See Hale (*Smithson. Contr. Bot.* 33, 1976), Kurokawa & Arakawa (*Bull. Bot. Gdns Toyama* 2: 23, 1997; Japan), Wang *et al.* (*Mycotaxon* 77: 25, 2001; China), Blanco *et al.* (*Mol. Phylogen. Evol.* 39: 52, 2006; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Myeloconidiaceae** P.M. McCarthy (2001), Ostropales. 2 gen., 5 spp.
Lit.: McCarthy & Elix (*Lichenologist* 28: 402, 1996), McCarthy (*Flora of Australia* 58 A: 242 pp., 2001), McCarthy *et al.* (*Lichenologist* 33: 292, 2001).
- Myeloconis** P.M. McCarthy & Elix (1996), Myeloconidiaceae (L). 4, widespread (tropical). See McCarthy & Elix (*Lichenologist* 28: 402, 1996).
- Myelorrhiza** Verdon & Elix (1986), Cladoniaceae (L). 2, Australia. See Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998; DNA), Stenroos *et al.* (*Mycol. Progr.* 1: 267, 2002; phylogeny).
- Myelosperma** Syd. & P. Syd. (1915), Myelospermataceae. 4 (on *Palmae*), Brunei; Irian Jaya. See Hyde (*Sydowia* 45: 241, 1993), Hyde & Wong (*MR* 103: 347, 1999; fam. rels).
- Myelospermataceae** K.D. Hyde & S.W. Wong (1999), Xylariales. 1 gen., 4 spp.
Lit.: Hyde (*Sydowia* 45: 241, 1993), Kang *et al.* (*Fungal Diversity* 1: 147, 1998), Hyde & Wong (*MR* 103: 347, 1999).
- Myiocoprloa** Cif. (1958) = *Schizothyrium* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Myiocoprella** Sacc. (1916) = *Rhagadolobium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Myiocopron**, see *Muyocopron*.
- Myiocoprula** Petr. (1955), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, USA. See Petrak (*Sydowia* 9: 547, 1955).
- Myiophagus** Thaxt. ex Sparrow (1939), ? Chytridiales. 2, widespread (north temperate). See Karling (*Am. J. Bot.* 35: 246, 1948).
- Myiophyton** Lebert (1857) = *Empusa* fide Saccardo (*Syll. fung.* 7: 1, 1888).
- Mykoblastus**, see *Mycoblastus*.
- mykoholz**, basidioma of the edible *Kuehneromyces mutabilis* cultivated in Germany (Chang & Hughes, 1978).
- Mylitta** Fr. (1825) nom. dub., Fungi. Based on bacterial root nodules on *Robinia* fide Mattiolo (*Bull. Soc. bot. ital.* 1924: 13, 1924).
- mylitta**, a large sclerotium, e.g. that of blackfellows' bread (q.v.).
- Mylittopsis** Pat. (1895), Basidiomycota. 1, USA; Malaysia. See Rogers & Martin (*Mycol.* 47: 891, 1955).
- myosin**, see actin.
- Myosporidium** E. Baquero, M. Rubio, I.N.S. Moura, N.J. Pieniazek & R. Jordana (2005), Microsporidia. 1. See Baquero *et al.* (*J. Eukary. Microbiol.* 52: 476, 2005).
- Myriadoporus** Peck (1884) = *Bjerkandera* fide Donk (*Persoonia* 1: 173, 1960).
- Myriangiaceae** Nyl. (1854), Myriangiales. 4 gen. (+ 8 syn.), 18 spp.
Lit.: Boedijn (*Persoonia* 2: 63, 1963; Indonesia), von Arx (*Persoonia* 2: 421, 1963; gen. names), Rao & Pande (*Cryptog. bot.* 3: 255, 1993), Inácio & Dianese (*MR* 102: 695, 1998), Winka & Eriksson (*Phylogenetic Relationships Within the Ascomycota Based on 18S rDNA Sequences Akademisk Avhandling [Thesis (PhD), Department of Ecology and Environmental Science, Umeå University]: [17] pp., 2000*), Lumbsch & Lindemuth (*MR* 105: 901, 2001).
- Myriangiales** Starbäck (1899). Dothideomycetidae. 3 fam., 18 gen., 157 spp. Stromata crustose or pulvinate, composed of subhyaline or brown thin-walled pseudoparenchymatous tissue, with immersed ascumatal locules or fertile outgrowths of similar tissue containing scattered asci in individual locules, becoming gelatinous at maturity, opening by unordered breakdown of the surface layers. Specialized interascal tissue absent. Asci in a single layer or irregularly disposed, ± globose, sessile, fissitunicate, usually with a poorly defined ocular chamber. Ascospores hyaline to brown, transversely septate or muriform. Anamorphs acervular where known. Fams:
- (1) **Cookellaceae**
 - (2) **Elsinoaceae**
 - (3) **Myriangiaceae**
- Molecular data have confirmed links between the *Elsinoaceae* and *Myriangiaceae*, but relationships of the *Cookellaceae* remain uncertain.
- Lit.*: Eriksson (*Opera Bot.* 60, 1981), Schoch *et al.* (*Mycol* 98: 1041, 2006; phylogeny).
- Myriangiella** Zimm. (1902), ? Schizothyriaceae. c. 5, widespread (tropical). See von Arx & Müller (*Stud. Mycol.* 9, 1975), Hofmann & Piepenbring (*Fungal Diversity* 22: 55, 2006; Panama).
- Myriangina** (Henn.) Höhn. (1909) = *Uleomyces* fide von Arx (*Persoonia* 2: 421, 1963).
- Myrianginella** F. Stevens & Weedon (1923) = *Uleomyces* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Myriangiomyces** Bat. (1958) = *Saccardia* fide von Arx (*Persoonia* 2: 421, 1963).
- Myriangiopsis** Henn. (1902), Dothideomycetes. 1, Mexico.

- Myriangium** Mont. & Berk. (1845), Myriangiaceae. c. 8, widespread. See Petch (*TBMS* 10: 45, 1924; on *Insecta*), Miller (*Mycol.* 30: 158, 1938), Miller (*Mycol.* 32: 587, 1940), von Arx (*Persoonia* 2: 241, 1963), Lumbsch & Lindemuth (*MR* 105: 901, 2001; phylogeny), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Myriapodophila** Speg. (1918) ? = Pyxidiophora fide Blackwell (*Mycol.* 86: 1, 1994).
- Myridium** Clem. (1909) nom. rej. = Laetinaevia fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Myriellina** Höhn. (1915), anamorphic *Pezizomycotina*, Cac.≡ eH.15. 2, Europe; Papua New Guinea. See Sankaran & Sutton (*MR* 95: 1021, 1991).
- Myrillium** Clem. (1931) nom. dub., ? Onygenales. See Kuehn (*Mycol.* 51: 665, 1959), Currah (*Mycotaxon* 24: 1, 1985).
- Myrioblastus** Trevis. (1857) ≡ Biatorella.
- Myrioblepharis** Thaxt. (1895) nom. dub., Fungi. Based on a protozoan on *Pythium* or *Phytophthora* fide Waterhouse (*TBMS* 28: 94, 1945), Koch (*Mycol.* 56: 436, 1964).
- Myriocarpa** Fuckel (1870) [non *Myriocarpa* Benth. 1846, *Urticaceae*] ? = Guignardia fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Myriocarpium** Bonord. (1864) = Leptosphaeria fide Saccardo (*Syll. fung.* 2: 13, 1883).
- Myriocephalum** De Not. ex Corda (1842) = Cheirospora fide Hughes (*CJB* 36: 727, 1958).
- Myriococcum** Fr. (1823), anamorphic *Agaricomycetes*. 1 or 2, widespread. *M. albomyces* is included in *Melanocarpus*.
- Myrioconium** Fr. (1823), anamorphic *Agaricomycetes*. 1, widespread. See Stalpers in Sugiyama (Ed.) (*Pleomorphic Fungi: The Diversity and its Taxonomic Implications*: 201, 1987).
- Myrioconium** Syd. (1912), anamorphic *Sclerotinia*, *Myriosclerotinia*, Cac.0eH.15. 7, Europe; N. America. See Palmer (*Öst. Z. Pilzk.* 4: 81, 1995; on *Eriophorum*).
- Myriodiscus** Boedijn (1935), Helotiales. 1, Sumatra. See Liu & Guo (*Acta Mycol. Sin.* Suppl. 1: 97, 1988).
- Myriodontium** Samson & Polon. (1978), anamorphic *Pezizomycotina*, Hso.0eH.12. 1, Europe; N. America. See Samson & Polonelli (*Persoonia* 9: 505, 1978).
- Myriogenis** Clem. & Shear (1931) ≡ Myriogenospora.
- Myriogenospora** G.F. Atk. (1894), Clavicipitaceae. 2 (on *Poaceae*, incl. *Saccharum*), America. See Diehl (*USDA agric. Monogr.* 4, 1950), Luttrell & Bacon (*CJB* 55: 2090, 1977), Hanlin & Tortolero (*Mycotaxon* 39: 237, 1990), Phelps & Morgan-Jones (*Mycotaxon* 47: 41, 1993), White & Glenn (*Am. J. Bot.* 81: 216, 1994), Glenn *et al.* (*MR* 102: 483, 1998; DNA), Bacon & White (*Microbial Endophytes*, 2000).
- Myriogonium** Cain (1948) = Helicogonium fide Kreger-van Rij in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 15, 1973), Carpenter & Krapp (*Mycotaxon* 21: 487, 1984), Baral (*Nova Hedwigia* 69: 1, 1999), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Myriolecis** Clem. (1909) = Lecanora fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Myrionora** R.C. Harris (1988), Lecanoraceae (L). 1, USA. See Harris (*Evansia* 5: 27, 1988).
- Myriophacidium** Sherwood (1974), Rhytismataceae. 4, widespread. See Sherwood (*Occ. Pap. Farlow Herb. Crypt. Bot.* 15, 1980; key), Cannon & Minter (*Mycol. Pap.* 155, 1986).
- Myriophysa** Fr. (1849) ? = Atichia fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Myriophysella** Speg. (1910) = Seuratia fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Myriosclerotinia** N.F. Buchw. (1947), Sclerotiniaceae. Anamorphs *Myrioconium*, *Sclerotium*. 10, widespread. See Palmer (*Friesia* 9: 193, 1969), Schwegler (*Schweiz. Z. Pilzk.* 56: 49, 1978), Schumacher & Kohn (*CJB* 63: 1610, 1985; key), Holst-Jensen *et al.* (*Mycol.* 89: 885, 1997; phylogeny), Saito (*Mycoscience* 39: 145, 1998), Holst-Jensen *et al.* (*Nordic Jl Bot.* 18: 705, 1999; phylogeny), Holec *et al.* (*Sydowia* 59: 57, 2007).
- Myriosperma** Nägeli (1853) = Sarcogyne Flot. (1851) fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Jørgensen (*Taxon* 53: 521, 2004; nomencl.).
- Myriospora** Nägeli (1853), Acarosporaceae (L). 2. See Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Harris & Knudsen (*Opuscula Philolichenum* 3: 1, 2006).
- myriosporous**, having many spores. Cf. oligosporous.
- Myriostigma** G. Arnaud (1925) ≡ Myriostigmella.
- Myriostigma** Kremp. (1874) nom. rej. = Cryptothecia fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Lücking *et al.* (*Lichenologist* 38: 235, 2006).
- Myriostigmella** G. Arnaud (1952), Dothideomycetes. 1, Brazil. See Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Myriostoma** Desv. (1809), Geastraceae. 1, widespread. See Sunhede (*Syn. Fung.* 1: 534 pp., 1989), Rees *et al.* (*Australasian Mycologist* 24: 25, 2005; Australia).
- Myriotrema** Fée (1824), Thelotremataceae (L). 150, widespread (esp. tropical). See Hale (*Mycotaxon* 11: 130, 1980), Hale (*Bull. Br. Mus. nat. hist. Bot.* 8: 227, 1981), Matsumoto & Deguchi (*Bryologist* 102: 86, 1999; anamorphs), Frisch (*Biblthca Lichenol.* 92: 3, 2006; monogr. African spp.), Frisch *et al.* (*Biblthca Lichenol.* 92: 517, 2006; phylogeny, polyphyly), Mangold *et al.* (*Nova Hedwigia* 83: 275, 2006; Australia).
- Myriotrichum**, see *Myxotrichum*.
- Myrmaeciella** Lindau (1897), Hypocreales. Anamorph *Patellina*. 1, N. America. See Samuels & Seifert in Sugiyama (Ed.) (*Pleomorphic Fungi: The Diversity and its Taxonomic Implications*: 29, 1987), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999; allied to *Niessliaceae*).
- Myrmaecium** Nitschke ex Fuckel (1870), *Pezizomycotina*. 2, Europe.
- Myrmaecium** Sacc. (1880) ≡ Myrmaeciella.
- Myrmecocystis** Harkn. (1899) = Genabea fide Trappe (*TBMS* 65: 496, 1975), Smith *et al.* (*Mycol.* 98: 699, 2006), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Myrmecomycetes** Jouvenaz & Kimbr. (1991), anamorphic *Pezizomycotina*, Hso.0eH.10. 1 (endoparasitic on fire ants), USA; Argentina. See Jouvenaz & Kimbrough (*MR* 95: 1400, 1991).
- myrmecophilous** (of fungi), being a covering or food for ants.
- Myrmecridium** Arzanlou, W. Gams & Crous (2007), anamorphic *Sordariomycetes*. 2, widespread.
- Myrophagus**, see *Myiophagus*.
- Myropyxis** Ces. ex Rabenh. (1851), anamorphic *Pezizomycotina*. 1 or 2, Europe.
- Myrotheciastrum** Abbas & B. Sutton (1988), anamor-

- phic *Pezizomycotina*, St.0eP.19. 1, Pakistan; India. See Abbas & Sutton (*TBMS* 91: 352, 1988).
- Myrotheciella** Speg. (1910) = *Myrothecium* fide Tulloch (*Mycol. Pap.* 130, 1972).
- Myrothecium** Tode (1790), anamorphic *Hypocreales*, Cpd.0eP.15. 22, widespread. See Tulloch (*Mycol. Pap.* 130, 1972; key), Nag Raj (*Mycotaxon* 53: 295, 1995; *M. prestonii* heterogeneous), Schroers *et al.* (*Sydowia* 51: 114, 1999; teleomorph), Ahrazem *et al.* (*Archs Microbiol.* 173: 296, 2000; cell wall polysaccharides), Rossman *et al.* (*Mycol.* 93: 100, 2001; phylogeny), Seifert *et al.* (*Mycotaxon* 87: 317, 2003; Canada), Watanabe *et al.* (*Mycoscience* 44: 283, 2003; Japan), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Mystrosporiella** Munjal & Kulshr. (1969), anamorphic *Pezizomycotina*, Hso.#eP.10. 2, India. See Munjal & Kulshreshtha (*Mycopathologia* 39: 356, 1969), Sharma *et al.* (*Indian Phytopath.* 59: 257, 2006).
- Mystrosporium** Corda (1837) nom. dub., anamorphic *Pezizomycotina*, Hso.#eP.?. 5, widespread (temperate). *M. adustum* (ink disease of iris). See Hughes (*CJB* 36: 788, 1958).
- Mythicomycetes** Redhead & A.H. Sm. (1986), Psathyrellaceae. 1, widespread (north temperate). See Redhead & Smith (*CJB* 64: 643, 1986).
- Mytilidion** Sacc. (1875) = *Mytilinidion*.
- mytiliform**, like a mussel shell in form.
- Mytiliniaceae** Kirschst. (1924), Pleosporales. 11 gen. (+ 7 syn.), 93 spp.
Lit.: Zogg (*Beitr. Kryptfl. Schweiz* 11 no. 3, 1962; Eur.), Blackwell & Gilbertson (*Mycol.* 77: 50, 1985), Checa (*Mycotaxon* 63: 467, 1997), Checa (*Mycotaxon* 62: 349, 1997; Iberian spp.), Vasilyeva (*Mycoscience* 38: 341, 1997).
- Mytilinidion** Duby (1862), Mytiliniaceae. Anamorph *Septonema*-like. 12, Europe; N. America. See Zogg (*Beitr. Kryptfl. Schweiz* 11 no. 3, 1962), Speer (*BSMF* 102: 97, 1986), Checa (*Mycotaxon* 63: 467, 1997; Spain), Vasil'eva (*Mikol. Fitopatol.* 35: 15, 2001; E Russia).
- Mytilodiscus** Kropp & S.E. Carp. (1984), Helotiaceae. 1, N. America; Europe. See Kropp & Carpenter (*Mycotaxon* 20: 365, 1984).
- Mytilostoma** P. Karst. (1880), Dothideomycetes. 2, Finland. See Mathiassen (*Pyrenomyceter (Ascomyceter) på Salix i Troms*, 1985).
- Myxadium** (Fr.) P. Kumm. (1871) = *Cortinarius* fide Kuyper (*in litt.*).
- myxamoeba** (1) (of *Mycetozoa*), a zoospore after becoming amoeba-like; (2) a myxopod (obsol.).
- Myxariaceae** Jülich (1982) = *Hyaloriaceae*.
- myxarioid** (of basidia), having a stalk-like portion separated by a wall from the globose metabasidial portion, as in *Myxarium* (Donk, *Persoonia* 4: 232, 1966).
- Myxarium** Wallr. (1833), Hyaloriaceae. 6, widespread. See Roberts (*Mycotaxon* 69: 209, 1998), Wells *et al.* (*Frontiers in Basidiomycote Mycology*: 237, 2004).
- Myxasterina** Höhn. (1909) = *Asterina* fide Stevens & Ryan (*Ill. biol. monogr.* 17 no. 2, 1939).
- Myxobacterales**. An order of Bacteria (gliding bacteria) bearing extracellular slime; lyse filamentous and yeast fungi and bacteria in soil, dung and decaying vegetation.
- Myxobilimbia** Hafellner (2001) = *Bilimbia* fide Hafellner & Türk (*Stappia* 76: 154, 2001), Veldkamp (*Lichenologist* 36: 191, 2004), Llop (*Lichenologist* 38: 279, 2006).
- Myxocephala** G. Weber, Spaaij & Oberw. (1989), ? Sordariomycetes. 1. See Jacobs *et al.* (*CJB* 79: 110, 2001; phylogeny).
- Myxochytridiales**, see *Archimycetes*.
- Myxocladium** Corda (1837) = *Cladosporium* fide Saccardo (*Syll. fung.* 4: 364, 1886).
- Myxocollybia** Singer (1936) = *Flammulina* fide Singer (*Agaric. mod. Tax.*, 1951).
- Myxocybe** Fayod (1889) = *Hebeloma* fide Singer (*Agaric. mod. Tax.*, 1951).
- Myxocyclus** Riess (1852), anamorphic *Pleomassariaceae*, Hsp/Cac.#eP.1. 1, Europe; N. America. See Tanaka *et al.* (*Mycoscience* 46: 248, 2005).
- Myxocystis** Mrázek (1897), Microsporidia. 1.
- Myxoderma** Fayod ex Kühner (1926) = *Limacella*.
- Myxodictyon** A. Massal. (1860) = *Brigantiaea* fide Hafellner & Bellemère (*Nova Hedwigia* 35: 237, 1982), Hafellner (*Symb. bot. upsal.* 32 no. 1: 35, 1997).
- Myxodictyonomyces** Cif. & Tomas. (1953) = *Myxodictyon*.
- Myxodiscus** Höhn. (1906) = *Leptothyrium* fide Höhn (*Mykol. Unters.* 1: 301, 1923).
- Myxodochium** Arnaud (1952) nom. inval., anamorphic *Agaricomycetes*, Hsp.0eH.1. 1 (with clamp connexions), Europe.
- Myxofusicoccum** Died. (1912) = *Pseudodiscula* fide Sutton (*Mycol. Pap.* 141, 1977).
- Myxolibertella** Höhn. (1903) nom. rej. = *Phomopsis* (Sacc.) Bubák. fide Sutton (*Mycol. Pap.* 141, 1977).
- myxolichens**, synthetically produced loose associations of myxomycete plasmodia and a green alga (*Chlor-ella*).
- Myxomonas** Brzez. (1906) nom. dub., Fungi. Based on dead or partly formed cells fide Trzebinski (*Z. PflankrKh.* 17: 321, 1908).
- Myxomphalia** Hora (1960), Tricholomataceae. 4, widespread (north temperate). See Hora (*TBMS* 43: 453, 1960), Antonín (*Mykol. Listy* 76: I/1, 2001), Antonín (*Mykol. Listy* 90-91: 20, 2004; key European species).
- Myxomphalos** Wallr. (1833) = *Agyrium* fide Saccardo (*Syll. fung.* 8: 635, 1889).
- Myxomycetes** Renault (1895), Fossil Fungi ? *Myxogastria*. 1 (Carboniferous), France.
- myxomyceticolous**, growing on *Mycetozoa*. See Fungi on fungi.
- Myxomycidium** Massee (1901) = *Mucronella* fide Petersen (*Mycol.* 72: 301, 1980).
- Myxomycites** Mesch. (1898) = *Myxomycetes* (class).
- Myxomyriangiaceae** Theiss. (1917) = *Elsinoaceae*.
- Myxomyriangium** Theiss. (1913) = *Saccardinula* fide von Arx (*Persoonia* 2: 421, 1963).
- Myxonema** Corda (1837) [non *Myxonema* Fr. 1825, *Algae*] = *Myxonyphe*.
- Myxonyphe** Rchb. (1841) nom. dub., Fungi.
- Myxoparaphysella** Caball. (1941), anamorphic *Pezizomycotina*, Cac.0eH.?. 1, Spain.
- Myxophacidiaceae** Petr. (1922) = *Ascodichaenaceae*.
- Myxophacidiella** Höhn. (1917) = *Pseudophacidium* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Myxophacidium** Höhn. (1917) = *Pseudophacidium* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954), DiCosmo *et al.* (*Mycotaxon* 21: 68, 1984).
- Myxopholis** Locq. (1979) = *Cortinarius* fide Kuyper (*in litt.*).

- Myxophora** Döbbeler & Poelt (1978), Dothideomycetes. 1 (lichenicolous), widespread. See Döbbeler (*Biblthca Lichenol.* 58: 73, 1995), Hoffmann & Hafellner (*Biblthca Lichenol.* 77: 1, 2000).
- Myxopuntia** Mont. (1846) = *Leptogium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Myxormia** Berk. & Broome (1850) = *Myrothecium* fide Tulloch (*Mycol. Pap.* 130, 1972).
- myxospore**, a myxomycete spore (obsol.).
- Myxosporella** Sacc. (1881), anamorphic *Pezizomycotina*, Ccu.0eH.23. 1, Italy. See Sutton (*Mycol. Pap.* 141, 1977).
- Myxosporidiella** Negru (1960), anamorphic *Pezizomycotina*, Ccu.0eH.?. 1, Roumania. See Negru (*Stud. Cercet. Biol. Acad. romana* 11: 11, 1960).
- Myxosporina** Höhn. (1927) = *Rhodesia* fide Sutton (*Mycol. Pap.* 141, 1977).
- Myxosporium** Link (1825) nom. conf., anamorphic *Pezizomycotina*. See Höhnelt (*Z. Garungs.* 5: 191, 1915), Weindlmayr (*Sydowia* 17: 74, 1964), Weindlmayr (*Sydowia* 18: 26, 1965), Weindlmayr (*Sydowia* 19: 193, 1966).
- myxosporium**, see perisporium; Spore wall.
- Myxostomella** Syd. (1931) = *Campoa* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Myxostomellina** Syd. (1931), anamorphic *Pezizomycotina*, St.0eH.?. 1, Philippines.
- Myxotheca** Ferd. & Winge (1910) = *Cryptothecia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Lücking *et al.* (*Lichenologist* 38: 235, 2006).
- Myxotheciella** Petr. (1959) = *Scolionema* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Myxothecium** Kunze (1823) = *Meliola* fide Hansford (*Beih. Sydowia* 2, 1961).
- Myxothyriaceae** Höhn. (1909) = *Asterinaceae*.
- Myxothyriopsis** Bat. & A.F. Vital (1956), anamorphic *Pezizomycotina*, Cpd.0eH.?. 1, Brazil. See Batista & Vital (*An. Soc. Biol. Pernambuco* 14: 90, 1956).
- Myxothyrium** Bubák & Kabát (1915), anamorphic *Pezizomycotina*, St.0eH.15. 1, Europe.
- Myxotrichaceae** Locq. ex Currah (1985), *Leotiomyces* (inc. sed.). 5 gen. (+ 7 syn.), 60 spp.
Lit.: Currah (*Mycotaxon* 24: 1, 1985), Rosing (*Mycol.* 77: 920, 1985), Currah (*SA* 7: 1, 1988; key gen.), Dalpé (*New Phytol.* 113: 523, 1989; mycorrhizas), Caretta & Piontelli (*Mycopathologia* 140: 77, 1997), Hambleton *et al.* (*Mycol.* 90: 854, 1998; anams), Currah *et al.* (*Karstenia* 39: 65, 1999), McLean *et al.* (*New Phytol.* 144: 351, 1999), Monreal *et al.* (*CJB* 77: 1580, 1999), Sugiyama *et al.* (*Mycoscience* 40: 251, 1999; phylogeny), Chambers *et al.* (*MR* 104: 168, 2000), Gibas *et al.* (*Stud. Mycol.* 47: 131, 2002), Tsuneda & Currah (*Mycol.* 96: 627, 2004), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Myxotrichella** (Sacc.) Sacc. (1899) = *Myxotrichum* fide Kendrick & Carmichael in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 390, 1973).
- Myxotrichellaceae** Nann. (1934) = *Myxotrichaceae*.
- Myxotrichum** Kunze (1823), *Myxotrichaceae*. Anamorph *Oidiodendron*. 12, widespread. See Orr *et al.* (*CJB* 41: 1463, 1963; key), Hughes (*CJB* 46: 939, 1968; synonymy), Currah (*Mycotaxon* 24: 1, 1985), Dalpé (*MSA News* 38: 22, 1987; anamorph), Udagawa & Uchiyama (*Mycoscience* 40: 291, 1999), Rice & Currah (*MR* 106: 1463, 2002), Tsuneda & Currah (*Mycol.* 96: 627, 2004; ontogeny), Rice & Currah (*Stud. Mycol.* 53: 83, 2005; anamorphs), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Myxozyma** Van der Walt, Weijman & Arx (1981), anamorphic *Lipomycetaceae*, Hso.0eH.3/4. 5, N. America; S. Africa. See Yamada (*J. gen. appl. Microbiol.* Tokyo 32: 259, 1986; coenzyme Q system), van der Walt *et al.* (*Syst. Appl. Microbiol.* 9: 121, 1987; key 4 spp.), Cottrell & Kock (*Syst. Appl. Microbiol.* 12: 291, 1989; history, delimitation, phenotypic characters), Kurtzman & Liu (*Curr. Microbiol.* 21: 387, 1990), Spaaij *et al.* (*Syst. Appl. Microbiol.* 13: 182, 1990), Jansen van Rensburg *et al.* (*Syst. Appl. Microbiol.* 18: 410, 1995), Kurtzman in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 592, 1998), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny), Kurtzman *et al.* (*FEMS Yeast Res.* 7: 1027, 2007; phylogeny).
- Myxyphe** (orthographic variant), see *Myxomyphes*.
- Myzeloblastanon**, see *Myceloblastanon*.
- nacreous**, like mother-of-pearl.
- Nadelspora** Olson, Tiekotter & Reno (1994), *Microsporidia*. 1.
- Nadsonia** Syd. (1912), *Saccharomycetales*. 2, widespread (north temperate). See Golubev *et al.* (*Antonie van Leeuwenhoek* 55: 369, 1989; key), Yamada *et al.* (*J. gen. appl. Microbiol.* Tokyo 38: 585, 1992; phylogeny), Miller & Phaff in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 268, 1998), Schweigkofler *et al.* (*Organ. Divers. Evol.* 2: 1, 2002; phylogeny), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Nadsoniella** Issatsch. (1914), anamorphic *Herpotrichiellaceae*, Hso.0eH.6. 1 (from sea water), former USSR. See Haase *et al.* (*Stud. Mycol.* 43: 80, 1999; phylogeny).
- Nadsoniomyces** Kudrjanzev (1932) = *Trichosporon* fide Carmo-Sousa in Lodder (Ed.) (*Yeasts, a taxonomic study* 2nd edn, 1970).
- Nadvornikia** Tibell (1984), *Thelotrema* (L.). 3, widespread. See Harris (*Some Florida lichens*, 1990; posn), Lumbsch *et al.* (*Symb. bot. upsal.* 34 no. 1: 9, 2004; phylogeny).
- Naegelia** Rabenh. (1844) nom. dub., *Fungi*.
- Naegiella** (Rehm) Clem. (1909) = *Eupropolella* fide Défago (*Sydowia* 21: 1, 1967).
- Naemacyclus** Fuckel (1873), *Leotiomyces*. 6, widespread. See Cannon & Minter (*Mycol. Pap.* 155: 123 pp., 1986), Gernandt *et al.* (*Mycol.* 93: 915, 2001; phylogeny), Johnston (*Aust. Syst. Bot.* 19: 135, 2006), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Naemaspora** Pers. (1796) nom. conf., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Naemaspora** Sacc. (1880) = *Roscoepoundia* fide Sutton (*Mycol. Pap.* 141, 1977).
- Naemaspora** Willd. (1787) = *Bombardia*.
- Naematelia** Fr. (1822) nom. dub., *Basidiomycota*. 1. Based on parasitized *Stereum* fide Bandoni (*Am. midl. Nat.* 66: 319, 1961).
- Naematoloma** P. Karst. (1879) = *Psilocybe* (Fr.) P. Kumm. fide Kuyper (*in litt.*).
- Naemosphaera** (Sacc.) Sacc. (1892) = *Naemosphaera* P. Karst. fide Sutton (*in litt.*).
- Naemosphaera** P. Karst. (1888), anamorphic *Pezizomycotina*, Cpd.0eP.?. 1, Finland.
- Naemosphaerella** Höhn. (1923), anamorphic *Pezizomycotina*. 2, Brazil; Japan. See Petrak (*Sydowia* 6: 302, 1952).
- Naemospora** Roth ex Kuntze (1898) nom. dub., anamorphic *Pezizomycotina*.

- Naemostroma** Höhn. (1919) = *Septoriella* fide Sutton in Ainsworth *et al.* (Eds) (*The Fungi* 4A, 1973).
- Naetrocymbaceae** Höhn. ex R.C. Harris (1995), Pleosporales ($\pm$ L). 5 gen. (+ 16 syn.), 79 spp.
Lit.: Aguirre & Hawksworth (*Biblthca Lichenol.* 25: 249, 1987), Aguirre-Hudson & Fiol (*Lichenologist* 25: 207, 1993), Harris (*More Florida Lichens*, 1995), Harris (*More Florida Lichens*: 192 pp., 1995), Hyde & Wong (*MR* 103: 347, 1999).
- Naetrocymbe** Bat. & Cif. (1963) = *Limacinula* Höhn. fide Eriksson (*Op. Bot.* 60, 1981).
- Naetrocymbe** Körb. ex Körb. (1865), Naetrocymbaceae (L). 12. See Eriksson (*Opera Bot.* 60: 111, 1981; concept), Harris (*More Florida Lichens*, 1995).
- Naevala** B. Hein (1976), Helotiales. 6, Europe. See Hein (*Willdenowia* Beih. 9, 1976), Nauta & Spooner (*Mycologist* 13: 65, 1999; Brit. spp.).
- Naevia** Fr. (1825) = *Arthonia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Naevia** Fr. (1849) $\equiv$ *Naevala*.
- Naeviella** (Rehm) Clem. (1909), Helotiales. 3, Europe. See Nannfeldt (*Sydowia* 35: 162, 1982), Scheuer (*Biblthca Mycol.* 123: 274, 1988), Suková (*Czech Mycol.* 56: 63, 2004).
- Naeviopsis** B. Hein (1976), Helotiales. 15, Europe. See Suková *et al.* (*Czech Mycol.* 55: 223, 2003).
- Naganishia** Goto (1963) = *Cryptococcus* Vuill. fide Phaff & Fell in Lodder (Ed.) (*Yeasts, a taxonomic study* 2nd edn: 1088, 1970).
- Nagrajia** R.F. Castañeda & W.B. Kendr. (1991), anamorphic *Pezizomycotina*, Cpd.0eH.15. 1, Cuba. See Castañeda Ruiz & Kendrick (*Univ. Waterloo Biol. Ser.* 35: 76, 1991).
- Nagrajomyces** Melnik (1984), anamorphic *Pezizomycotina*, Cpd.#eP.19. 1, Russia. See Melnik (*Mikol. Fitopatol.* 18: 9, 1984).
- Naiadella** Marvanová & Bandoni (1987), anamorphic *Classicula*, Hso.0eH.1. 1 (aquatic), Canada; former Czechoslovakia. See Marvanová & Bandoni (*Mycol.* 79: 579, 1987).
- Nailisporites** T.C. Huang (1981), Fossil Fungi. 1 (Miocene), Taiwan.
- Naïs** Kohlm. (1962), Halosphaeriaceae. 2 (marine and freshwater), Europe; N. America. See Crane & Shearer (*TBMS* 86: 509, 1986), Hyde *et al.* (*Mycoscience* 40: 165, 1999), Kong *et al.* (*MR* 104: 35, 2000; DNA), Pang *et al.* (*Mycol. Progr.* 2: 29, 2003).
- Nakaiomyces** Kobayasi (1939) nom. dub., Fungi. Based on a parasitized *Tremella* fide Olive (*Bull. Torrey bot. Cl.* 85: 99, 1958).
- Nakaseomyces** Kurtzman (2003), Saccharomycetales. 2, widespread. See Kurtzman (*FEMS Yeast Res.* 4: 240, 2003), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Nakataea** Hara (1939) = *Pyricularia* fide Sivanesan (*in litt.*), Bussaban *et al.* (*Mycol.* 97: 1002, 2005; phylogeny, morphology).
- Nakatopsis** Whitton, McKenzie & K.D. Hyde (2001), anamorphic *Pezizomycotina*. 2, Malaysia. See Whitton *et al.* (*Fungal Diversity* 8: 165, 2001).
- Nakazawaea** Y. Yamada, K. Maeda & Mikata (1994), Saccharomycetales. 1, USA. See Kurtzman in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 273, 1998), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Nalanthamala** Subram. (1956), anamorphic *Rubrinectria*, Hsp.0eH.15. 2, pantropical. See Subramanian (*J. Indian bot. Soc.* 35: 478, 1956), Schroers *et al.* (*Mycol.* 97: 375, 2005; phylogeny, morphology).
- Namakwa** Hale (1988), Parmeliaceae (L). 2, S. Africa. See Thell *et al.* (*Mycol. Progr.* 3: 297, 2004; phylogeny), Thell *et al.* (*J. Hattori bot. Lab.* 100: [797], 2006).
- nameko**, basidioma of the edible *Pholiota nameko* cultivated in Japan (Chang & Hayes, 1978).
- names** (1) of fungi, see Common names, Nomenclature; (2) Escallon (*Precis de myconymie*, 1989; meaning of scientific names).
- Nannenga-Bremekamp** (Neeltje Elizabeth; 1916-1996; Netherlands). An amateur and authority on *Mycetozoa*, noted for her acute observation; contributed to understanding of certain difficult genera (*Cribraria*, *Diderma*, *Didymium*, *Licea*, *Reticularia* and the *Stemonitidaceae* in general); her illustrative work was exemplary, and her book became a worldwide standard on the subject. *Publs. De Nederlandse Myxomyceten* (1974); *A Guide to Temperate Myxomycetes* (1991). *Biogs, obits etc.* Ing (*Mycologist* 10: 191, 1996) [portrait]; Rammeloo (*Coolia* 40: 1, 1997).
- Nannfeldt** (John Axel Frithiof; 1904-1985; Sweden). Assistant Professor (c. 1932-1939) then Professor and Director of the Botanical Garden and Herbarium (1939-1970), University of Uppsala. He produced critical accounts of numerous groups of discomycete fungi, and later some pyrenomycetes (especially *Sordariales* and *Xylariales*) and smuts. He was noted for his innovative thinking, and his dedication to mycology: he continued to dictate the text of his final paper, from a hospital oxygen tent. *Publs.* Studien über die Morphologie und Systematik der nichlichenisierten inoperculaten Discomyceten. *Nova Acta Regiae Societatis Scientiarum Upsaliensis* (1932) [this work established two main types of ascomycete ontogeny: ascohymenial and ascolocular (see also Luttrell)]; (with E. Melin) *Researches into the Blueing of Ground Wood-pulp* (1934) [a pioneering investigation into blue-stain fungi]. *Biogs, obits etc.* Grummann (1974: 495); Holm (*Mycol.* 78: 692, 1986).
- Nannfeldtia** Petr. (1947), ? Leptopeltidaceae. 1, Austria. See Scheuer (*Biblthca Mycol.* 123, 1988).
- Nannfeldtiella** Eckblad (1968) = *Pseudombrophila* fide Harmaja (*Ann. bot. fenn.* 16: 159, 1979), Nannfeldt (*Sydowia* 35: 166, 1982), van Brummelen (*Libri Botanici* 14, 1995), Hansen *et al.* (*Mycol.* 97: 1023, 2005), Yao & Spooner (*Fungal Diversity* 22: 267, 2006).
- Nannfeldtiomyces** Vánky (1981), Doassansiaceae. 2 (on *Sparganium*), Europe; N. America. See Vánky (*Sydowia* 34: 171, 1981).
- Nannizzia** Stockdale (1961) = *Arthroderma* fide Weitzman *et al.* (*Mycotaxon* 25: 505, 1986), Kawasaki *et al.* (*Mycopathologia* 118: 95, 1992), Hirai *et al.* (*Antonie van Leeuwenhoek* 83: 11, 2003).
- Nannizziopsis** Currah (1985), Onygenaceae. Anamorph *Chrysosporium*. 3, widespread. See Guarro *et al.* (*Mycotaxon* 42: 193, 1991; key), Udagawa & Uchiyama (*Mycoscience* 40: 291, 1999), Sugiyama & Mikawa (*Mycoscience* 42: 413, 2001), Solé *et al.* (*MR* 106: 388, 2002; phylogeny), Thomas *et al.* (*Medical Mycology* 40: 143, 2002; from crocodile).
- Nanomyces** Thaxt. (1931), Laboulbeniaceae. 3, Pacific. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- Nanoschema** B. Sutton (1980), anamorphic *Pezizomycotina*, St.1eH.15. 1, Solomon Islands. See Sutton

- (*The Coelomycetes*: 589, 1980).
- Nanoscypha** Denison (1972), Sarcoscyphaceae. Anamorph *Molliardiomyces*. c. 10, widespread. See Das & Pant (*Indian Phytopath.* 37: 294, 1984; Indian spp.), Pfister (*Mem. N. Y. bot. Gdn* 49: 339, 1989), Harrington (*Mycol.* 90: 235, 1998; DNA), Harrington *et al.* (*Mycol.* 91: 41, 1999; phylogeny), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Nanostictis** M.S. Christ. (1954), Stictidaceae. 2 (on lichens, esp. *Peltigera*), Denmark; N. America. See Sherwood (*Sydowia* 38: 267, 1986).
- Nanstelocephala** Oberw. & R.H. Petersen (1990), Cortinariaceae. 1, USA. See Oberwinkler & Petersen (*Mycol.* 82: 783, 1990).
- Naohidea** Oberw. (1990), Naohideales. 1, widespread (north temperate). See Piątek (*Polish Botanical Journal* 47: 49, 2002; rediscov. in Poland).
- Naohideales** R. Bauer, Begerow, J.P. Samp., M. Weiss & Oberw. (2006). Cystobasidiomycetes. 1 gen., 1 spp. No families recognized.
- Naohidemycetes** S. Sato, Katsuya & Y. Hirats. (1993), Pucciniastraceae. 3 (on *Tsuga* (0, I); on *Ericaceae* (II, III)), north temperate. See Sato *et al.* (*TMSJ* 34: 48, 1993).
- Naothyrsium** Bat. (1960), anamorphic *Pezizomycotina*, Cpt.1eP.1. 1, Brazil. See Batista (*Publicações Inst. Microl. Recife* 250: 5, 1960).
- Napamichum** J.I.R. Larsson (1990), Microsporidia. 3.
- Napicladium** Thüm. (1875) = *Fusicladium* fide Hughes (*CJB* 36: 727, 1958), Schubert *et al.* (*Schlechtendalia* 9, 2003).
- napiform**, turnip-like in form (Fig. 23.26).
- Napomyces** Setch. ex Clem. & Shear (1931) = *Daleomyces* fide Korf (*Mycol.* 48: 711, 1956).
- Naranus** Ts. Watan. (1995), anamorphic *Pezizomycotina*. 1, Japan. See Watanabe (*MR* 99: 806, 1995).
- Narasimhania** Thirum. & Pavgi (1952), Doassansiaceae. 1 (on *Alisma*), India; Mali. See Vánky (*Sydowia* 34: 167, 1981).
- Narasimhella** Thirum. & P.N. Mathur (1966) = *Gymnoascus* fide von Arx (*Persoonia* 13: 173, 1986), Solé *et al.* (*Stud. Mycol.* 47: 141, 2002; phylogeny).
- Nascimentoa** Cif. & Bat. (1956) = *Spiropes* fide Ellis (*Mycol. Pap.* 114, 1968).
- nassace** (nasse), the finger-like protrusion of the inner part of a bitunicate ascus into the inner tunica; internal apical beak; see ascus.
- nasse**, see nassace.
- Natalia** Fr. (1847) [non *Natalia* Hochst. 1841, *Meliasthaceae*] = *Levieuxia*.
- Natantisporea** J. Campb., J.L. Anderson & Shearer (2003), Halosphaeriaceae. 2, USA. See Campbell *et al.* (*Mycol.* 95: 543, 2003), Sakayaroj *et al.* (*Mycol.* 97: 804, 2005; key).
- Natarajania** Pratibha & Bhat (2006), anamorphic *Pezizomycotina*. 1 (from decaying leaves), India.
- native bread**, see blackfellows' bread.
- Nattrassia** B. Sutton & Dyko (1989) = *Fusicoccum* fide Sutton & Dyko (*MR* 93: 483, 1989), Roelijmans *et al.* (*J. Med. Vet. Mycol.* 35: 181, 1997; molecular taxonomy), Sigler *et al.* (*J. Clin. Microbiol.* 35: 433, 1997; in man), Farr *et al.* (*Mycol.* 97: 730, 2005; synonymy).
- Naucoria** (Fr.) P. Kumm. (1871), Strophariaceae. 30 (usually associated with *Alnus*), widespread. Because of nomenclatural complications the name *Alnicola* is often used for this genus. See Orton (*TBMS* 43: 308, 1960), Reid (*TBMS* 82: 191, 1984; key 17 Br. spp.), Moreau (*Fungal Diversity* 20: 121, 2005; as *Alnicola*), Moreau *et al.* (*Mol. Phyl. Evol.* 38: 794, 2006; phylogeny, as *Alnicola*).
- Naufregella** Kohlm. & Volkm.-Kohlm. (1998), Halosphaeriaceae. 2 (marine), Europe; N. America. See Kohlmeyer & Volkmann-Kohlmeyer (*SA* 16: 9, 1998).
- Naumov** (Nikolai Aleksandrovich; 1888-1959; Russia). Student, Department of Natural Sciences, St Petersburg University (1906-1910); Assistant, Bureau of Mycology and Phytopathology (1910-1919); organizer and Head of Phytopathology Station, Tsarskoye Selo (1919-1931); Head, Phytopathology Department (1930-1935) then Director (1935-1954), All Union Institute of Plant Protection; Lenin Prize (1954). Directed development of plant pathology (particularly diseases of brassicas, cereals and potato), and research on the mechanism of fungicides in the difficult conditions of the Soviet Union under Stalin and World War II; produced textbooks highly influential in the Soviet Union and China. *Publs.* [*Tables of the Identification of Mucoraceae*] (1915) [in Russian]; [*Methods of Microscopic Investigations in Phytopathology*] (1932) [in Russian]; [*Methods of Mycological and Phytopathological Investigations*] (1937) [in Russian]; [*Mycoflora of Leningrad Oblast*] vols 1 & 2 (1954, 1964) [in Russian, published posthumously]. *Biogs, obits etc.* Khokhryakov ([*Mikologiya i Fitopatologiya*] 2: 167, 1968) [portrait, in Russian]; Khokhryakov, Novotelnova & Potlaichuk ([*Mikologiya i Fitopatologiya*] 3: 197, 1969) [in Russian].
- Naumovela** Kravtzev (1955), *Pezizomycotina*. 2 (on wood), former USSR. See Kravtzev (*Trudy Inst. Bot., Alma-Ata* 2: 153, 1955).
- Naumovia** Dobrozr. (1928) = *Rosenscheldia* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Naumovia** Kurtzman (2003) = *Naumovozyma*.
- Naumoviella** Novot. (1950) = *Mortierella* fide Heseltine (*Mycol.* 47: 344, 1955).
- Naumovozyma** Kurtzman (2008), Saccharomycetaceae. 2. See Kurtzman (*FEMS Yeast Res.* 4: 240, 2003; as *Naumovia*), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny; as *Naumovia*).
- Nautosphaeria** E.B.G. Jones (1964), Halosphaeriaceae. 1 (marine), British Isles. See Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 34: 1, 1991).
- Navaneethospora** V.G. Rao (1994), anamorphic *Pezizomycotina*, Hso.???. 1, India. See Rao (*Advances in Mycology and Aerobiology* (Dr S.T. Tilak Commemoration Volume). *Current Trends in Life Sciences* 20: 134, 1994).
- navel**, see umbilicus.
- Navicella** Fabre (1879), Massariaceae. 5, widespread. See Eriksson (*Op. Bot.* 60, 1981), Holm & Holm (*Symb. bot. upsal.* 28 no. 2, 1988), Barr (*N. Amer. Fl. ser.* 2 13: 129 pp., 1990; posn), Aptroot & van Iperen (*Nova Hedwigia* 67: 481, 1998), Elshafie *et al.* (*Sydowia* 57: 19, 2005; Costa Rica).
- navicular** (naviculate), boat-like in form; cymbiform (Fig. 23.32).
- Navisporus** Ryvarden (1980), Polyporaceae. 6, widespread (pantropical). See Ryvarden & Johansen (*Prelim. Polyp. Fl. E. Afr.*: 429, 1980), Decock & Herrera Figueroa (*Cryptog. Mycol.* 21: 153, 2000; Cuba), Ryvarden & Iturriaga (*Mycol.* 95: 1066, 2003; Venezuela).
- Nawawia** Marvanová (1980), anamorphic *Pezizomy-*

- cotina*, Hso.0eH.15. 2 (aquatic), widespread. See Kuthubutheen *et al.* (*CJB* 70: 96, 1992), Hyde *et al.* (*MR* 100: 810, 1996; S Africa), Mel'nik & Hyde (*Mikol. Fitopatol.* 40: 411, 2006; E Russia).
- Necator** Massee (1898), anamorphic *Erythrimum*. 1, S.E. Asia. See Brooks & Sharples (*Ann. appl. Biol.* 2: 58, 1915).
- Necium** Arthur (1907) = *Melampsora* fide Davis (*Transactions of the Wisconsin Academy of Sciences, Arts and Letters* 18: 78, 1915).
- Necol technique**, see Mounting media.
- necral layer**, a layer of horny dead fungal hyphae with indistinct lumina in or near the cortex of lichens; **epinecral layer** if above the algal layer, **hyponecral layer** if below.
- Necraphidium** Cif. (1951), anamorphic *Pezizomycotina*, Hso.0-1eH.?. 1 (on larvae of *Callipterus*), Italy. See Ciferri (*Mycopath. Mycol. appl.* 6: 25, 1951).
- necrophagous**, saprobic.
- necrophyte**, an organism living on dead material (Münch); cf. perthophyte, saprophyte.
- Necrosis** Paulet (1793) = *Ustilago* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- necrosis**, death of plant cells, esp. when resulting in the tissue becoming dark in colour; commonly a symptom of fungus infection.
- necrotroph**, a parasite that derives its energy from dead cells of the host (Thrower, *Phytopath. Z.* 56: 258, 1966). Cf. biotroph.
- nectar**, the sticky, sometimes sweet, secretion (esp. of pycnia of rusts) in which spores or spermatia may be freed, and which has an attraction for insects.
- Nectaromyces** Syd. & P. Syd. (1919) = *Metschnikowia* fide von Arx *et al.* (*Stud. Mycol.* 14: 1, 1977), Giménez-Jurado (*Syst. Appl. Microbiol.* 15: 432, 1992; teleomorph).
- Nectaromycetaceae** Cif. & Redaelli (1929) = *Metschnikowiaceae*.
- Nectria** (Fr.) Fr. (1849) nom. cons., Nectriaceae. Anamorphs *Tubercularia*, *Acremonium*-like. 82 (from decaying wood, bark etc.), widespread. *N. cinnabarina* (coral spot of woody plants. See also Fungicolous fungi. See Lohman & Watson (*Lloydia* 6: 77, 1943; spp. on hardwoods), Booth (*Mycol. Pap.* 73, 1959; UK, keys), Passeur (*Sydowia* 27: 7, 1975; morphology, substratum), Perrin (*BSMF* 92: 335, 1976; key Eur. spp.), Doyle (*Mycol.* 70: 355, 1978; metabolites), Rossman (*Mycol. Pap.* 150, 1983; phragmosporous spp.), Dargan *et al.* (*Nova Hedwigia* 42: 109, 1986; Himalayas), Samuels (*Brittonia* 40: 306, 1988), Samuels (*Mem. N. Y. bot. Gdn* 48: 1, 1988; fungicolous spp.), Rossman (*Mem. N. Y. bot. Gdn* 49: 253, 1989; key 28 spp.; *N. cinnabarina* agg.), Rossman (*The Fungal Holomorph: Mitotic, Meiotic and Pleomorphic Speciation in Fungal Systematics*: 149, 1993; review), Samuels & Brayford (*Sydowia* 46: 75, 1994; spp. with striate ascospores), Rossman (*Mycol.* 88: 1, 1996; phylogeny, review), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999; generic revision), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Nectriaceae** Tul. & C. Tul. (1865), Hypocreales. 57 gen. (+ 64 syn.), 646 spp.
Lit.: Brayford & Samuels (*Mycol.* 85: 612, 1993), Samuels & Brayford (*Sydowia* 45: 55, 1993), Rehner & Samuels (*CJB* 73: S816, 1995), Nirenberg & O'Donnell (*Mycol.* 90: 434, 1998), O'Donnell *et al.* (*Mycol.* 90: 465, 1998), Victor *et al.* (*MR* 102: 273, 1998), Aoki & O'Donnell (*Mycol.* 91: 597, 1999), Arie *et al.* (*Mycoscience* 40: 311, 1999), Leslie (*Pl. Path. J.* 15: 259, 1999), Möller *et al.* (*J. Phytopath.* 147: 497, 1999), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Baayen *et al.* (*Phytopathology* 90: 891, 2000), Lieckfeldt & Seifert (*Stud. Mycol.* 45: 35, 2000), O'Donnell *et al.* (*Proc. natn Acad. Sci. U.S.A.* 97: 7905, 2000), Rossman (*Stud. Mycol.* 45: 27, 2000), Schoch *et al.* (*Stud. Mycol.* 45: 45, 2000), Crous (*Taxonomy and Pathology of Cyllindrocladium (Calonectria) and Allied Genera*: 278 pp., 2002), Brayford *et al.* (*Mycol.* 96: 572, 2004), Crous *et al.* (*Stud. Mycol.* 55: 213, 2006).
- Nectricladiella** Crous & C.L. Schoch (2000), Nectriaceae. Anamorph *Cyllindrocladiella*. 2, widespread (tropical). See Schoch *et al.* (*Stud. Mycol.* 45: 45, 2000), Crous (*Taxonomy and Pathology of Cyllindrocladium (Calonectria) and Allied Genera*: 278 pp., 2002; revision).
- Nectriella** Nitschke ex Fuckel (1870), Bionectriaceae. Anamorphs *Acremonium*-like, *Kutilakesa*, *Dendrodochium*-like. 35 (on dead plant tissues or fungicolous), widespread (temperate). See Lowen (*Mycotaxon* 39: 461, 1990; concept), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Ramaley (*Mycotaxon* 90: 181, 2004; on *Agavaceae*).
- Nectriella** Sacc. (1877) = *Pseudonectria* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Nectrioidaceae** Sacc. (1884).
Lit.: Petch (*TBMS* 26: 53, 1943; genera), Sutton in Ainsworth *et al.* (Eds) (*The Fungi* 4A, 1973; discussion family names).
- Nectriopsis** Maire (1911), Bionectriaceae. Anamorphs *Acremonium*-like, *Rhopalocladium*. 58 (on fungi and myxomycetes), widespread. See Samuels (*Mem. N. Y. bot. Gdn* 48, 1988), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Rossman *et al.* (*Mycol.* 93: 100, 2001; phylogeny), Samuels *et al.* (*CBS Diversity Ser.* 4, 2006; USA).
- needle cast** (of conifers), loss of leaves caused by spp. of *Hypoderma*, *Lophodermium*, *Rhabdochloa*, or other *Rhytismatales*.
- Neelakesa** Udaiyan & V.S. Hosag. (1992), Sordariomycetes. 1 (submerged wood), India. See Udaiyan & Hosagoudar (*J. Econ. Taxon. Bot.* 15: 649, 1992).
- Nees** (von Esenbeck, Christian Gottfried Daniel; 1776-1858; Germany). Medical degree, Giesen (1800); Professor of Botany, Erlangen (1818-1819); Professor of Botany, Bonn (1819-1830); Professor of Botany, Breslau (1831-1851) [dismissed for alleged 'moral turpitude', but more probably because of involvement in a movement for emancipation of the under-privileged]. Produced influential early work on fungal taxonomy. *Publs. Das System der Pilze und Schwämme* (1817) [366 colour figures on 44 plates]; *Horae Physicae Berolinensis* (1820); also various papers jointly with his brother (T.F.L. Nees, q.v.). *Biogs, obits etc.* Grumann (1974: 34); Stafleu & Cowan (*TL-2* 3: 705, 1981).
- Nees** (von Esenbeck, Theodor Friedrich Ludwig; 1787-1837; Germany, later Switzerland, Netherlands). Pharmaceutical Assistant, Basle (1811-1816), then Hanau (1816-1817); Inspector, Botanic Garden, Leiden (1817-1819); Garden Inspector and Lecturer (1819-1822) then Professor of Pharmacy (1822-1827) then Regius Professor of Pharmacy (1827-1833) then Co-Director of Botanic Garden (1833 onwards), University of Bonn. Produced influential

- early work on fungal taxonomy. *Publs.* (with Henry) *Das System der Pilze* (1837, with coloured plates) [Abt. 2 by Bail (1858)]; also various papers jointly his brother (C.G.D. Nees, q.v.). *Biogs, obits etc.* Grumann (1974: 34); Stafleu & Cowan (*TL-2* 3: 712, 1981).
- Neesiella** Kirschst. (1935) [non *Neesiella* Schiffn. 1893, *Hepaticae*] = *Myconesia*.
- Negeriella** Henn. (1897), anamorphic *Pezizomycotina*, Hsy. = eP.?. 2, S. America. See Morris (*Mycopathologia* 33: 183, 1967).
- Neilreichina** Kuntze (1891) = *Polytrichia*.
- Nelliemelba** J.I.R. Larsson (1983), *Microsporidia*. 1.
- Nemaclada** J. Sm. (1896), Fossil Fungi (mycel.) Fungi. 1 (Carboniferous), British Isles.
- Nemacola** A. Massal. (1855) nom. dub., ? *Dothideomycetes* (L). Possibly an alga.
- Nemadiplodia** Zambett. (1955) = *Lasiodiplodia* fide Petrak (*Sydowia* 16: 353, 1963).
- Nemania** Gray (1821), *Xylariaceae*. Anamorph *Geniculosporium*. 44, widespread. See Pouzar (*Česká Mykol.* 39: 129, 1985), Pouzar (*Česká Mykol.* 39: 15, 1985), Petrini & Rogers (*Mycotaxon* 26: 40, 1986; key, as *Hypoxylon serpens* group), Læssøe (*SA* 13: 113, 1994), Granmo *et al.* (*Sommerfeltia* 27, 1999), Sánchez-Ballesteros *et al.* (*Mycol.* 92: 964, 2000; phylogeny), Stadler *et al.* (*Mycotaxon* 77: 379, 2001; chemistry), Ju & Rogers (*Nova Hedwigia* 74: 75, 2002; revision), Ju *et al.* (*Mycol.* 97: 562, 2005), Ju *et al.* (*Mycol.* 99: 612, 2007; phylogeny), Tang *et al.* (*MR* 111: 392, 2007; Thailand).
- Nemaplana** J. Sm. (1896), Fossil Fungi (mycel.) ? Fungi. 1 (Carboniferous), British Isles.
- Nemaria** Navas (1909) = *Roccella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Nemariaceae** Navas (1910) = *Roccellaceae*.
- Nematidia** Stirt. (1879) = *Eremothecella* fide Sérusiaux (*SA* 11: 39, 1992).
- Nematococcomyces** C.L. Hou, M. Piepenbr. & Oberw. (2004), *Rhytismataceae*. 1, China. See Hou *et al.* (*Mycol.* 96: 1381, 2004).
- Nematococcus** Kütz. (1833) nom. dub., Fungi.
- Nematocolla** Link (1833) = *Myxosporium* fide Link (*Handbuck zur Erkennung der Nutzbarsten und am Häufigsten Vorkommenden Gewächse* 3, 1833).
- Nematoctonus** Drechsler (1941), anamorphic *Hohenbuehelia*, Hso.0-1eP.10+1. 16 (with clamp connexions, on nematodes), widespread. See Giuma *et al.* (*TBMS* 60: 49, 1973; nematoxins), Thorn & Barron (*Mycotaxon* 25: 321, 1986; key 14 spp.), Rubner (*Stud. Mycol.* 39, 1996).
- nematodes** (fungi pathogenic to), see *Mycopesticides*, *Predacious fungi*, *Zoopagaceae*.
- nematogenous**, of conidiogenous cells arising at all levels from single hyphae; lanose. See Gams (*Cephalosporium-artige Schimmelpilze*, 1971).
- Nematogonum** Desm. (1834), anamorphic *Pezizomycotina*, Hso.0eH.3. 2 (contact mycoparasites), widespread (temperate). See Gams (*Revue Mycol.* Paris 39: 273, 1975), Walker & Minter (*TBMS* 77: 299, 1981).
- Nematographium** Goid. (1935), anamorphic *Pezizomycotina*, Hsy.0eH.?. 5, Europe.
- Nematoloma**, see *Naematoloma*.
- Nematomyces** Faurel & Schotter (1966) = *Gliomastix* fide von Arx (*Gen. Fungi Sporul. Cult.*, 1970).
- Nematonostoc** Nyl. ex Elenkin (1934), *Algae*. *Algae*.
- nematophagous**, nematode-feeding; see *Predacious fungi*. Nematophagous fungi are also reported as fossils (Jansson & Poinar, *TBMS* 87: 471, 1986).
- Nematophagus** Mekht. (1975) = *Arthrotrys* fide Scholler *et al.* (*Sydowia* 51: 89, 1999).
- Nematora** Fée (1825) = *Strigula* fide Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952).
- Nematospora** Peglion (1897) = *Eremothecium* fide Batra (*USDA Tech. Bull.* 1469, 1973), Kurtzman (*J. Industr. Microbiol.* 14: 523, 1995), de Hoog *et al.* in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 201, 1998).
- Nematospora** Tassi (1904) = *Giulia*.
- Nematosporaceae** E.K. Novák & Zsolt (1961) = *Eremotheciaceae*.
- Nematostigma** Syd. & P. Syd. (1913), *Pseudoperisporiaceae*. 1, S. Africa. See Hansford (*Mycol. Pap.* 15, 1946), Petrak (*Sydowia* 3: 251, 1949).
- Nematostoma** Syd. & P. Syd. (1914), *Pseudoperisporiaceae*. Anamorph *Chaetosticta*. c. 12, widespread (tropical). See Hansford (*Mycol. Pap.* 15, 1946), Petrak (*Sydowia* 3: 251, 1949), Rossman (*Mycol. Pap.* 157, 1987), Barr (*Mycotaxon* 64: 149, 1997).
- Nematothecium** Syd. & P. Syd. (1912), ? *Pseudoperisporiaceae*. Anamorph *Atractilina*. c. 2, widespread (tropical). See Rossman (*Mycol. Pap.* 157, 1987).
- nematotoxin**, a metabolic product toxic to nematodes, e.g. **nematoctonins** from *Nematoctonus* spp. (Kennedy & Taplin, *TBMS* 70: 140, 1978); see also *Mycopesticides*.
- Nemecomyses** Pilát (1933) = *Pholiota* fide Singer (*Agaric. mod. Tax.* edn 3, 1975).
- nemin**, a principle from a nematode-free culture filtrate of *Neoplectana glaseri*, which caused *Arthrotrys conoides* to differentiate traps (Pramer & Stoll, *Science, N.Y.* 129: 966, 1959); see *Predacious fungi*.
- nemoral**, living in woods or groves.
- Nemostroma**, see *Naemostroma*.
- Nemozythiella** Höhn. (1925), anamorphic *Pezizomycotina*, St.1eH.?. 1, Europe.
- neo-** (prefix), new.
- Neopalakesa** Punith. (1981), anamorphic *Pezizomycotina*, Cpd.0eH.19. 1, British Isles. See Punithalingam (*Nova Hedwigia* 34: 137, 1981).
- Neoarachnotheca** Ulfig, Cano & Guarro (1997), *Onygenaceae*. 2, Australasia; S. Africa. See Cano *et al.* (*Antonie van Leeuwenhoek* 72: 149, 1997).
- Neoarbuscula** B. Sutton (1983), anamorphic *Pezizomycotina*, Hso.#eP.42. 1, widespread (tropical). See Subramanian & Vittal (*CJB* 51: 977, 1973).
- Neoarcangelia** Berl. (1900) = *Pleurostoma* fide Shear (*Mycol.* 29: 355, 1937).
- Neoballadyna** Boedijn (1961) = *Dysrhynchis* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Neobarclaya** Sacc. (1899), anamorphic *Pezizomycotina*, Cac.1eP.19. 1, USA. See Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993).
- Neobarya** Lowen (1986), ? *Clavicipitaceae*. Anamorph *Acremonium*-like. 3 (parasitic on agarics), widespread. See Seifert (*SA* 5: 310, 1986; status), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999; possible synonym of *Berkelella*), Candoussau *et al.* (*Sydowia* 59: 179, 2008; monogr.).
- Neobroomella** Petr. (1947), *Amphisphaeriaceae*. Anamorph *Pestalotiopsis*. 1, Syria. See Eriksson (*SA* 5: 145, 1986), Kang *et al.* (*MR* 103: 53, 1999).
- Neobulgaria** Petr. (1921), ? *Helotiaceae*. Anamorph

- Myrioconium*-like. 8, Europe. See Verkley (*Persoonia* 15: 3, 1992; ultrastr.), Landvik *et al.* (*Mycoscience* 37: 237, 1996; phylogeny), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Neocallimastigaceae** I.B. Heath (1983), Neocallimastigales. 6 gen. (+ 1 syn.), 20 spp.
Lit.: Heath *et al.* (*CJB* 61: 295, 1983), Heath *et al.* (*Fourth International Mycological Congress Abstracts*, 1989), Coleman in Levett (Ed.) (*Anaerobic microbiology. A practical approach*, 1991), Dore & Stahl (*CJB* 69: 1964, 1991; RNA, phylogeny), Li & Heath (*Fifth International Colloquium on Invertebrate Pathology and Microbial Control* [Adelaide, Australia, 20-24 August 1990] Proceedings and Abstracts, 1992), Li *et al.* (*CJB* 71: 393, 1993), Ho & Barr (*Mycol.* 87: 655, 1995).
- Neocallimastigales** J.L. Li, I.B. Heath & L. Packer (1993). Neocallimastigomycetes. 1 fam., 6 gen., 20 spp. Thallus mono- or polycentric; zoospores mono- or polyflagellate, without mitochondria; kinetosomes with a skirt, spur, cylinder and microtubule root, lacking props; anaerobic saprobes occurring in the guts of herbivores. Fam.:
- Neocallimastigaceae**
Lit.: Heath (*CJB* 67: 2815, 1989; emend.), Heath *et al.* (*CJB* 71: 393, 1993), Li & Heath (*CJB* 70: 1738, 1992; RNA, cladistics), Trinci *et al.* (*MR* 98: 129, 1994, review), Ho & Barr (*Mycol.* 87: 655, 1995; taxonomy), James *et al.* (*Mycol.* 98: 860, 2006; molecular phylogeny), Hibbett *et al.* (*MR* 111: 109, 2007), and see under Families.
- Neocallimastigomycetes** M.J. Powell (2007), Neocallimastigomycota. 1 ord., 1 fam., 6 gen., 20 spp. Ord.:
- Neocallimastigales**
Lit.: James *et al.* (*Mycol.* 98: 860, 2006; molecular phylogeny), and see under Order.
- Neocallimastigomycota** M.J. Powell (2007), Fungi. 1 class., 1 ord., 1 fam., 6 gen., 20 spp. Class:
- Neocallimastigales**
Lit.: James *et al.* (*Mycol.* 98: 860, 2006; molecular phylogeny), and see under Orders.
- Neocallimastix** Vavra & Joyon ex I.B. Heath (1983), Neocallimastigaceae. 5 (in rumen of sheep and cattle), widespread. See Orpin & Munn (*TBMS* 86: 178, 1986; emend.), Wubah *et al.* (*CJB* 69: 835, 1991; morphology), Wubah *et al.* (*Mycol.* 83: 40, 1991; resistant body), Chen *et al.* (*FEMS Microbiol. Lett.* 221: 227, 2003; genetics).
- Neocapnodium** W. Yamam. (1955) = *Phragmocapnias* fide Reynolds (*Mycotaxon* 8: 917, 1979).
- Neocarpenteles** Udagawa & Uchiy. (2002), Trichocomaceae. 1. See Udagawa & Uchiyama (*Mycoscience* 43: 4, 2002).
- Neocatapyrenium** H. Harada (1993), Verrucariaceae (L). 4, widespread. See Harada (*Nat. Hist. Res.* 2: 129, 1993), Breuss (*Bryologist* 108: 537, 2005; N America), Gueidan *et al.* (*MR* 111: 1145, 2007; phylogeny).
- Neochaetospora** B. Sutton & Sankaran (1991), anamorphic *Pezizomycotina*, Cpd.≡ eH.1. 1 (coprophilous), Sahara. See Sutton & Sankaran (*MR* 95: 768, 1991).
- Neoclaviceps** J.F. White, Bills, S.C. Alderman & Spatafora (2001), Clavicipitaceae. 1, Costa Rica. See White *et al.* (*Mycol.* 93: 90, 2001).
- Neoclitocybe** Singer (1962), Tricholomataceae. 10, widespread (esp. tropical). See Singer (*Sydowia* 15: 55, 1961), Liew *et al.* (*Mol. Phylogen. Evol.* 16: 392, 2000; phylogeny).
- Neococcomyces** Y.R. Lin, C.T. Xiang & Z.Z. Li (1999), Rhytismataceae. 1, China. See Lin *et al.* (*Mycosystema* 18: 357, 1999), Gao & Hou (*Nova Hedwigia* 82: 123, 2006).
- Neocoleroa** Petr. (1934) = *Wentiomycetes* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Neocordyceps** Kobayasi (1984), ? Cordycipitaceae. 1 (entomogenous), Japan. See Fukatsu (*Nippon Kingakukai Kaiho* 40: 34, 1999), Fukatsu & Nikoh (*Mycology Series* 19: 311, 2003), Sung *et al.* (*Stud. Mycol.* 57, 2007).
- Neocosmospora** E.F. Sm. (1899), Nectriaceae. Anamorph *Acremonium*-like. 13, widespread (esp. tropical). See also *Haematonectria*. See Cannon & Hawksworth (*TBMS* 82: 673, 1984; key), Udagawa *et al.* (*Sydowia* 41: 349, 1989; key 7 spp.), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), O'Donnell (*Mycol.* 92: 919, 2000; phylogeny), Cornely *et al.* (*Emerging Infectious Diseases* 7: 149, 2001; clinical strain).
- Neocryptospora** Petr. (1959), *Pezizomycotina*. 1, Brazil. See Petrak (*Sydowia* 13: 51, 1959).
- Neocudoniella** S. Imai (1941), ? Helotiaceae. 2, Japan; Canada. See Kohn *et al.* (*Mycol.* 78: 934, 1986).
- Neodasyscypha** Spooner (1987) nom. inval. = *Neodasyscypha* Suková & Spooner.
- Neodasyscypha** Suková & Spooner (2005), *Hyaloscyphaceae*. 2, widespread (temperate). See Spooner (*Bibliotheca Mycol.* 116: 711 pp., 1987), Eriksson & Hawksworth (*SA* 7: 83, 1988; status), Suková (*Czech Mycol.* 57: 139, 2005).
- Neodeightonia** C. Booth (1970), Botryosphaeriaceae. 1. See Punithalingam (*Mycol. Pap.* 119, 1969), von Arx & Müller (*Stud. Mycol.* 9, 1975), Phillips *et al.* (*Persoonia* 21: in press, 2008; phylogeny).
- Neodimerium** Petr. (1950) = *Epipolaeum* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Neodiplodina** Petr. (1954), anamorphic *Pezizomycotina*, St.1eH.?. 1, Australia. See Petrak (*Sydowia* 8: 36, 1954).
- Neoerysiphe** U. Braun (1999), Erysiphaceae. Anamorph *Oidium* subgen. *Striatoidium*. 5, widespread. See Braun (*Beih. Nova Hedwigia* 89, 1987; key (as *Erysiphe* sect. *Galeopsidis*)), Braun (*Schlechtendalia* 3: 50, 1999; taxonomy), Bolay (*Cryptogamica Helvetica* 20, 2005; Switzerland), Voytyuk *et al.* (*Mycotaxon* 97: 247, 2006; Israel), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Neofabraea** H.S. Jacks. (1913), Dermateaceae. Anamorphs *Cryptosporiopsis*, *Phlyctema*. 4, widespread. Molecular data do not support separation from *Pezizula*. See Verkley (*Stud. Mycol.* 44, 1999), Abeln *et al.* (*Mycol.* 92: 685, 2000; phylogeny), Cunningham (*Australas. Pl. Path.* 33: 453, 2004; Australia), Gariépy *et al.* (*Can. J. Pl. Path.* 27: 118, 2005; Pacific NW), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Neoflageoletia** J. Reid & C. Booth (1966), Hyponectriaceae. 1 (on bamboo stem), Philippines. See Reid & Booth (*CJB* 44: 445, 1966).
- Neofracchiacea** Teng (1938), Scortechiniaceae. 1, China; USA. See Huhndorf *et al.* (*MR* 108: 1384, 2004; phylogeny).
- Neofuckelia** Zeller & Goodd. (1935), anamorphic *Pezizomycotina*, St.0eH.?. 1, N. America.
- Neofuscelia** Essl. (1978) = *Xanthoparmelia* fide Elix (*Bryologist* 96: 359, 1993; close to *Xanthoparmelia*) but see also Elix (*Flora of Australia* 55: 68, 1994),

- Krug & Sang (*Flechten Follmann Contributions to Lichenology in Honour of Gerhard Follmann*: 263, 1995; Namibia), Rico & Manrique (*Lazaroa* 16: 9, 1995; Spain), Crespo & Cubero (*Lichenologist* 30: 369, 1998; phylogeny), Elix (*Mycotaxon* 71: 431, 1999; S hemisphere), Elix (*Australasian Lichenology* 51: 7, 2002; chemistry), Elix (*Australasian Lichenology* 53: 14, 2003; Australia), Giordani *et al.* (*Lichenologist* 35: 377, 2003; Italy), Blanco *et al.* (*Taxon* 53: 959, 2004; phylogeny, synonymy with *Xanthoparmelia*), Thell *et al.* (*Mycol. Progr.* 3: 297, 2004; phylogeny), Blanco *et al.* (*Mol. Phylogen. Evol.* 39: 52, 2006; phylogeny).
- Neofusicoccum** Crous, Slippers & A.J.L. Phillips (2006), anamorphic *Botryosphaeriaceae*, H??.?. 13, widespread. See Morgan-Jones & White (*Mycotaxon* 30: 117, 1987), Darvas (*Phytophylactica* 23: 295, 1991; S Africa), Jacobs & Rehner (*Mycol.* 90: 601, 1998; morphology, ITS), Smith & Stanosz (*Mycol.* 93: 505, 2001), Phillips *et al.* (*Sydowia* 54: 59, 2002), Denman *et al.* (*Mycol.* 95: 294, 2003; on *Proteaceae*), Slippers *et al.* (*Stud. Mycol.* 50: 343, 2004; on *Eucalyptus*), van Niekerk *et al.* (*Mycol.* 96: 781, 2004; on *Vitis*), Barber *et al.* (*MR* 109: 1347, 2005; synanamorph), Slippers *et al.* (*Mycol.* 97: 99, 2005; on *Mangifera*), Crous *et al.* (*Stud. Mycol.* 55: 247, 2006), Slippers *et al.* (*Pl. Path.* 56: 128, 2007; on *Rosaceae*).
- Neogeotrichum** O. Magalh. (1932) = *Trichosporon* fide Lodder & Kreger-van Rij (*Yeasts, a taxonomic study*, 1952).
- Neogibbera** Petr. (1947) = *Acantharia* fide Müller & von Arx in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 87, 1973).
- Neogodronia** Schläpf.-Bernh. (1969) = *Encoeliopsis* fide Korf in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 249, 1973).
- Neogymnomycetes** G.F. Orr (1970), *Onygenaceae*. 1, USA. See Orr (*CJB* 48: 1065, 1970), Currah (*Mycotaxon* 24: 1, 1985), Currah (*SA* 7: 1, 1988; key).
- Neogyromitra** S. Imai (1932) = *Gyromitra* fide Eckblad (*Nytt Mag. Bot.* 15: 1, 1968).
- Neohaplomyces** R.K. Benj. (1955), *Laboulbeniaceae*. 3, widespread. See Benjamin (*Aliso* 3: 189, 1955), Santamaría & Rossi (*Pl. Biosystems* 133: 163, 1999; Mediterranean).
- Neohendersonia** Petr. (1921), anamorphic *Pezizomycotina*, St.≡ eP.1/19. 3, widespread. See Sutton (*The Coelomycetes*, 1980).
- Neohenningsia** Koord. (1907) = *Hydropisphaera* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Neoheppia** Zahlbr. (1909), *Peltulaceae* (L). 2, Brazil; Zaïre. See Büdel (*Mycotaxon* 54: 137, 1995).
- Neoheteroceras** Nag Raj (1993), anamorphic *Pezizomycotina*, Cpd/Cac.≡ eP.19. 1, widespread (temperate). See Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*: 539, 1993), Hüseyin *et al.* (*Mycotaxon* 94: 241, 2005), Yonezawa & Tanaka (*Mycoscience* 49: 152, 2008; Japan).
- Neohoenelia** Theiss. & Syd. (1918) = *Dysrhynchis* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Neohygrocybe** Herink (1958) = *Hygrocybe* fide Singer (*Agaric. mod. Tax.* edn 2, 1962).
- Neohygrophorus** Singer ex Singer (1962), *Tricholomataceae*. 1, N. America. See Redhead *et al.* (*Mycotaxon* 76: 321, 2000), Matheny *et al.* (*Mycol.* 98: 982, 2006; phylogeny).
- Neohypodiscus** (Lloyd) J.D. Rogers, Y.M. Ju & Laessøe (1994), ? *Boliniaceae*. 3, widespread. See Rogers *et al.* (*Mycol.* 86: 684, 1994).
- Neojohnstonia** B. Sutton (1983), anamorphic *Pezizomycotina*, Hso.1eP.1/10. 1, pantropical. See Sutton (*TBMS* 81: 407, 1983), Gusmão & Grandi (*Mycotaxon* 80: 97, 2001; Brazil).
- Neokeissleria** Petr. (1920) = *Melanconis* fide Müller & von Arx in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 87, 1973), Barr (*Mycol. Mem.* 7, 1978).
- Neokellermania** Punith. (1981) = *Pseudorobillarda* M. Morelet fide Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993).
- Neokneiffia** Sacc. (1898) = *Hyphoderma* Wallr. fide Donk (*Persoonia* 3: 199, 1964).
- Neolamyia** Theiss. & Syd. (1918), *Pezizomycotina*. 1 (on lichens, esp. *Peltigera*), Europe. See Kümmerling & Alstrup (*Graphis Scripta* 3: 120, 1992; Scandinavia), Zhurbenko & Davydov (*Folia cryptog. Estonica* 37: 109, 2000; Siberia).
- Neolecta** Speg. (1881), *Neolectaceae*. 3, north temperate; Brazil. See Redhead (*CJB* 55: 301, 1977; ecology), Landvik *et al.* (*SA* 11: 107, 1993; phylogeny), Landvik (*MR* 100: 199, 1996), Sjamsuridzal *et al.* (*Mycoscience* 38: 267, 1997), Liu *et al.* (*Mol. Biol. Evol.* 16: 1799, 1999; phylogeny), Landvik *et al.* (*Mycol.* 93: 1151, 2001; phylogeny), Landvik *et al.* (*MR* 107: 1021, 2003; morphology, ultrastr.), Sugiyama *et al.* (*Mycol.* 98: 996, 2006; phylogeny).
- Neolectaceae** Redhead (1977), *Neolectales*. 1 gen. (+ 2 syn.), 3 spp.
Lit.: Redhead (*CJB* 55: 301, 1977), Landvik *et al.* (*SA* 11: 107, 1993), Landvik (*MR* 100: 199, 1996), Sugiyama (*Mycoscience* 39: 487, 1998), Liu *et al.* (*Mol. Biol. Evol.* 16: 1799, 1999), Berbee & Taylor in McLaughlin *et al.* (Eds) (*The Mycota A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research* 7A: 229, 2001), Landvik *et al.* (*Mycol.* 93: 1151, 2001), Sugiyama *et al.* (*Mycol.* 98: 996, 2006; phylogeny), Sugiyama *et al.* (*Mycol.* 98: 996, 2006).
- Neolectales** Landvik, O.E. Erikss., Gargas & P. Gust. (1993). *Neolectomycetidae*. 1 fam., 1 gen., 3 spp. Fam.:
Neolectaceae
For Lit. see under fam.
- Neolectomycetes** O.E. Erikss. & Winka (1997), *Taphrinomycotina*. 1 ord., 1 fam., 1 gen., 3 spp. Contains only one genus, *Neolecta*, which has some outward similarities to members of the *Pezizomycetes*, but clusters with the *Taphrinomycetes* when molecular data are analysed. Ord.:
Neolectales
For Lit. see fam.
- Neolectomycetidae**, see *Neolectomycetes*.
- Neolentinus** Redhead & Ginns (1985), *Polyporaceae*. 11, widespread. See Redhead & Ginns (*TMSJ* 26: 357, 1985), Lechner & Wright (*Mycotaxon* 82: 281, 2002; N. Am.).
- Neolentiporus** Rajchenb. (1995), *Fomitopsidaceae*. 1, S. America. See Rajchenberg (*Nordic J Bot.* 15: 105, 1995).
- Neolichina** Gyeln. (1940) = *Lichina* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Neoligniella** Naumov (1951), anamorphic *Pezizomycotina*, St.0eH.?. 1, former USSR. See Naumov (*Bot. Mater. Otd. Sporov. Rast. Bot. Inst. Komarova Akad. Nauk S.S.S.R.* 7: 116, 1951).

- Neolinocarpon** K.D. Hyde (1992) = *Linocarpon* fide Yanna & Ho (*MR* 107: 1305, 2003; ultrastr.).
- Neolysurus** O.K. Mill., Ovrebo & Burk (1991), Phallaceae. 1, Costa Rica. See Miller *et al.* (*MR* 95: 1230, 1991).
- Neomarssoniella** U. Braun (1991), anamorphic *Pezizomycotina*, Cac.1eH.?. 2, Europe; N. America. See Braun (*Nova Hedwigia* 53: 304, 1991).
- Neomelanconium** Petr. (1940), anamorphic *Pezizomycotina*, St.0eP.19. 2, Europe; Africa.
- Neomichelia** Penz. & Sacc. (1901) = *Pithomyces* fide Ellis (*Mycol. Pap.* 76, 1960).
- Neomunkia** Petr. (1947), anamorphic *Hypocreales*, St.0eH.?. 1, S. America. See Bischoff *et al.* (*Mycol.* 96: 1088, 2004; phylogeny).
- Neonaumovia** Schwarzman (1959) = *Lophophacidium* fide Korf in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 249, 1973).
- Neonectria** Wollenw. (1917), Nectriaceae. Anamorph *Cylindrocarpon*. 33, widespread. *N. galligena* (canker and eye rot of apple and pear; Flack & Swinburne, *TBMS* 68: 186, 1977; host range). See Brayford & Samuels (*Mycol.* 85: 612, 1993; *Cylindrocarpon* anamorphs), Samuels & Brayford (*Sydowia* 45: 55, 1993; phragmosporous spp.), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Schoch *et al.* (*Stud. Mycol.* 45: 45, 2000), Mantiri *et al.* (*CJB* 79: 334, 2001; phylogeny), Langrell (*MR* 106: 280, 2002; molecular detection), Seifert *et al.* (*Phytopathology* 93: 1533, 2003; on ginseng), Brayford *et al.* (*Mycol.* 96: 572, 2004; spp. without microconidia), Halleen *et al.* (*Stud. Mycol.* 50: 431, 2004; on *Vitis*), Castlebury *et al.* (*CJB* 84: 1417, 2006; phylogeny on *Fagus*), Hirooka & Kobayashi (*Mycoscience* 48: 53, 2007; Japan).
- Neonorrinia** Syd. (1923) = *Cercidospora* fide Hafellner & Obermayer (*Cryptog. Bryol.-Lichénol.* 16: 177, 1995).
- Neonosemoides** N. Faye & B.S. Togubaye (1996), Microsporidia. 1.
- Neonothopanus** R.H. Petersen & Krisai (1999), Marasmiaceae. 1, S. America. See Petersen & Krisai-Greilhuber (*Persoonia* 17: 210, 1999).
- Neovularia** U. Braun (1992), anamorphic *Pezizomycotina*, Hsp.0eP.10. 3, Europe; Japan. See Braun (*Monogr. Cercosporaella, Ramularia Allied Genera (Phytopath. Hyphom.)* 2: 342, 1998; key).
- Neoparodia** Petr. & Cif. (1932), Parodiopsidaceae. Anamorph *Chuppia*-like or *Sarcinella*-like. 1, West Indies.
- Neopatella** Sacc. (1908) = *Selenophoma* fide Petrak (*Sydowia* 5: 354, 1951).
- Neopaxillus** Singer (1948), Serpulaceae. 5, C. & S. America. See Singer *et al.* (*Beih. Nova Hedwigia* 98: 17, 1990).
- Neopectia** Sacc. (1883), Pleosporales. 1, N. America. See Bose (*Phytopath. Z.* 41, 1961; syn. with *Herpotrichia*), Barr (*Mycotaxon* 20: 1, 1984), von Arx & Müller (*Sydowia* 37: 6, 1984; syn. with *Herpotrichia*), Chen & Hsieh (*Sydowia* 56: 24, 2004).
- Neopeltella** Petr. (1950), ? Schizothyriaceae. 1, S. America. See Petrak (*Sydowia* 4: 329, 1950).
- Neopeltis** Petr. (1949) = *Microcallis* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Neopeltis** Syd. (1937), anamorphic *Pezizomycotina*, St.0eH.?. 1, C. America.
- Neoperezia** I.V. Issi & Voronin (1979), Microsporidia. 1.
- Neopericonia** Kamal, A.N. Rai & Morgan-Jones (1983), anamorphic *Pezizomycotina*, Hso.#eP.10. 1, India. See Kamal *et al.* (*Mycotaxon* 18: 15, 1983).
- Neopetromyces** Frisvad & Samson (2000), Trichocomaceae. Anamorph *Aspergillus*. 1, Philippines. See Frisvad & Samson (*Stud. Mycol.* 45: 201, 2000).
- Neophacidium** Petr. (1950), ? Rhytismatales. 2, Pakistan; S. America. See Petrak (*Sydowia* 4: 333, 1950).
- Neophaeosphaeria** M.P.S. Câmara, M.E. Palm & A.W. Ramaley (2003), Pleosporales. Anamorph *Coniothyrium*-like. 5 (on *Agavaceae*), widespread. See Câmara *et al.* (*MR* 107: 519, 2003).
- Neophoma** Petr. & Syd. (1927), anamorphic *Pezizomycotina*, St.0eH.?. 2, Europe; N. America.
- Neophyllis** F. Wilson (1891), Sphaerophoraceae (L). 2, Australasia. See Ahti (*Regnum veg.* 128: 58, 1993), Döring *et al.* (*Aust. J. Bot.* 47: 783, 1999), Wedin & Döring (*MR* 103: 1131, 1999; phylogeny), Döring & Wedin (*Pl. Biol.* 2: 361, 2000; phylogeny, morphology), Wedin *et al.* (*Lichenologist* 32: 171, 2000; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Neophyscia** M. Choisy (1959) nom. nud. = *Physcia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Neopiptostoma** Kuntze (1898) = *Piptostoma*.
- Neoplaconema** B. Sutton (1977), anamorphic *Pezizomycotina*, St.0eH.15. 2, Germany; Australia. See Yuan & Mohammed (*MR* 101: 1531, 1997; n.sp. Australia).
- Neoplacosphaeria** Petr. (1921) = *Sphaeriothyrium* fide Petrak (*Annls mycol.* 22: 1, 1924).
- Neopsoromopsis** Gyeln. (1940), ? Parmeliaceae (L). 1, Argentina.
- Neopycnodothis** Tak. Kobay. (1965) = *Cytoplea* fide Sutton (*Mycol. Pap.* 141, 1977).
- Neoramularia** U. Braun (1991), anamorphic *Pezizomycotina*, St.0-1eH.3. 9, widespread. See Braun (*Monogr. Cercosporaella, Ramularia Allied Genera (Phytopath. Hyphom.)* 2: 351, 1998; key), Braun *et al.* (*Australas. Pl. Path.* 34: 509, 2005; Australia).
- Neoravenelia** Long (1903) = *Ravenelia* fide Arthur (*Manual Rusts US & Canada*, 1934).
- Neorehmia** Höhn. (1902), Trichosphaeriaceae. Anamorph *Tritirachium*-like. 2, Austria. See Müller & Samuels (*Sydowia* 35: 143, 1982), Barr (*Mycotaxon* 39: 43, 1990), Samuels & Barr (*CJB* 75: 2165, 1998), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Neosaccardia** Mattir. (1921) ? = *Scleroderma* fide Guzmán (*Ciencia* 25: 195, 1967).
- Neosartorya** Malloch & Cain (1973), Trichocomaceae. Anamorph *Aspergillus*. 12, widespread. See Takada *et al.* (*TMSJ* 27: 415, 1986; mating), Guarro & Figueras (*Boln Soc. Micol. Madrid* 11: 217, 1987; ontogeny), Peterson (*MR* 96: 547, 1992; 6 spp. DNA homology), Udagawa *et al.* (*Mycoscience* 37: 217, 1996; toxigenic spp.), Geiser *et al.* (*Mycol.* 90: 831, 1998; DNA), Samson (*Contributions to Microbiology* 2: 5, 1999; review), Varga *et al.* (*Antonie van Leeuwenhoek* 77: 235, 2000; phylogeny), Takada *et al.* (*Mycoscience* 42: 361, 2001; Africa), Klich (*Identification of Common Aspergillus Species*: 116 pp., 2002), Horie *et al.* (*Mycoscience* 44: 397, 2003; Brazil), Balajee *et al.* (*J. Clin. Microbiol.* 43: 5996, 2005; comparison with *Aspergillus fumigatus*), Dyer & Paoletti (*Medical Mycology* 43 Suppl. 1: S7, 2005; genetics), Nierman (*Nature Lond.* 438 no. 7071: 1151, 2005; genome sequence), Rydholm *et al.* (*Eu-*

- karyotic *Cell* 5: 650, 2006; population structure), Samson *et al.* (*Medical Mycology* 44 Suppl. 1: S133, 2006; species concepts), Wortman *et al.* (*Medical Mycology* 44 Suppl. 1: S3, 2006; phylogeny), Samson *et al.* (*Stud. Mycol.* 59: 147, 2007; phylogeny, chemistry, morphology), Samson *et al.* (*Stud. Mycol.* 59: 147, 2007; section *Fumigati*), Hong *et al.* (*Antonie van Leeuwenhoek* 93: 87, 2008).
- Neoscytalidium** Crous & Slippers (2006), anamorphic *Botryosphaeriaceae*, H??.?. 1, tropical. See Crous & Slippers (*Stud. Mycol.* 55: 244, 2006).
- Neosecotium** Singer & A.H. Sm. (1960), *Agaricaceae*. 2, N. America; Africa. Basidioma gasteroid. See Singer & Smith (*Madroño* 15: 154, 1960).
- neosexual**, see protosexual.
- Neoskofitzia** Schulzer (1880) nom. dub., *Sordariomycetes*. 5, widespread. See Rossman (*Stud. Mycol.* 42, 1999).
- Neosolorina** (Gyeln.) Räsänen (1943) = *Solorina* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Neospegazzinia** Petr. & Syd. (1936), anamorphic *Pezizomycotina*, Cpd.0fH.?. 1, S. America.
- Neosphaeropsis** Petr. (1921) ? = *Sphaeropsis* Sacc. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Neosporidesmium** Mercado & J. Mena (1988), anamorphic *Pezizomycotina*, Hsy.≡ eP.1. 1, Cuba. See Mercado & Mena (*Acta Bot. Cubana* 59: 2, 1988).
- Neostomella** Syd. (1927), *Asterinaceae*. 4, C. America. See Hansford (*Mycol. Pap.* 15, 1946).
- Neotapesia** E. Müll. & Hütter (1963), *Helotiales*. 3, Europe. See Korf in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 249, 1973), Nannfeldt (*TBMS* 67: 283, 1976).
- Neotestudina** Segretain & Destombes (1961), *Testudinaceae*. 3, widespread. *N. rosatii* (mycetoma of foot). See Hawksworth & Booth (*Mycol. Pap.* 135, 1974), Hawksworth (*CJB* 57: 91, 1979), Kruys *et al.* (*MR* 110: 527, 2006; phylogeny).
- Neothyridaria** Petr. (1934), *Pezizomycotina*. 1, Europe.
- neotony**, a process in which normal development of cells, except those involved in reproduction, is arrested; results in a sexually mature organism with juvenile features; see Kreisel (in Hawksworth (Ed.), *Frontiers in mycology*: 69, 1991; in fungal phylogeny); cf. pedogenesis.
- Neotremella** Lowy (1979), *Tremellaceae*. 1, Mexico. See Lowy (*Boletín de la Sociedad Mexicana de Micología* 13: 224, 1979).
- Neotrichophyton** Castell. & Chalm. (1919) = *Trichophyton* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Neotrotteria** Sacc. (1921), *Coronophorales*. See Nannfeldt (*Svensk bot. Tidskr.* 69: 49, 1975), Nannfeldt (*Svensk bot. Tidskr.* 69: 289, 1975), Subramanian & Sekar (*Kavaka* 18: 19, 1993).
- Neottiella** (Cooke) Sacc. (1889), *Pyronemataceae*. c. 13, Europe. See Caillet & Moyne (*BSMF* 103: 179, 1987; synonym of *Octospora*), Caillet & Moyne (*Bull. Soc. Hist. nat. Doubs* 84: 9, 1991; keys), Kristiansen (*SA* 14: 61, 1995), Moravec (*Czech Mycol.* 49: 149, 1997; sect. *Neottiellae*), Benkert (*Z. Mykol.* 64: 153, 1998; Germany), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Neottiopezis** Clem. (1903) ≡ *Neottiella* fide Clements (*Gen. Fung.*: 90, 1909).
- Neottiospora** Desm. (1843), anamorphic *Pezizomycotina*, Cpd.0eH/1eP.15. 2, widespread.
- Neottiosporella** Höhn. ex Falck (1923) nom. dub., anamorphic *Pezizomycotina*. No spp. included.
- Neottiosporina** Subram. (1961), anamorphic *Pezizomycotina*, Cpd.≡ eH.1. 10, widespread. See Sutton & Alcorn (*Aust. J. Bot.* 22: 517, 1974; key), Sutton & Wu (*MR* 99: 831, 1995; on *Sorghum*).
- Neottiosporis** Clem. & Shear (1931) ≡ *Neottiosporella*. **neotype**, see type.
- Neotyphodium** Glenn, C.W. Bacon & Hanlin (1996), anamorphic *Epichloë*. 4 (endosymbiotic in grasses), widespread (esp. temperate). See Glenn *et al.* (*Mycol.* 88: 369, 1996; phylogeny), Glenn & Bacon (*Neotyphodium/Grass Interactions Proceedings of the Third International Symposium on Acremonium/Grass Interactions, held May 28-31, 1997, in Athens, Georgia*: 53, 1997; chemistry), Kulda *et al.* (*Mycol.* 89: 431, 1997; phylogeny), Leuchtmann (*Neotyphodium/Grass Interactions Proceedings of the Third International Symposium on Acremonium/Grass Interactions, held May 28-31, 1997, in Athens, Georgia*: 93, 1997; ecology), White (*Neotyphodium/Grass Interactions Proceedings of the Third International Symposium on Acremonium/Grass Interactions, held May 28-31, 1997, in Athens, Georgia*: 27, 1997), Wilkinson & Schardl (*Neotyphodium/Grass Interactions Proceedings of the Third International Symposium on Acremonium/Grass Interactions, held May 28-31, 1997, in Athens, Georgia*: 13, 1997; mutualism), Leuchtmann & Schardl (*MR* 102: 1169, 1998; genetics, phylogeny), Miles *et al.* (*Appl. Environm. Microbiol.* 64: 601, 1998; Australasia), Naffaa *et al.* (*Ann. appl. Biol.* 132: 211, 1998; Europe), White & Reddy (*Mycol.* 90: 226, 1998; phylogeny), Kulda *et al.* (*Mycol.* 91: 776, 1999; hybridisation), Schardl & Leuchtmann (*Mycol.* 91: 95, 1999; N America), Tredway *et al.* (*MR* 103: 1593, 1999; phylogeny), Lane *et al.* (*Microbial Endophytes*: 341, 2000; coevolution, chemistry), Moon *et al.* (*Mycol.* 92: 1103, 2000; evolution), Schardl (*Fungal Genetics Biol.* 33: 69, 2001; on *Festuca*), Moon *et al.* (*Mycol.* 94: 694, 2002; S hemisphere), Brem & Leuchtmann (*Evolution* Lancaster, Pa. 57: 37, 2003; on *Bromus*), Moon *et al.* (*Mol. Ecol.* 13: 1455, 2004; hybridisation), Sullivan & Faeth (*Mol. Ecol.* 13: 649, 2004; gene flow), Yokoyama *et al.* (*FEMS Microbiol. Lett.* 264: 182, 2006; genetics), Moon *et al.* (*Mycol.* 99: 895, 2007; on *Stipeae* and *Meliceae*).
- Neotyphula** Wakef. (1934), *Basidiomycota*. 1, Guyana. See Martin (*Lloydia* 11: 121, 1948).
- Neournula** Paden & Tylutki (1969), *Chorioactidaceae*. 2, USA; Europe; N. Africa. See Paden (*Mycol.* 64: 457, 1972; nomencl.), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Pfister *et al.* (*MR* 112: 513, 2008).
- Neoventuria** Syd. & P. Syd. (1919), *Dothideomycetes*. 1, S. America.
- Neovossia** Körn. (1879), *Tilletiaceae*. 1 (on *Poaceae*), widespread. See Vánky (*Illustrated genera of smut fungi*, 1987), Castlebury *et al.* (*Mycol.* 97: 888, 2005; phylog.) cf. *Tilletia*.
- Neoxenophila** Apinis & B.M. Clark (1974) = *Aphanascus* fide Cano & Guarro (*MR* 94, 1990), Cano *et al.* (*Stud. Mycol.* 47: 153, 2002).
- Neozimmermannia** Koord. (1907) = *Glomerella* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1,

- 1954).
- Neozygitaceae** Ben Ze'ev, R.G. Kenneth & Uziel (1987), Entomophthorales. 3 gen., 21 spp.
Lit.: Ben-Ze'ev *et al.* (*Mycotaxon* 28: 313, 1987), Humber (*Mycotaxon* 34: 441, 1989), Keller (*Sydowia* 43: 39, 1991), Delalibera *et al.* (*Can. J. Microbiol.* 50: 579, 2004), Delalibera *et al.* (*Mycol.* 96: 1002, 2004), Keller & Petrini (*Sydowia* 57: 23, 2005).
- Neozygites** Witlaczil (1885), Neozygitaceae. 18 (on *Arthropoda*), widespread. See Keller & Wuest (*Entomophaga* 28: 123, 1983), Butt & Heath (*Eur. J. Cell. Biol.* 46: 499, 1988; cell division), Butt & Humber (*Protoplasma* 151: 115, 1989; mitosis), Keller (*Sydowia* 43: 39, 1991; key Swiss spp.), Dick *et al.* (*Mycol.* 84: 729, 1992), Steenberg *et al.* (*J. Invert. Path.* 68: 97, 1996), Keller (*Sydowia* 49: 118, 1997), Keller & Steenberg (*Sydowia* 49: 21, 1997), Delalibera *et al.* (*Mycol.* 96: 1002, 2004; *Neozygites tana-joeae* n.sp. pathogenic on cassava green mite), Keller & Petrini (*Sydowia* 57: 23, 2005; key), White *et al.* (*Mycol.* 98: 872, 2006; phylogeny).
- Neozythia** Petr. (1958), anamorphic *Helotiales*, St.0eH.38. 1, Iran. See Petrak (*Sydowia* 11: 351, 1957).
- Nephlyctis** Arthur (1907) = *Prospodium* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- Nephrochytrium** Karling (1938), Endochytriaceae. 4, N. America.
- Nephroma** Ach. (1809), Nephromataceae (L). 36, widespread. See Wetmore (*Publs Mich. St. Univ. Mus., ser. biol.* 1: 369, 1960; N. Am.), White & James (*Lichenologist* 20: 103, 1988; key 15 S. temp. spp.), Eriksson & Strans (*SA* 14: 33, 1995; molec. phylogeny), Goffinet & Bayer (*Fungal Genetics Biol.* 21: 228, 1997; DNA), Burgaz & Martínez (*Cryptog. Mycol.* 20: 225, 1999; Iberian spp.), Lohtander *et al.* (*MR* 106: 777, 2002; phylogeny), Wiklund & Wedin (*Cladistics* 19: 419, 2003; phylogeny), Miadlikowska & Lutzoni (*Am. J. Bot.* 91: 449, 2004; phylogeny), Louwhoff (*Muelleria* 22: 3, 2005; Australia), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Piercey-Normore *et al.* (*Lichenologist* 38: 441, 2006; Pacific NW).
- Nephromataceae** Wetmore ex J.C. David & D. Hawksw. (1991), Peltigerales (L). 1 gen. (+ 6 syn.), 36 spp.
Lit.: James & White (*Lichenologist* 19: 215, 1987), White & James (*Lichenologist* 20: 103, 1988), Galloway (*Symbiosis* 11: 327, 1991), Eriksson & Strand (*SA* 14: 33, 1995), Eriksson & Strans (*SA* 14: 33, 1995; molec. phylogeny), Goffinet & Bayer (*Fungal Genetics Biol.* 21: 228, 1997; DNA), Goffinet & Goward (*Lichenogr. Thomsoniana* North American Lichenology in Honor of John W. Thomson: 41, 1998), Burgaz & Martínez (*Cryptog. Mycol.* 20: 225, 1999), Wiklund & Wedin (*Cladistics* 19: 419, 2003), Buschbom & Mueller (*Mol. Phylogen. Evol.* 32: 66, 2004), Miadlikowska & Lutzoni (*Am. J. Bot.* 91: 449, 2004), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Vitikainen (*Nordic Lichen Flora* 3: Cyanolichens: 91, 2007).
- Nephromatomyces** E.A. Thomas (1939) nom. inval. = *Nephroma* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Nephromiomyces** E.A. Thomas ex Cif. & Tomas. (1953) = *Nephroma* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Nephromium** Nyl. (1860) = *Nephroma* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Nephromopsis** Müll. Arg. (1891), Parmeliaceae (L). 26, Asia. See Kärnefelt *et al.* (*Pl. Syst. Evol.* 183: 113, 1992), Randlane & Saag (*Mycotaxon* 44: 485, 1992), Randlane (*Cryptog. Bryol.-Lichénol.* 16: 35, 1995), Randlane & Saag (*Cryptog. Bryol.-Lichénol.* 19: 175, 1998), Chen & Gao (*Mycotaxon* 77: 491, 2001), Thell *et al.* (*Mycol. Progr.* 4: 303, 2005; revision).
- Nephromyces** Giard (1888), ? Cladochytriaceae. 3 (in ascidians), Europe. See Saffo & Nelson (*CJB* 61: 3230, 1983), Beakes in Coombs *et al.* (Eds) (*Evolutionary Relationships Among Protozoa*: 351, 1998), Cavalier-Smith in Coombs *et al.* (Eds) (*Evolutionary Relationships Among Protozoa*: 375, 1998).
- Nephromyces** Sideris (1927) = *Rhizidiocystis*.
- Nephrospora** Loubière (1923) = *Microascus* Zukal fide von Arx (*Persoonia* 8: 191, 1975).
- Nepotatus** Lloyd (1925) = *Scleroderma* fide Stevenson & Cash (*Bull. Lloyd Libr. Mus.* 35: 130, 1936).
- Neptunella** K.L. Pang & E.B.G. Jones (2003), Halosphaeriaceae. 1. See Pang *et al.* (*Mycol. Progr.* 2: 35, 2003).
- Nereiospora** E.B.G. Jones, R.G. Johnson & S.T. Moss (1983), Halosphaeriaceae. Anamorph *Monodictys*-like. 2 (marine), widespread (northern hemisphere). See Mouzouras & Jones (*CJB* 63: 2444, 1985), Jones & Moss (*SA* 6: 179, 1987), Hyde & Jones (*Bot. Mar.* 32: 205, 1989; ultrastr.), Anderson *et al.* (*Mycol.* 93: 897, 2001; phylogeny), Chatmala *et al.* (*Fungal Diversity Res. Ser.* 7: 59, 2002; anamorph), Campbell *et al.* (*Mycol.* 95: 530, 2003; phylogeny).
- nervicolous**, living on veins of leaves or stems.
- Nervostroma** Narumi & Y. Harada (2006), Sclerotiniaceae. Anamorph *Cristulariella*. 1, widespread (temperate). See Narumi-Saito *et al.* (*Mycoscience* 47: 351, 2007).
- Nesolechia** A. Massal. (1856), Parmeliaceae. 1 (lichenicolous), widespread. See Triebel *et al.* (*Bryologist* 98: 71, 1995), Peršoh & Rambold (*Mycol. Progr.* 1: 43, 2002; phylogeny), Doré *et al.* (*Lichenologist* 38: 425, 2006; biometrics), Crespo *et al.* (*Mol. Phylogen. Evol.* 44: 812, 2007; phylogeny).
- Nesolechiaceae** Arnold (1858) = Parmeliaceae.
- Nesophloea** Fr. (1849) nom. dub., Fungi.
- Neta** Shearer & J.L. Crane (1971), anamorphic *Pezizomycotina*, Hso.1 = eH.10. 6 (terrestrial and aquatic), widespread (north temperate). See de Hoog (*Stud. Mycol.* 26: 44, 1985; key), Castañeda Ruiz & Heredia (*Mycotaxon* 76: 131, 2000; Mexico).
- Neural networks** (Artificial Neural Networks, ANNs), allow for the identification or classification of input patterns (characters). In practice this approach generally requires a considerable amount of data in order to set up the network. Final placement is arrived at after the passage of the input values through a series of nodes arranged in layers. The method has not yet been used widely with fungal data, but has potential for more use, particularly in classification and data mining; examples include Acuña *et al.* (*Biotechnology techniques* 12: 515, 1998; estimation of fungal biomass), Boddy & Morris (*Binary* 5: 17, 1991), Bridge *et al.* (in Hawksworth (Ed.), *Identification and characterization of pest organisms*: 153, 1994), Morgan *et al.* (*MR* 102: 975, 1998), Morris *et al.* (*MR* 96: 967, 1992), Nie *et al.* (*J. Phytopath.* 155: 364, 2007; identification of *Fusarium*). For methodology see Boddy *et al.* (*Binary* 2: 179, 1990), Specht (*Neu-*

- ral networks* 3: 109, 1990), Zaruda (*Artificial neural systems*, 1992). Successful use requires a good understanding of underlying theory. See Numerical taxonomy.
- Neuroecium** Kunze (1823) nom. dub., Fungi. Not a fungus fide Juel (*Dansk. bot. Ark.* 5: 1, 1928).
- Neuronectria** Munk (1957) $\equiv$ *Hydropisphaera* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Neurophyllum**, see *Neurophyllum*.
- Neuropogon** Nees & Flot. (1835) = *Usnea* fide Lamb (*Index Nom. Lich.*, 1963), Articus (*Taxon* 53: 925, 2004), Wirtz *et al.* (*Taxon* 55: 367, 2006; phylogeny, synonymy with *Usnea*).
- Neurospora** Shear & B.O. Dodge (1927), Sordariaceae. Anamorph *Chrysonilia*. 51, widespread. See mould, bread, Genetics. See Frederick *et al.* (*Mycol.* 61: 1083, 1970; key), Perkins & Turner (*Exp. Mycol.* 12: 91, 1988; natural populations), Raju (*Mycol.* 80: 825, 1988; multipored ascus apices), Perkins (*Genetics Bethesda* 130: 687, 1992; history as a model organism), Raju (*MR* 96: 241, 1992; genetic control of sexual cycle), Beatty *et al.* (*MR* 98: 1309, 1994; genetics), Skupskiet *al.* (*Fungal Genetics Biol.* 21: 153, 1997; phylogeny), Pöggeler (*Curr. Genet.* 36: 222, 1999; mating type genes), Turner *et al.* (*Fungal Genetics Biol.* 32: 67, 2001; natural populations, review), Dettman *et al.* (*Evolution Lancaster, Pa.* 57: 2703, 2003; phylogeny), Dettman *et al.* (*Evolution Lancaster, Pa.* 57: 2721, 2003; species concepts), Galagan (*Nature Lond.* 422 no. 6934: 859, 2003; genome sequence), Braun *et al.* (*Applied Mycology and Biotechnology* 4: 295, 2004; genetics review), Dettman & Taylor (*Genetics Bethesda* 168: 1231, 2004; microsatellites), García *et al.* (*MR* 108: 1119, 2004; wide concept including *Gelasinospora*), Miller & Huhndorf (*Mol. Phylogen. Evol.* 35: 60, 2005; phylogeny, wall structure), Dettman *et al.* (*Mycol.* 98: 436, 2006; *N. discreta* agg.), Jacobson *et al.* (*Mycol.* 98: 550, 2006; biogeography), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny), Wik *et al.* (*BMC Evolutionary Biology* 8: 109, 2008; mating type genes).
- neurotoxin**, a toxin which affects the nervous system.
- Nevodovsky** (Gavril Stepanovich; 1874-1952; Ukraine, later Georgia, Kazakhstan, Russia). Schoolteacher (1897-1903); student, Novo-Aleksandriysky Institute of Agriculture and Forestry, Pulavy, now Poland (1903-1911); Head, Phytopathological Laboratory, Tbilisi Botanic Garden (1911-1913); mycologist, Smelianskaya Mycological-Entomological Station, later the Ukrainian Scientific Research Institute of Sugar Beet (1913-1930); mycologist, Alma Ata Station of Plant Protection (1930-1940); Lecturer, Tomsk Forest Technical School, and mycologist, Tomsk Zonal Flax Experiment Station (1940-1946). A pioneer mycologist in the Caucasus and Central Asia, particularly noted for his compilation of exsiccata. Collections are in the Kazakh State University, Alma Ata (AA) [about 17,000 specimens] and the V.I. Komarov Botanical Institute, St Petersburg (LE). *Publs.* [Fungal diseases of cultivated and wild useful plants of the Caucasus in 1912. Second year]. *Trudy Tiflisskogo Botanicheskogo Sada* (1914) [in Russian] [*Flora of the Spring Plants of Kazakhstan. Rust Fungi*] (1956) [published posthumously, in Russian].
- Nevrophyllum** Pat. (1886) [non *Neurophyllum* Torrey & A. Gray 1840, *Umbelliferae*] $\equiv$ *Gomphus* Pers.
- Newinia** Thaug (1973), ? Phakopsoraceae. 3 (on *Bignoniaceae*), Asia; Africa. See Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003; placed in *Uropyxidaceae*) Cf. *Phragmidiella*.
- Nia** R.T. Moore & Meyers (1961), Niaceae. 3 (marine), widespread (northern hemisphere). See Doguet (*BSMF* 85: 93, 1969; cultures, development), Doguet (*BSMF* 84: 343, 1969), Kohlmeyer & Kohlmeyer (*Marine Mycology*, 1979), Leightley & Eaton (*TBMS* 73: 35, 1979), Jones & Jones (*MR* 97: 1, 1993), Rosello *et al.* (*MR* 97: 68, 1993; key), Binder *et al.* (*Mycol.* 93: 679, 2001; phylogeny).
- Niaceae** Jülich (1982), Agaricales. 6 gen. (+3 syn.), 56 spp.
- Lit.*: Kohlmeyer & Kohlmeyer (*Marine Mycology*: 690 pp., 1979), Jones & Jones (*MR* 97: 1, 1993), Barata *et al.* (*MR* 101: 687, 1997), Binder *et al.* (*Mycol.* 93: 679, 2001), Bodensteiner *et al.* (*Mol. Phylogen. Evol.* 33: 501, 2004), Sivichai & Jones (*Sydowia* 56: 132, 2004).
- Nicholsoniella** Kuntze (1891) $\equiv$ *Libertiella*.
- nidose** (**nidorose**), having an unpleasant smell.
- Nidula** V.S. White (1902), Agaricaceae. 4, widespread.
- nidulant**, lying free in a cavity.
- Nidularia** Bull. (1791) nom. rej. = *Cyathus* fide Stalpers (*in litt.*).
- Nidularia** Fr. (1817) nom. cons., Agaricaceae. 3, widespread. See Cejp & Palmer (*Česká Mykol.* 17: 125, 1963; key), Baseia & Milanez (*Revista Brasileira de Botânica* 24: 479, 2001; Brazil), Sarasini (*Gasteromiceti Epigei*: 406 pp., 2005).
- Nidulariaceae** Dumort. (1822) = Agaricaceae.
- Nidulariales** = Agaricales.
- Nidulariopsis** Greis (1935), Geastraceae. 2, Europe; N. America. See Zeller (*Mycol.* 40: 639, 1948), Miller & Miller (*Gasteromycetes. Morphological and Development Features with Keys to the Orders, Families, and Genera*: 157 pp., 1988).
- Nidulispora** Nawawi & Kuthub. (1990), anamorphic *Pezizomycotina*, Hso.1bH.1. 1 (aquatic), Malaysia. See Nawawi & Kuthubutheen (*Mycotaxon* 36: 329, 1990), Ho *et al.* (*Mycol.* 92: 582, 2000).
- Niebla** Rundel & Bowler (1978), Ramalinaceae (L). 1, California; Mexico. Perhaps synonymous with *Ramalina*. See Bowler *et al.* (*Phytologia* 77: 23, 1994), Marsh & Nash (*Phytologia* 76: 458, 1994; Mexico), Riefner *et al.* (*Mycotaxon* 54: 397, 1995; USA), Nash *et al.* (*Lichen Flora of the Greater Sonoran Desert Region* 2, 2004), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- NIEC**, see **RIEC**.
- Nielsenia** Syd. (1921) = *Uromyces* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- Niessl** (von Meyendorf, Gustav; 1839-1919; Italy, later Austria, Moravia). Born in Verona; Geometrist, Vienna (1857-1865); Professor of Geodesy and Astronomy, University of Brno (1865-1906); retired to Vienna (1906 onwards). A major contributor to early understanding of the mycotas of central Europe. Most collections are in *M. Publs. Vorarbeiten zu einer Kryptogamenflora von Mähren und Oest Schlesiens. II. Pilze und Myxomyceten. Verhandlungen des Naturforschender Vereins in Brunn* (1865); Über Myxomyceten. *Verhandlungen des Naturforschender Vereins in Brunn* (1868); Notizen über neue und kritische Pyrenomyceten. *Verhandlungen des Naturforschender Vereins in Brunn* (1875). *Biogs, obits etc.* Grumann (1974: 436); Nožička (*Česká Mykologie* 18: 185, 1964) [portrait].
- Niesslella** Höhn. (1919) = *Micropeziza* fide Nannfeldt

- (*Bot. Notiser* 129: 323, 1976).
- Niesslella** Speg. (1880) ? = *Sporormiella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Niesslia** Auersw. (1869), Niessliaceae. Anamorph *Monocillium*. 23, widespread. See Gams (*Cephalosporium-artige Schimmelpilze*, 1971), Samuels & Barr (*CJB* 75: 2165, 1998), Tretiach (*Nova Hedwigia* 75: 357, 2002; on lichens), Castlebury *et al.* (*MR* 108: 864, 2004; phylogeny), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Niessliaceae** Kirschst. (1939), Hypocreales. 12 gen. (+ 4 syn.), 51 spp.
Lit.: Barr (*Mycotaxon* 39: 43, 1990), Scheuer (*MR* 97: 543, 1993), Crous *et al.* (*Mycol.* 88: 789, 1996), Gams & Turhan (*Mycotaxon* 59: 343, 1996), Samuels & Barr (*CJB* 75: 2165, 1997), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Castlebury *et al.* (*MR* 108: 864, 2004).
- nietsuki**, a product of failure in the drying of *Lentinula edodes* basidiomata (Kawai & Kawai, *Rep. Tottori mycol. Inst.* 1: 29, 1961).
- nigeran**, see mycodextran.
- Nigredo** (Pers.) Roussel (1806) nom. rej. prop. ≡ *Uredo*.
- Nigrococcus** E.K. Novák & Zsolt (1961) [non *Nigrococcus* Castell. & Chalm. 1919, *Bacteria*] = *Phaeococcus* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Nigrocornus** Ryley & Langdon (2003), Clavicipitaceae. 1, widespread (old world). See Ryley (*Mycology Series* 19: 266, 2003), Ryley (*Mycotaxon* 95: 97, 2006).
- Nigrocupula** Sawada (1944) = *Graphiola* fide Mordue (*in litt.*).
- Nigrodiplodia** Kravtzev (1955) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Nigrofomes** Murrill (1904), Polyporaceae. 1, widespread (pantropical). See Corner (*Beih. Nova Hedwigia* 86: 124, 1987), Roberts & Ryvarden (*Kew Bull.* 61: 55, 2006; Cameroon).
- Nigrofomitaceae** Jülich (1982) = Polyporaceae.
- Nigrohydnum** Ryvarden (1987), Polyporales. 1, S. America. See Ryvarden (*Mycotaxon* 28: 531, 1987).
- Nigrolentilocus** R.F. Castañeda & Heredia (2001), anamorphic *Melanomma*, Hso.???. 5, widespread. See Castañeda Ruiz *et al.* (*Cryptog. Mycol.* 22: 13, 2001).
- Nigromacula** Etayo (2002), anamorphic *Pezizomycotina*, H??.?. 2, Colombia; British Isles. See Etayo (*Biblthca Lichenol.* 84: 87, 2002).
- Nigromammilla** K.D. Hyde & J. Fröhl. (2003), Sordariomycetes. 1, Hong Kong. See Hyde & Fröhl. (*Cryptog. Mycol.* 24: 17, 2003).
- Nigropogon** Coker & Couch (1928) = *Entoloma* fide Kuyper (*in litt.*).
- Nigroporus** Murrill (1905), Polyporaceae. 3, widespread. See Pegler (*The polypores [Bull. BMS Suppl.]*, 1973), Ryvarden & Iturriaga (*Mycol.* 95: 1066, 2003; Venezuela).
- Nigropuncta** D. Hawksw. (1981), anamorphic *Pezizomycotina*, Cpd.0eP.23. 1 (on lichens), Austria. See Hawksworth (*Bull. Br. Mus. nat. Hist. Bot.* 9: 46, 1981).
- Nigrosabulum** Malloch & Cain (1970), Hypocreales. Anamorph *Acremonium*-like. 1 (coprophilous), widespread. See Suh & Blackwell (*Mycol.* 91: 836, 1999; phylogeny), Rossman *et al.* (*Mycol.* 93: 100, 2001; phylogeny).
- Nigrosphaeria** N.L. Gardner (1905) ? = *Melanospora* Corda fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Nigrospora** Zimm. (1902), anamorphic *Khuskia*, Hso.0eP.1. 6, widespread. *N. oryzae* on maize (*Zea*) and other hosts. See Standen (*Iowa St. Coll. J. Sci.* 17: 263, 1943), Minter (*Proc. Indian Acad. Sci. Pl. Sci.* 94: 281, 1985).
- Nimbomollisia** Nannf. (1983) = *Niptera* fide Baral (*SA* 13: 113, 1994).
- Nimbospora** J. Koch (1982), Halosphaeriaceae. 3 (marine), pantropical. See Hyde & Jones (*CJB* 63: 611, 1985), Read *et al.* (*Phil. Trans. Roy. Soc. London ser. B* 339: 483, 1993; ultrastr.), Jones (*CJB* 74 Suppl. 1: S790, 1995; ultrastr.), Spatafora *et al.* (*Am. J. Bot.* 85: 1569, 1998; phylogenetic analysis), Campbell *et al.* (*Mycol.* 95: 530, 2003; phylogeny), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- nimbospore**, a spore having a gelatinous, apparently many-layered wall, e.g. *Histoplasma capsulatum* (Nielsen & Evans, *J. Bact.* 68: 261, 1954).
- Nimbya** E.G. Simmons (1989), anamorphic *Macrospora*, Hso.≡ eP.26. 12, widespread. See Simmons (*Sydowia* 41: 316, 1989), Harada *et al.* (*Ann. phytopath. Soc. Japan* 58: 766, 1992; on *Eleocharis*), Johnson *et al.* (*Mycotaxon* 84: 413, 2002; on *Scirpus*), Pryor & Bigelow (*Mycol.* 95: 1141, 2003; phylogeny), Zhao & Zhang (*Fungal Diversity* 19: 201, 2005; China).
- Nimisias** Kärnefelt & A. Thell (1993) = *Himantormia* fide Kärnefelt & Thell (*Lichenologist* 25: 370, 1993), Thell *et al.* (*Mycol. Progr.* 1: 335, 2002; phylogeny), Fryday (*Lichenologist* 37: 313, 2005; nomencl.), Thell *et al.* (*Biblthca Lichenol.* 95: 531, 2007; phylogeny).
- Nimisiostella** Calat., Barreno & O.E. Erikss. (1997), Lecanorales (L). 1, Spain. See Calatayud *et al.* (*SA* 15: 112, 1997).
- Niopsora** A. Massal. (1861) = *Caloplaca* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Niorma** A. Massal. (1861) = *Teloschistes* fide Zahlbruckner (*Catalogus Lichenum Universalis* 7, 1931).
- Niospora** Kremp. (1869) ≡ *Niopsora*.
- Nipholepis** Syd. (1935), Arthoniales. 1, S. America.
- Nipicola** K.D. Hyde (1992), Sordariomycetes. 2, Brunei; Hong Kong. See Eriksson & Hawksworth (*SA* 13: 198, 1994; posn), Hyde (*Sydowia* 46: 257, 1995), Hyde & Taylor (*Nova Hedwigia* 63: 417, 1996).
- Niptera** Fr. (1849), Helotiales. Anamorph *Cystodendron*. 5, Europe. See Dennis (*Kew Bull.* 26: 439, 1972), Nannfeldt (*Sydowia* 38: 194, 1986), Nauta & Spooner (*Mycologist* 14: 65, 2000; UK).
- Nipterella** Starbäck ex Dennis (1962), ? Helotiaceae. 3, Europe; N. America. See Starbäck ex Dennis (*Per-soonia* 2: 189, 1962).
- nitid** (adj. **nitidous**), smooth and clear; lustrous.
- nitrophilous**, having a preference for habitats rich in nitrogen; chionophilous; **nitrophobous**, having a preference for habitats poor in nitrogen.
- Nitschkia** G.H. Otth ex P. Karst. (1873), Nitschkiaceae. c. 22 (from wood), widespread. See Nannfeldt (*Svensk bot. Tidskr.* 65: 49, 1971), Subramanian & Sekar (*Kavaka* 18: 19, 1993), Bianchinotti (*Mycol.* 96: 911, 2004; Argentina), Huhndorf *et al.* (*MR* 108: 1384, 2004; phylogeny), Schoch *et al.* (*MR* 111: 154, 2007; phylogeny).
- Nitschkiaceae** Nannf. (1932), Coronophorales. 16 gen. (+ 27 syn.), 59 spp.

Lit.: Sivanesan (*TBMS* 62: 40, 1974), Nannfeldt (*Svensk bot. Tidskr.* 69: 49, 1975), Nannfeldt (*Svensk bot. Tidskr.* 69: 289, 1975), Corlett & Krug (*CJB* 62: 2561, 1984), Jensen (*Mycol.* 77: 688, 1985), Eriksson & Santesson (*Mycotaxon* 25: 569, 1986), Subramanian & Sekar (*Kavaka* 18: 19, 1990), Hyde (*Nova Hedwigia* 61: 141, 1995), Linde & Botha (*S. Afr. J. Bot.* 63: 66, 1997), Petersen (*Bot. Mar.* 40: 71, 1997), Navarro-Rosinés *et al.* (*Bull. Soc. linn. Provence* 50: 233, 1999), Bianchinotti (*Mycol.* 96: 911, 2004), Huhndorf *et al.* (*Mycol.* 96: 368, 2004), Huhndorf *et al.* (*MR* 108: 1384, 2004).

Nitschkiopsis Nannf. & R. Sant. (1975) = *Niesslia* fide Samuels & Barr (*CJB* 75: 2165, 1998).

Nivatogastrium Singer & A.H. Sm. (1959), Strophariaceae. 4, N. America. Basidioma gasteroid. See Singer & Smith (*Brittonia* 11: 224, 1959).

Niveostoma Svrček (1988) = *Solenopezia* fide Raitviir *et al.* (*Sydowia* 43: 219, 1991).

nm, nanometer; one billionth of a metre.

noble rot, a condition in which the mould *Botrytis* grows on overripe grapes. A rich, sweet wine is made in small quantities from the affected grapes (Sauternes, Trockenbeerenlauslese, Botrytis-wine).

Nocardia Trevis. (1889), Actinobacteria. q.v.

Nocardioides Prauser (1976), Actinobacteria. q.v.

Nocardiopsis (Brocq-Rouss.) J. Mey. (1976), Actinobacteria. q.v.

Nochascypha Agerer (1983), Marasmiaceae. 6, S. America. See Agerer (*Mitt. bot. StSamml. Münch.* 19: 262, 1983), Bodensteiner & Agerer (*Mycol. Progr.* 2: 297, 2003).

node cell, see hyphopodium.

Nodobryoria Common & Brodo (1995), Parmeliaceae (L). 3, N. America; Greenland. See Common & Brodo (*Bryologist* 98: 198, 1995).

nodose-septum, see clamp-connexion.

Nodotia Hjortstam (1987) = *Hypochnicium* fide Hjortstam & Larsson (*Windahlia* 21, 1994).

nodular bodies (of dermatophytes), rounded bodies made up of massed hyphae.

Nodularia Peck (1872) [non *Nodularia* Link ex Lyngb. 1819, *Algae*] = *Aleurodiscus* fide Rogers & Jackson (*Farlowia* 1: 263, 1943).

Nodulisporium Preuss (1849), anamorphic *Xylaria*, *Annulohypoxylon*, *Biscogniauxia*, *Daldinia*, *Pulveria*, *Thamnomycetes*, Hso.0eP.10. c. 200, widespread. Most anamorphic taxa are unnamed. See Deighton (*TBMS* 85: 391, 1985), Glawe & Rogers (*CJB* 64: 1493, 1986), Polishook *et al.* (*Mycol.* 93: 1125, 2001; biogeography, chemistry).

nodulose (of spores), having broad-based, blunt, wart-like excrescences.

Nodulosphaeria Rabenh. (1858) nom. cons., Phaeosphaeriaceae. c. 48, widespread. See Holm (*Svensk bot. Tidskr.* 55: 63, 1961), Crivelli (*Über die heterogene Ascomycetengattung Pleospora Rbh.*, 1983), Barr & Holm (*Taxon* 33: 109, 1984; nomencl.), Shoemaker (*CJB* 62: 2730, 1985; key 23 spp.), Shoemaker & Babcock (*CJB* 65: 1921, 1987; key 5-septate spp.), Ahn & Shearer (*CJB* 76: 258, 1998; on *Ranunculaceae*).

Nodulospora Marvanová & Bärli. (2000), anamorphic *Basidiomycota*. 1 (freshwater), Canada. See Marvanová & Bärlocher (*Mycotaxon* 75: 416, 2000).

nodum (pl. **noda**) (in phytosociology), particular well-defined plant communities. See also Phytosociology.

Nohea Kohlm. & Volkm.-Kohlm. (1991), Halosphaeri-

aceae. 1 (marine), Hawaii. See Kohlmeyer & Volkmann-Kohlmeyer (*SA* 10: 121, 1991), Spatafora *et al.* (*Am. J. Bot.* 85: 1569, 1998; phylogeny), Campbell *et al.* (*Mycol.* 95: 530, 2003; phylogeny), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).

Nolanea (Fr.) P. Kumm. (1871) = *Entoloma* fide Kuyper (*in litt.*).

Nolleria C.B. Beard, J.F. Butler & J.J. Becnel (1990), Microsporidia. 1.

nomen (Latin), name; - **ambiguum**, one having different senses; - **anamorphosis**, see States of fungi; - **confusum**, one of a taxonomic group based on two or more different elements; - **conservandum**, one authorized for use by a decision of an International Botanical Congress (see Nomenclature); - **propositum**, one put up for conservation; - **dubium**, one of uncertain sense; - **holomorphosis**, see States of fungi; - **illegitimum** (nom. **illegit.**), a validly published name contravening particular Articles in the Code (see Nomenclature); - **invalidum** (nom. **inval.**), one not validly published (see Nomenclature); - **monstrositatis**, one based on an abnormality; - **novum**, a new name; a replacement [nom. nov. should replace the author's name only at the first publication]; - **nudum**, one for a taxon having no description; - **provisorium**, one proposed provisionally; - **rejiendum**, one rejected by a Botanical Congress. A generic name may be a nomen ambiguum (etc.), but a binomial under such a name may be without ambiguity. - **species** (of bacteria), a type species.

Nomenclature. The allocation of scientific names to units which a systematist considers merit formal recognition. The nomenclature of fungi (including chromistans, lichen-forming fungi, slime-moulds and yeasts) is governed by the *International code of botanical nomenclature* (latest edn, McNeill *et al.* (Eds) [*Regnum veg.* 138], 2006), as adopted by each International Botanical Congress. The tradition of treating fungi, chromistans and slime-moulds under the 'Botanical' Code, although none have been classified in the Kingdom *Plantae* for many years has been criticized by some and supported by others, but undoubtedly exerts a strong influence on mycology. Any proposals to change the Code are published in *Taxon*, debated, and voted on at the Nomenclature Section of such a Congress. As rules can change in different editions, the latest should always be consulted. The Congress appoints the Committee for Fungi (CF) which advises on action to be taken on proposals concerned with fungi. The Code aims to provide a stable method of naming taxonomic groups, avoiding and rejecting use of names which may cause error or ambiguity or throw science into confusion.

The Code comprises six **Principles**, 62 **Articles** (which are mandatory), **Recommendations** (non-mandatory but good practice) and various **Appendices**. The Code is designed to allow any taxon to have as many correct names as there may be opinions as to its classification. When the taxonomic decisions have been taken, the Code provides the rules to determine the name that should be applied; each taxon in a given position and rank can have only one nomenclaturally correct name.

In determining the correct name for a taxon, five steps must be followed in what is in effect a nomenclatural filter.

Effective publication (A): To be effectively published names must be in printed matter (journals,

books) distributed to the public or at least botanical institutions through sale, exchange, or gift. See Nicolson (*Taxon* 29: 485, 1980) for categories and special provisions.

Valid publication (B): To be validly published, names of newly described taxa must also simultaneously fulfil the following requirements: (1) have a correct form; (2) have a description or diagnosis (in Latin (q.v.) after 1 Jan. 1935); (3) be accepted by the author and comply with any relevant special provisions elsewhere in the Code; (4) have a clear indication of rank (after 1 Jan. 1953); and (5) indicate the type (after 1 Jan. 1958) and its place of conservation (after 1 Jan. 1990). Replacement names and combinations have to give full bibliographic details of the place of publication of and cite the replaced name or basionym (after 1 Jan. 1953). Names which are not validly published (**nom. inval.**) need not be considered further. Many are knowingly included in this *Dictionary* as an alert so that future workers can avoid them and also as they can be encountered in the literature. The inclusion of a name in the *Dictionary* does not therefore automatically mean that the name is validly published and available for use.

Typification (C): The linking of each name to a nomenclatural type is the keystone of stability in the application of names. All ranks from fam. downwards are ultimately based on a single collection; e.g. *Erysiphaceae* on *Erysiphe* on *E. polygoni* on a single collection. A holotype is required (see type) but where none exists, the order of priority is isotype - lectotype - neotype. Should the type not be critically identifiable, an interpretative type (epitype) can be designated. An epitype may also be used to change the status of names of pleomorphic fungi that formerly applied to the anamorph only to be usable for all morphs (i.e. the holomorph). See 'type' for definitions of kinds of types. Type specimens must be dried specimens, specimens in a liquid preservative, dried cultures preserved in a fungal dried reference collection, cultures preserved in a metabolically inactive state (e.g. freeze-dried, in liquid nitrogen) or microscopic preparations; actively growing cultures are not permitted. If a specimen cannot be preserved an illustration or description can suffice. If a type collection is mixed, one part must be selected as lectotype.

Legitimacy (D): Validly published names not in accordance with certain provisions of the Code are **illegitimate (nom. illegit.)** and to be rejected, i.e. (1) **superfluous**, i.e. including the type of a name that should have been used; or (2) **homonyms**, i.e. spelled like a previously validly published name.

Priority (E): Priority of publication determines the correct name for a taxon. The **correct name** (i.e. name in accordance with the Code) of a species is the combination of the earliest available legitimate epithet in the same rank with the correct generic name. This may change if the generic placement or rank is altered; i.e. a species can have more than one correct name according to different taxonomies. The principle of priority can only be set aside through **conservation**, or where the rules on pleomorphic fungi apply (see below). Names for a taxon other than the correct one are **synonyms**; **heterotypic synonyms** (also known as facultative or taxonomic synonyms) are names based on different nomenclatural types, and **homotypic synonyms** (obligate or nomenclatural synonyms) are names based on the same type. Where

a name change is considered desirable as a result of to former misinterpretation or competition between unfamiliar (but priorable) and familiar names, conservation proposals must be published in *Taxon*, receive a positive vote from the Special Committee for Fungi and be ratified at the next nomenclatural Congress.

In the code, the starting point for nomenclature is Linnaeus' *Species plantarum* (1 May 1753), with later exceptions for some groups. Prior to 1981, different groups of fungi had dates later than 1753: 31 Dec. 1801 (Persoon, *Synopsis methodica fungorum*) for *Gasteromycetes* (s.l.), *Pucciniales* and *Ustilaginales*; and 1 Jan. 1821 (Fries, *Systema mycologicum* 1 (1)) for the remaining fungi (other than slime-moulds and lichen-forming species). Reasons for the change in starting point dates are discussed in Demoulin *et al.* (*Taxon* 30: 52, 1981). Names used in the previous starting point books of Fries and Persoon are **sanctioned** and not affected by, and take priority over, homonymous and synonymous names published earlier (listed by Gams, *Mycotaxon* 19: 219, 1984). Names given to lichens are ruled as applying only to their fungal components, i.e. to the lichen-forming fungus. Algae in lichens have separate names, and the composite 'lichen' strictly has no name. Many names ending in *-myces* introduced for lichen mycobionts by Thomas (*Beitr. Kryptog.-Fl. Schweiz.* 9 (1), 1939) and Ciferri & Tomaselli (*Atti Ist. Bot. Univ. Lab. crittog. Pavia* ser. V 10, 1953) are thus superfluous (see Lücking & Hawksworth, *Taxon* 56: 1274, 2007).

Pleomorphic fungi:

The Code permits the different states of fungi (q.v.), other than lichen-forming fungi, with pleomorphic life-cycles to be given separate names; it does not apply to fungi in which pleomorphism is not confirmed (Reynolds & Taylor, *Taxon* 41: 98, 1992). Whether a name can be considered as that of an anamorph or teleomorph depends on its original description and nomenclatural type, *not* the genus in which it was placed; if a teleomorph is present, the name automatically refers to that morph even if the anamorph is also evident (e.g. *Penicillium brefeldianum* B.O. Dodge (1933) included both states in its type and description and is thus a teleomorph name that has correctly been combined as *Eupenicillium brefeldianum* (B.O. Dodge) Stolk & D.B. Scott (1967); the name of the anamorph is *P. dodgei* Pitt (1980), the type and description of which are only of the anamorph). The correct name of a holomorph is that of its teleomorph.

Name changing:

In order to avoid name changes for nomenclatural reasons through a strict application of the Code, special provisions have been made. Names of families, genera and species can be **conserved (nomina conservanda, nom. cons.)** against names threatening their retention, and names in any rank can be **rejected (nomina rejicienda, nom. rej.)** if their use would cause disadvantageous nomenclatural change. If a name has been widely used for a taxon in a sense conflicting with its type, it is not to be used unless and until a proposal to deal with it has been submitted and the name rejected. If a particular work would cause instability if it were used as a source of valid names, it can be proposed for inclusion in a list of **suppressed works**. Proposals for conservation, rejection

tion, or suppression have to be published in *Taxon* and voted on by appropriate Committees. Appendices to the Code list names and works in these categories.

Lists of Names in Current Use (NCUs) were developed through a Committee appointed by the 1994 Congress; those published include those for names of fungal families (David, *Regnum Veg.* 126: 71, 1993; NCU-1), genera (Greuter *et al.*, *Regnum Veg.* 129, 1993, NCU-3), and species in *Cladoniaceae* (Ahti, *Regnum Veg.* 128: 58, 1983) and *Trichocomaceae* (Pitt & Samson, *Regnum Veg.* 128: 13, 1993; subject of a special Nomenclatural Section Resolution). The 1993 Congress, noting improvements being made in the systems of nomenclature to promote stability, urged taxonomists 'to avoid displacing well established names for purely nomenclatural reasons' (see Greuter & Nicolson, *Taxon* 42: 925, 1993; Hawksworth, *SA* 12: 1, 1993).

Authorities:

The authority of a name, usually abbreviated (see Authors' names) is cited after a name for precision and is intended to be a much abbreviated bibliographic reference. If a species is move from one genus to another, or has its rank changed, the original author, i.e. of the basionym (q.v.), is given in brackets and the one making the change cited outside the brackets (e.g. *Fusarium poae* (Peck) Wollenw., based on the earlier *Sporotrichum poae* Peck). Where a name not validly published by one author is taken up and validated by a second, 'ex' is used to link the names of the two authors. In the case of names sanctioned by Persoon or Fries (see above), a colon (:) can be used where it is considered appropriate to indicate the special status of that name or epithet (see Korf, *Mycol.* 74: 250, 1982; *Mycotaxon* 14: 476, 1982); 'ex', 'per' or '[]' had previously been used for devalidated names taken up again after the former later starting dates; 'in' was sometimes formerly used where one author contributed an account of a taxon to the work of another but this was ruled to be part of the bibliographic reference by the 1994 Code and does not form a part of author citations. The Code now emphasizes that the authority is not part of the name itself and there is no reason to use it in works other than formal systematic treatments, unless homonyms are involved.

Registration:

The time and effort needed to maintain formal nomenclators of fungal names (i.e. the *Index of Fungi*, see under *Literature*, and its web-based counterpart *Index Fungorum*, see Internet) are considerable, and scientific names can currently be effectively published in almost any non-ephemeral publicly available printed product. Some of these may only become apparent to the taxonomic community years after publication, potentially causing great confusion and nomenclatural instability. There have been several initiatives over the past ten years or so, developing partly from the Names in Current Use scheme, to make registration of fungal (and plant) names mandatory so that priority of publication is determined by the date of receipt of the information or publication by a Registration Authority. A similar scheme is already in use for the Bacteriological Code. The proposals received a very mixed response from the nomenclatural community, with concerns expressed about the potential for nomenclatural censorship and over the possible continuing use of non-registered

names in contravention of the Code. References in the Tokyo Code (1994) to registration as a future requirement were summarily removed by the St Louis Congress (2000). Some pilot schemes have nevertheless taken place. Under defined conditions, unique IndexFungorum-compatible identifier numbers for new scientific fungal names can now be obtained via the internet (at the time of writing, the only 'registration' website in operation is Mycobank, www.mycobank.org). Although the numbers themselves currently have no formal nomenclatural status, the names 'registered' in this manner are then passed automatically to *Index Fungorum*. Such a system ('registration' websites issuing numbers on behalf of a single internationally recognized nomenclator) may suit the needs of mycology, but ultimately innovations in Internet searching may make all of these initiatives superfluous, especially as the average age continues to increase of those who have in-depth knowledge of nomenclature, and the ability to write Latin descriptions declines.

Other Codes:

Separate Codes exist for zoology, bacteriology, cultivated plants, and viruses. These are independent of the Botanical Code, but there has been extensive discussion as to how harmonization between the Codes can be improved (Hawksworth *et al.*, 1994). See also ambiregnal organisms. A draft International Code of Bionomenclature (the *BioCode*) was planned to apply to names in all groups introduced after (provisionally) 1 Jan. 2000 (see Hawksworth, *Taxon* 44: 447, 1995) but its proponents have to date been unable to gain sufficient support to see it into reality. A further challenge to the *status quo* has been development of a draft *PhyloCode* (<http://www.ohiou.edu/phylocode/>) which proposes a formal nomenclature system for nodes and branches of phylogenies. There is effectively an almost infinite number of ranks in a phylogenetic classification if these are measured by evolutionary age, and it is often difficult to map these onto a traditional system. Molecular tools will increasingly dominate research into systematics, diagnostics etc., and it is important to embrace new technologies while building on rather than rejecting current knowledge.

Lit.: Davis & Heywood (*Principles of angiosperm taxonomy*, 1963), McNeill *et al.* (*Regnum Veg.* 146, 1994; Vienna Code), Hawksworth (*Mycologist's handbook*, 1974 [incl. relevant parts of 1972 Code with mycological examples, glossary]; (Ed.), *Improving the stability of names; needs and options*, [*Regnum Veg.* 123], 1991; *Bot. J. Linn. Soc.* 109: 543, 1992; *A draft glossary of terms used in bionomenclature*, [IUBS Monogr. 8], 1994 [1,175 entries]), Hawksworth *et al.* (*Towards a harmonized bionomenclature for life on Earth*, [*Biol. Internat., Sp. Issue* 30, 1994], Jeffrey (*Biological nomenclature*, edn 3, 1989; general survey all Codes), Weresub (*Sydowia, Beih.* 8: 416, 1979; history, problems). **Nomuraea** Maubl. (1903), anamorphic *Clavicipitaceae*, Hso.0eH.15. 2, widespread. See Samson (*Stud. Mycol.* 6, 1974), Tzean *et al.* (*Atlas of Entomopathogenic Fungi from Taiwan*, 1997), Boucias *et al.* (*Biological Control* 19: 124, 2000; genetic variation), Han *et al.* (*Lett. Appl. Microbiol.* 34: 376, 2002; phylogeny), Suwannakut *et al.* (*J. Invert. Path.* 90: 169, 2005; on noctuids), Sung *et al.* (*Stud. Mycol.* 57, 2007; phylogeny).

- nonfissitunicate** (of asci), ones in which discharge does not involve a separation of the wall layers; see ascus.
- non-target organisms**, organisms found with or near those being treated with chemical or biological control agents.
- Norlevinea** Vávra (1984), Microsporidia. 1.
- Normal saline solution**, sodium chloride (NaCl), 8.5 g, water, 1000.0 ml.
- Normandina** Nyl. (1855), Verrucariaceae (L). 7, widespread. See also *Lauderlindsaya*. See Henssen in Brown *et al.* (Eds) (*Lichenology: progress and problems*: 107, 1976), Tschermak-Woess (*Nova Hedwigia* 35: 63, 1981; photobiont), Aptroot (*Willdenowia* 21: 263, 1991), Eriksson & Hawksworth (*SA* 11: 67, 1992), Aptroot *et al.* (*Bibliotheca Lichenol.* 97, 2008; Costa Rica).
- Normandinomyces** Cif. & Tomas. (1953) = *Normandina* fide Aptroot (*Lichenologist* 30: 501, 1998).
- Normkultur** (of cultures or states), one in which all the forms characteristic of a fungus are present and of good development; **Ankultur**, one of poor development; **Jungkultur**, one when young; **Hochkultur**, one when mature; **Altkultur**, one over-mature; **Abkultur**, a degenerate culture. These names were first used by Appel & Wollenweber (*Ark. biol. BundAnst. Land-u. Forstw.* 8(1): 209, 1910) for *Fusarium*.
- Norrlinia** Theiss. & Syd. (1918), Verrucariales. 1 (on lichens), Europe. See Hawksworth (*TBMS* 74: 363, 1980), Santesson (*Nordic Jl Bot.* 9: 97, 1989), Eriksson & Hawksworth (*SA* 8: 109, 1990), Lumbsch *et al.* (*Mol. Phylogen. Evol.* 31: 822, 2004; phylogeny), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny).
- Norrlinia** Vain. (1921) = *Neonorrlinia*.
- Nosema** Nägeli (1857), Microsporidia. 81.
- Nosemoides** Vinckier (1975), Microsporidia. 3. See Vinckier (*J. Protozool.* 22: 170, 1975).
- Nosophloea** Fr. (1849), anamorphic *Pezizomycotina*. 3, Europe.
- Nostoclavus** Paulet (1791) nom. dub., Agaricomycetes. 'basidiomycetes', inc. sed.
- Nostocotheca** Starbäck (1899) = *Mollerella* fide von Arx (*Persoonia* 2: 421, 1963).
- Notarisiella** (Sacc.) Clem. & Shear (1931) = *Pseudonectria* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- notate** (of surfaces), marked by straight or curved lines.
- Nothadelphia** Degawa & W. Gams (2004), Zygomycota. 1, Japan. See Degawa & Gams (*Stud. Mycol.* 50: 569, 2004).
- Nothocastoreum** G.W. Beaton (1984), Mesophelliaceae. 1, Australia. See Beaton (*TBMS* 82: 666, 1984).
- Nothoclavulina** Singer (1970), anamorphic *Arthrosporella*, Hsy.0eH.38. 1, Argentina. See Singer (*Fl. Neotrop. Monogr.* 3: 18, 1970).
- Nothocorticium** Gresl. & Rajchenb. (1999), Corticiaceae. 1, Argentina. See Greslebin & Rajchenberg (*Mycotaxon* 70: 372, 1999).
- Nothodiscus** Sacc. (1917) nom. dub., Fungi. See Petrak (*Annls mycol.* 38: 253, 1940).
- Nothojafnea** Rifai (1968), Pyronemataceae. 2, Australia; S. America. See Gamundí *et al.* (*Mycologist* 13: 84, 1999; col. pls).
- Notholepiota** E. Horak (1971), Agaricaceae. 1, New Zealand. Basidioma gasteroid. See Horak (*N.Z. Jl Bot.* 9: 463, 1971), Vellinga (*MR* 108: 354, 2004; posn.).
- Nothomitra** Maas Geest. (1964), Helotiales. 3, widespread. Position uncertain, formerly placed in the *Geoglossaceae*. See Zhuang & Wang (*Mycotaxon* 63: 307, 1997), Wang *et al.* (*Mycol.* 94: 641, 2002).
- Nothopanus** Singer (1944), Marasmiaceae. 2, widespread (tropical). See Moncalvo *et al.* (*Syst. Biol.* 49: 278, 2000; phylogeny), Mossebo *et al.* (*Mycotaxon* 76: 267, 2000; Cameroon).
- Nothopatella** Sacc. (1895) = *Botryodiplodia* fide Petrak & Sydow (*Beih. Rep. spec. nov. regn. veg.* 42, 1927).
- Nothopacidium** J. Reid & Cain (1962), Helotiales. 1, N. America. *N. phyllophilum* (snow blight of conifers). See Smerlis (*CJB* 44: 563, 1966).
- Nothopodospora** Mirza (1963) nom. inval. = *Arnium* fide Lundqvist (*Symb. bot. upsal.* 20 no. 1, 1972).
- Nothoporpida** Hertel (1984) = *Lecidea* fide Hertel (*Mitt. bot. StSamml., München* 23: 321, 1987).
- Nothoravenelia** Dietel (1910), Phakopsoraceae. 2 (on *Burseraceae*, *Euphorbiaceae*), Japan; Russian far east; Africa. See Thirumalachar (*Sydowia* 5: 23, 1951).
- Nothorhytisma** Minter, P.F. Cannon, A.I. Romero & Peredo (1998), Rhytismataceae. 1, S. America (temperate). See Minter *et al.* (*SA* 16: 27, 1998).
- Nothospora** Peyronel (1913), anamorphic *Pezizomycotina*, Hso.0eH.?. 1, Italy.
- Nothostrasseria** Nag Raj (1983), anamorphic *Terasphaeria*, Cpd.1eP.15. 1, Australia. See Nag Raj (*CJB* 61: 23, 1983), Crous *et al.* (*Stud. Mycol.* 58: 1, 2007; teleomorph).
- Nothostroma** Clem. (1909) = *Tomasellia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Notocladonia** S. Hammer (2003), Cladoniaceae (L). 2, Australasia. See Hammer (*Bryologist* 106: 162, 2003).
- Notolecidea** Hertel (1984), Lecanorales (L). 1, Antarctica. See Hertel (*Nova Hedwigia* Beih. 79: 440, 1984), Buschbom & Mueller (*Mol. Phylogen. Evol.* 32: 66, 2004; phylogeny).
- Notothyrites** Cookson (1947), Fossil Fungi, Microthyriaceae. 12 (Cretaceous, Tertiary), widespread. See Eriksson (*Ann. bot. fenn.* 15: 122, 1978).
- NRRL**, Agricultural Research Service Culture Collection (Peoria, Ill, USA); founded 1941; a part of the United States Department of Agriculture's (USDA) Agricultural Research Service; see Kurtzman (*Enzyme Microbiol. Tech.* 8: 328, 1986).
- nubilated**, cloudy and semi-opaque as viewed by transmitted light.
- nuclear cap** (of *Blastocladiaceae*), a body at one side of the nucleus of a zoospore or gamete.
- Nuclear division**. See Beccard & Pfeffer (*Protoplasma* 174: 62, 1993; status in arbuscular mycorrhizal fungi), Gladfelter (*Current opinion in microbiology* 9: 547, 2006; asynchronous mitosis in multinucleated fungal hyphae), Heath (Ed.) (*Nuclear division in fungi*, 1978; review), Plamann (*J. Genetics* 75: 351, 1996; review); - **status**, of fungal cells (fide Jinks & Simchen, *Nature* 210: 778, 1966) may be considered (1) numerically: mono-, di-, multi-karyon (= uni-, bi-, multinucleate) and (2) by gene content: homokaryon or heterokaryon according as to whether the nuclei are genetically identical or not. See Chromosome numbers.
- Nucleophaga** P.A. Dang. (1895), ? Olpidiaceae. 2 (on *Amoeba*), France. See Karling (*Bull. Torrey bot. Club* 99: 223, 1972).

Nucleospora R.P. Hedrick, J.M. Groff & D.V. Baxa (1991), Microsporidia. 2.
Nudispora J.I.R. Larsson (1990), Microsporidia. 1. See Larsson (*J. Protozool.* 37: 310, 1990).
Numbers of fungi. Numbers of fungi. The development of reliable estimates of both the numbers of accepted species of fungi and the actual number on

Earth is fraught with uncertainties. The difficulties involved in the enumeration of fungi as individuals, kinds (i.e. as genera and species) or even names are considerable (Ainsworth, 1968). The early edns of this *Dictionary* estimated the number of known

TABLE 4. The Numbers of Fungi.

	gen.	spp.	gen.	spp.
FUNGI				
Ascomycota			5674	64056
<i>Arthoniomycetes</i>	78	1608		
<i>Dothideomycetes</i>	1302	19010		
<i>Eurotiomycetes</i>	281	3401		
<i>Laboulbeniomycetes</i>	151	2072		
<i>Lecanoromycetes</i>	630	14199		
<i>Neoelectomycetes</i>	1	3		
<i>Orbiliomycetes</i>	12	288		
<i>Pezizomycetes</i>	200	1684		
<i>Pneumocystidomycetes</i>	1	5		
<i>Saccharomycetes</i>	95	915		
<i>Schizosaccharomycetes</i>	2	5		
<i>Sordariomycetes</i>	1119	10564		
<i>Taphrinomycetes</i>	8	140		
incertae sedis	1794	10162		
Basidiomycota			1586	31503
<i>Agaricomycetes</i>	1147	20951		
<i>Agaricostilbomycetes</i>	10	47		
<i>Atractiellomycetes</i>	10	34		
<i>Classiculomycetes</i>	2	2		
<i>Cryptomycocolacomycetes</i>	2	2		
<i>Cystobasidiomycetes</i>	7	14		
<i>Dacrymycetes</i>	9	101		
<i>Entorrhizomycetes</i>	2	15		
<i>Exobasidiomycetes</i>	53	597		
<i>Microbotryomycetes</i>	25	208		
<i>Mixiomycetes</i>	1	1		
<i>Pucciniomycetes</i>	190	8016		
<i>Tremellomycetes</i>	50	377		
<i>Ustilaginomycetes</i>	62	1113		
incertae sedis	16	25		
Chytridiomycota			105	706
<i>Monoblepharidomycetes</i>	5	26		
<i>Chytridiomycetes</i>	98	678		
incertae sedis	2	2		
Zygomycota			168	1065
<i>Entomophthoromycotina</i>	23	277		
<i>Kickxellomycotina</i>	59	264		
<i>Mucoromycotina</i>	61	325		
<i>Zoopagomycotina</i>	22	190		
incertae sedis	3	9		
TOTAL			75337	97330

‘good’ species to be 38,000, rising to 50,000 in the fifth edn. For the seventh edn of this *Dictionary*, the numbers of genera and species accepted were derived by upwards summation of the totals from the generic entries; this gave a total of 64,200 species. For the eighth edn the number was 72,065, and for the ninth edn the number was 80060. The editors of that edition commented that this figure was within the limits

of error expected in an exercise of this type. Since the start of 2001, new species of fungi have been catalogued in the *Index of Fungi* at the rate of c. 1200 each year. Assuming that mycologists still inadvertently redescribe already known species at the rate of about 2.5:1 (Hawksworth, 1991) this means that an additional c. 2,200 ‘good’ species would be expected to have been added in the period 2001-2007; i.e. a

total of 82,060 species. The figure of just over 97,000 in Table 4 obtained by upwards addition in entries in this edn of the *Dictionary* is substantially larger. Reasons for this include possible double counting (because of the on-going process of incorporating the conidial fungi in a single holomorphic system), and an increase in the number of species accepted in some groups (perhaps partly as a result of molecular studies); in addition, it is now evident that the earlier estimates were probably very conservative. These figures show a clear upward trend over more than half a century in the number of species discovered, described and accepted by the scientific community.

It is also important to note that amongst the over 338,000 names at species rank proposed for fungi, many have never been reassessed since their first description nor have they been adopted by modern workers. Names in many accepted genera, especially some of the larger, have not been critically revised; in this edn of the *Dictionary* we have not added in all species names proposed and catalogued in the *Index of Fungi* in the absence of the opinions of specialists. In the absence of a world checklist of accepted fungi (a topic starting to be addressed through the IUBS/IUMS SPECIES 2000 project), the possibility that as many as 100,000 'good' species are already described seems quite believable, and as many as 150,000 (Rossman, 1994) 'good' species already described cannot be excluded.

Estimating the total number of fungi on Earth is even more problematic. Bisby & Ainsworth (1943) estimated that there are at least 100,000 species of fungi. Martin (*Proc. Iowa Acad. Sci.* 58: 175, 1951) considered this estimate 'excessively conservative' and suggested that the number of species of fungi is at least as great as the number of 'good' species of phanerogams, then believed to be not less than 250,000. Based on extrapolations from three independent data sets (ratios of the numbers of fungi in all habitats to plants in the British Isles, numbers restricted to particular hosts, and a community studied in depth) Hawksworth (1991) suggested that a 'conservative' working figure of c. 1.5 million be adopted. Although Hammond (1992) recommended 1 million for general use, this 1.5 million estimate has been supported by subsequent data (Hawksworth, 1993; Cannon & Hawksworth, 1995). Schmit & Mueller (*Biodiversity conservation* 16: 99, 2007) suggested that 712,000 species of fungi worldwide was a very conservative lower limit of global fungal diversity. Currently Hawksworth's estimate of 1.5 million species remains the most widely accepted (Heywood, *Global biodiversity assessment*, 1995; Rossman, 1994).

The gap between described and estimated species of fungi is immense, and new species are regularly found in all countries of the world. Of the 16,013 new species recorded in the *Index of Fungi* in 1981-90, 51% were from countries outside the tropics; the individual countries providing most species were India and the USA (c. 10% each) (Hawksworth, 1993). In the tropics, around 15-25% of the fungi collected in short studies can be expected to be undescribed, the percentage rising to 60-85% in more prolonged intensive investigations (depending on the groups and habitats). Examination of more recent issues of the *Index of Fungi* suggests this pattern continues. Pirozynski (*Mycol. Pap.* 129, 1972) reported a ratio of

micro-fungi *alone* to plants of at least 3:1 (and possibly 5:1) in Tanzania, and detailed (but still incomplete) site inventories in temperate regions yield ratios of 3-4:1 when all groups are considered (Hawksworth, 1991).

Lit.: Ainsworth (in Ainsworth & Sussman, *The Fungi* 3: 505, 1968), Bisby (*Am. J. Bot.* 20: 246, 1933), Bisby & Ainsworth (*TBMS* 26: 16, 1943), Cannon & Hawksworth (*Adv. Pl. Path.* 11: 277, 1995), Hammond (in Groombridge, *Global biodiversity*: 17, 1992), Hawksworth (*MR* 95: 641, 1991; in Isaac *et al.*, *Aspects of tropical mycology*: 265, 1994), Kirk (*MR* 104: 516, 2000), Pascoe (in Short, *History of systematic mycology in Australia*: 259, 1990), Rossman (in Hawksworth (Ed.), *Identification and characterization of pest organisms*: 35, 1994).

Numerical taxonomy (phenetics, taxometrics). Now largely replaced by phylogenetic analysis (q.v.). The entry from the previous edn of this *Dictionary*, retained for historical interest, follows. The derivation of computer-based assessments of resemblance, for both classification and identification, has not been as widely used for fungi as for bacteria. Examples of this approach applied to fungal classification are the papers by Bridge *et al.* (*J. Gen. Microbiol.* 135: 2941, 1989; *Penicillium*), Höls & Raitviir (*Scripta mycol.* 6, 1974; morphometrics), Ibrahim & Threlfall (*Proc. R. Soc. B* 165: 362, 1966; graminicolous *Helminthosporium*), Joly (*BSMF* 85: 213, 1969; *Alternaria*), Kendrick & Proctor (*CJB* 42:65, 1964; anamorphic fungi), Kendrick & Weresub (*Syst. Zool.* 15: 307, 1966; ordinal level in basidiomycetes), Kiefer (*Mycol.* 71: 343, 1979; methodology of Machol & Singer, *Nova Hedw.* 21: 353, 1971), Parker-Rhodes & Jackson (in Cole (Ed.), 1969: 181; ecology of basidiomycetes). For examples of identification schemes see Barnett *et al.* (*Yeasts: characteristics and identification*, edn 2, 1990), Bridge *et al.* (*Mycol. Pap.* 165, 1992), Pankhurst (*Nature* 227: 1269, 1970; *Biological identification*, 1978; key generation).

For methods see Bridge & Sackin (*Mycopath.* 115: 105, 1991), Carmichael & Sneath (*Syst. Zool.* 18:402, 1969), Cole (Ed.) (*Numerical taxonomy*, 1969), Cutbill (Ed.) (*Data processing in biology and geology*, 1971), Felsenstein (*Numerical taxonomy*, 1983), Sneath & Sokal (*Numerical taxonomy*, edn 2, 1973).

Nummospora E. Müll. & Shoemaker (1964), anamorphic *Pezizomycotina*, Cpd.#eP.?. 1, Switzerland. See Müller & Shoemaker (*Nova Hedwigia* 7: 1, 1964), Wu *et al.* (*MR* 102: 179, 1998).

Nummularia Tul. & C. Tul. (1863) [non *Nummularia* Hill 1756, *Primulaceae*] = *Biscogniauxia* fide Jong & Benjamin (*Mycol.* 63: 862, 1971; N. Am. spp.), Ju *et al.* (*Mycotaxon* 66: 1, 1998).

Nummulariella Eckblad & Granmo (1978) = *Biscogniauxia* fide Pouzar (*Česká Mykol.* 33: 129, 1979), Læssøe (*SA* 13: 43, 1994; ? synonym of *Xylaria*).

Nummularioidea (Cooke & Massee) Lloyd (1924) = *Camillea* fide Læssøe *et al.* (*MR* 93: 121, 1989), Læssøe (*SA* 13: 43, 1994; ? synonym of *Xylaria*).

Nummularioidea, see *Nummularioidea*.

Numulariola House (1925) = *Biscogniauxia*.

nurse cells (in *Scleroderma*), hyphae supplying food material to spores which have come away from the basidia.

TABLE 4 (cont.). The Numbers of protozoan and chromistan analogues.

	gen.	spp.	gen.	spp.
PROTOZOA				
Percolozoa (<i>Acrasida</i>)			6	14
Amoebozoa			82	1019
<i>Dictyostelia</i>	4	93		
<i>Myxogastria</i>	62	888		
<i>Protostelia</i>	16	38		
Cercozoa (<i>Plasmodiophorida</i>)			15	50
Choanozoa (<i>Amoebidiales</i> , <i>Eccrinales</i>)			19	78
Incertae sedis			3	4
TOTAL			125	1165
CHROMISTA				
Hyphochytriomycota	6	24		
Labyrinthista	12	56		
Oomycota	106	956		
Incertae sedis	2	3		
TOTAL			1264	1036

Nusia Subram. (1995), anamorphic *Pezizomycotina*, Hso.≡ eP.24. 2, Singapore. See Subramanian (*Cryptog. Mycol.* 14: 109, 1993), Subramanian (*Kavaka* 20/21: 57, 1992/1993).

nutant, nodding.

nutrilite, any organic compound necessary in small amounts for the nutrition of an organism (Williams, *Biol. Rev.* 16: 49, 1941).

nutriocyte (of *Ascosphaera*), the inflated part of the ascogonium which eventually develops into a spore cyst (Spiltoir & Olive, *Mycol.* 47: 240, 1955).

Nutrition. Fungi are able to degrade and subsequently metabolize many widely different materials. Some parasites (obligate parasites, e.g. *Pucciniales*, *Erysiphales*, *Peronosporaceae*) have such special needs that full development takes place only on the right host; but growth of other parasites, like that of most fungi, will take place on a synthetic medium (see Methods). The growth of fungi is dependent on carbon (C), hydrogen (H), oxygen (O), nitrogen (N), potassium (K), phosphorus (P), magnesium (Mg), and sulphur (S), together with very small amounts of iron (Fe), zinc (Zn), copper (Cu), and/or possibly other minor (or trace) elements. Calcium (Ca) is probably a necessary element but it is not always possible to demonstrate that this is so. In addition, complex 'growth substances' are sometimes needed.

Fungi are heterotrophic in needing their carbon in a complex (organic) form. In general, aliphatic carbon compounds (esp. carbohydrates) are more readily used by fungi than aromatic ones. Nevertheless, basidiomycete fungi are the key organisms in breaking down the ubiquitous aromatic polymer lignin. There are some yeasts which can grow on the one carbon methanol. Some fungi are dependent on organic nitrogen (esp. amino acids and proteins), others can use ammonium or nitrate nitrogen. Fungi are able to adapt and regulate their metabolism according to the nutrients available. The complex bios (q.v.) was the first 'growth substance' to be noted for fungi,

yeast making better growth with it. Thiamin [aneurin, vitamin B₁] is one of the substances necessary for the growth of some fungi; for certain species the complete molecule is needed but others are able to synthesize thiamin if given one, or both, of its components (thiazole and pyrimidine). Fungi are often able to tolerate high concentrations of toxic metals and high concentrations of salt and sugar (which can be lethal to many other organisms) and the species which are able to do this cause spoilage of food.

Lichen-forming fungi obtain the carbohydrates they require in the form of sugars and sugar-alcohols (polyols) produced by the algal partner; the nature of the mobile carbohydrate depends on the kind of alga present (e.g. glucose with *Nostoc*, ribitol with *Myrmecia* and *Trebouxia*, erythritol with *Trentepohlia*); cyanobacteria fix atmospheric nitrogen. The carbohydrates are commonly stored as mannitol by the fungal component. The mineral requirements of lichen fungi are met by ions dissolved in rain and from the deposition of dust; in some cases diffusion from the substrate can occur but is usually very limited in extent.

See Jennings (*The physiology of fungal nutrition*, 1995), Lichens, Physiology.

NY, New York Botanical Garden (Bronx, New York, USA); founded 1891; a private institution.

Nyctalidaceae Jülich (1982) nom. rej. = **Lyophyllaceae**.

Nyctalina Arnaud (1952), anamorphic *Agaricomycetes*, Hso.0eH.?. 1 (with clamp connexions), Europe. See Arnaud (*BSMF* 68: 189, 1952).

Nyctalis Fr. (1825) = *Asterophora* fide Stalpers (*in litt.*).

Nyctalospora E.F. Morris (1972), anamorphic *Pezizomycotina*, Hsy.≡ eP.1. 1, Costa Rica. See Morris (*Mycol.* 64: 890, 1972).

Nycteromyces Thaxt. (1917), *Laboulbeniaceae*. 1, S. America.

Nyctomyces Hartig (1833), *Fossil Fungi* (mycel.) *Fungi*. 4 (Tertiary), Europe; N. Africa.

- Nylander** (William; 1822-1899; Finland). Practising medic (1852-1858; Professor of Botany, Helsinki University (1858-1863); living in Paris (1863 onwards). Visited England to examine Hooker's lichen collection [now in the British Museum (Natural History), London BM] (1857); published c. 330 works [of which the first few were on ants]; introduced the use of chemical reagents (C, I and K) into lichenology (see Metabolic products); described over 5,000 new species of lichen-forming fungi from all parts of the world. Main collections in Helsinki (H), but material in most major European institutions with mycological collections. *Publs. Synopsis Methodica Lichenum Omnium hucusque Cognitorum, Praemissa Introductione Lingua Gallica* 1 (1), 1 (2) and 2 (1858, 1860, 1863); *Lichenes Scandinaviae sive prodromus lichenographiae Scandinaviae. Notiser ur Sällskapets pro Fauna et Flora Fennica Förhandlingar* (1861); *Lichenes Japoniae. Accedunt Observationibus Lichenes Insulae Labuan* (1890). *Biogs, obits etc.* Ahti [ed.] (*Collected Papers of William Nylander* 6 vols, 1967-1990) [biography in 1: viii, 1990]; Grumann (1974: 611); Hue (*Bulletin de la Société Botanique de France* 46: 153, 1899) [bibliography, portrait]; Stafleu & Cowan (*TL-2* 3: 788, 1981).
- Nylanderaria** Kuntze (1891) = *Letharia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Nylanderiella** Hue (1914) = *Siphula* Fr. (1831) fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Nylanderopsis** Gyeln. (1935) = *Heppia* fide Henssen (*Acta Bot. Fenn.* 150: 57, 1994).
- Nymanomyces** Henn. (1899), Rhytismataceae. 1, Java.
- Nypaella** K.D. Hyde & B. Sutton (1992), anamorphic *Pezizomycotina*, Cpd.0eH.15. 1, Brunei. See Hyde & Sutton (*MR* 96: 210, 1992).
- Nyssopsora** Arthur (1906), Raveneliaceae. 9 (on dicots, esp. *Araliales*), widespread. See Lütjeharms (*Blumea*, 1937), Lohsomboon *et al.* (*MR* 94: 907, 1990; key).
- Nyssopsorella** Syd. (1921) = *Triphragmiopsis* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- nystatin** (mycostatin), an antibiotic from the actinomycete *Streptomyces noursei*; antifungal, widely used against *Candida albicans* infections of man. See Brown & Hazen (*Trans. N.Y. Acad. Sci.* ser. 2 19: 447, 1957), Baldwin (*The fungus fighters*, 1981).
- Nyungwea** Sérus., Eb. Fischer & Killmann (2006), ? Arthoniales (L). 1, E. Africa. See Sérusiaux *et al.* (*Lichenologist* 38: 115, 2006).
- O**, Botanical Garden and Museum, University of Oslo (Norway); founded 1812.
- OA**, see Media.
- oak-moss** (oakmoss, oak moss), *Evernia prunastri* (mousse de chêne); extracts of which are used in perfumes to reduce the rate of evaporation of other ingredients. Cf. tree hair.
- ob-** (prefix), inversely or oppositely.
- obclavate**, inversely clavate (widest at the base) (Fig. 23.17).
- Obconicum** Velen. (1939), ? Helotiales. 2, former Czechoslovakia.
- Obelidium** Nowak. (1877), Chytridiaceae. 3, widespread (north temperate).
- Obeliospora** Nawawi & Kuthub. (1990), anamorphic *Pezizomycotina*, Hso.0bH.15. 1 (on submerged decaying wood), Malaysia. See Nawawi & Kuthubutheen (*Mycotaxon* 37: 395, 1990), Kuthubutheen & Nawawi (*MR* 98: 677, 1994), Wu & McKenzie (*Fungal Diversity* 12: 223, 2003).
- Oberwinkleria** Vánky & R. Bauer (1995), Tilletiaceae. 1 (in seeds of *Poaceae*), Venezuela. See Vánky & Bauer (*Mycotaxon* 53: 363, 1995).
- oblate**, with the equatorial diameter greater than the polar diameter; - **spheroidal**, shaped like the earth.
- obligate** (1) necessary; essential; (2) (of a parasite), living as a parasite in nature, sometimes of one that has not been cultured on laboratory media, cf. facultative; see synonym.
- oblique septum**, see septum.
- oblong** (of spores), twice as long as wide and having somewhat truncate ends (Fig. 23.4b, c); - **ellipsoid** (of spores), rounded-oblong; having long sides parallel and ends almost hemispherical.
- Oblongichytrium** R. Yokoy. & D. Honda (2007), Thraustochytriaceae. 3 (marine), widespread. See Yokoyama, R.; Honda, D. (*Mycoscience* 48: 199, 2007).
- Obolarina** Pouzar (1986), Xylariaceae. Anamorph *Rhinocladiella*-like. 1, Europe. See Hawksworth (*SA* 13: 198, 1985), Candoussau & Rogers (*Mycotaxon* 39: 345, 1990), Læssøe & Spooner (*Kew Bull.* 49: 1, 1994; as *Rosellinia*), Eriksson (*SA* 14: 61, 1995; posn), Nordén & Sunhede (*Svensk bot. Tidskr.* 94: 331, 2001; ecology).
- obovate**, inversely ovate.
- obovoid**, inversely ovoid (Fig. 23.12).
- obpyriform**, the reverse of pyriform (Fig. 23.15).
- Obryzaceae** Körb. (1855), Sordariomycetes (inc. sed.). 1 gen., 3 spp.
Lit.: Hoffmann & Hafellner (*Biblthca Lichenol.* 77: 181 pp., 2000).
- Obryzum** Wallr. (1825), Obryzaceae. 3 (lichenicolous, on *Leptogium*), Europe. See Eriksson (*Op. Bot.* 60, 1981), Hoffmann & Hafellner (*Biblthca Lichenol.* 77: 1, 2000).
- Obscurodiscus** Raitv. (2002), Helotiales. 1, Europe. See Raitviir (*Mycotaxon* 81: 49, 2002).
- obsolete** (1) (of organs or parts), rudimentary or absent; (2) (of terms), no longer in use.
- Obstipipilus** B. Sutton (1968), anamorphic *Pezizomycotina*, Cac.1eP.19. 1, India. See Sutton (*CJB* 46: 187, 1968).
- Obstipispora** R.C. Sinclair & Morgan-Jones (1979), anamorphic *Pezizomycotina*, Hso.0fH.1. 1 (aquatic), USA. See Sinclair & Morgan-Jones (*Mycotaxon* 8: 152, 1979).
- obsubulate**, very narrow; pointed at the base and a little wider at the tip.
- Obtectodiscus** E. Müll., Petrini & Samuels (1980), Helotiales. 2, Switzerland; S. America. See Samuels & Rogerson (*Acta Amazon. Supl.* 14: 81, 1984), Scheuer (*Biblthca Mycol.* 123: 274, 1988).
- obtuse** (1) rounded or blunt (Fig. 23.4b); (2) greater than a right angle.
- occluded**, closed; often used of the lumina of hyphae or pseudoparenchymatous cells.
- Occultifur** Oberw. (1990), Cystobasidiaceae. 4, widespread (north temperate). See Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 1351, 2000; mol. phylogeny).
- Occultithecra** J.D. Rogers & Y.-M. Ju (2003), Xylariaceae. 1, Costa Rica. See Rogers & Ju (*Sydowia* 55: 359, 2003).
- Oceanites** Kohlm. (1977), ? Halosphaeriaceae. 1, Atlantic. See Kohlmeyer (*Revue Mycol. Paris* 41: 193,

- 1977).
- Ocellaria** (Tul. & C. Tul.) P. Karst. (1871) = *Pezicula* Tul. & C. Tul. fide Verkley (*Stud. Mycol.* 44: 180 pp., 1999), Abeln (*Mycol.* 92: 685, 2000; phylogeny).
- Ocellariella** Petr. (1947) ? = *Naevia* Fr. (1849) fide Korf in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 249, 1973).
- ocellate**, having rounded marks, like eyes.
- Ocellis** Clem. (1909) = *Ocellularia* fide Zahlbruckner (*Catalogus Lichenum Universalis* 2, 1923).
- Ocellularia** G. Mey. (1825) nom. cons., *Thelotrema*-aceae (L). 249, widespread (esp. tropical). See Hale (*Mycotaxon* 11: 130, 1980; limits), Nagarkar *et al.* (*Biovigyanam* 14: 24, 1988; key 32 spp. India), Matsumoto & Deguchi (*Bryologist* 102: 86, 1999; anamorphs), Sipman (*Biblhca Lichenol.* 86: 177, 2003; Singapore), Frisch (*Biblhca Lichenol.* 92: 3, 2006; Africa), Frisch & Kalb (*Biblhca Lichenol.* 92: 371, 2006; anatomy), Frisch *et al.* (*Biblhca Lichenol.* 92: 517, 2006; phylogeny), Mangold *et al.* (*Biblhca Lichenol.* 96: 193, 2007; Australia).
- ocellus**, an eyespot functioning as a lens and concentrating light rays on a sensitive spot.
- Ochotrichobolus** Kimbr. & Korf (1983), *Pezizales*. 1, USA. See Brummelin (*Persoonia* 16: 425, 1998; possible placement in *Pyronemataceae*).
- Ochraceospora** Fiore (1930) nom. dub., *Hypocreales*. Possibly an earlier name for *Haematonectria* (*Nectriaceae*), but type material is lost. See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- ochratoxin** (A, B), toxins of *Aspergillus ochraceus*, *Penicillium viridicatum*, etc.; the cause of nephrotoxicosis in sheep, cattle, and pigs; also carcinogenic and has been found in coffee.
- Ochrocladosporium** Crous & U. Braun (2007), anamorphic *Pleosporales*. 2, Sweden; Germany. See Crous *et al.* (*Stud. Mycol.* 58: 33, 2007).
- Ochroconis** de Hoog & Arx (1974), anamorphic *Pezizomycotina*, Hso.1eP.11. 8, widespread. See de Hoog (*Stud. Mycol.* 26: 51, 1985), Fukushima *et al.* (*J. Med. Vet. Mycol.* 24: 175, 1986; subcutaneous abscesses), Sides *et al.* (*J. Med. Vet. Mycol.* 29: 317, 1991; phaeohyphomycosis), Padhye *et al.* (*J. Med. Vet. Mycol.* 32: 141, 1994; in cat), Schaumann & Priebe (*CJB* 72: 1629, 1994; in salmon), Horré *et al.* (*Stud. Mycol.* 43: 194, 1999; DNA, physiology).
- Ochroglossum** S. Imai (1955) = *Microglossum* Gillet fide Maas Geesteranus (*Persoonia* 3: 89, 1964).
- Ochrolechia** A. Massal. (1852), *Ochrolechiaceae* (L). 58, widespread (esp. temperate). See Versegny (*Beih. Nova Hedwigia* 1, 1962; monogr., keys), Poelt (*Ergebn. Forsch.-Unternehmen Nepal Himal.* 1: 251, 1966; Himalaya), Brodo (*CJB* 66: 1264, 1988; N. Am.), Awasthi & Tewari (*Kavaka* 15: 23, 1989; key 12 spp. Indian subcont.), Schmitz *et al.* (*Acta Bot. Fenn.* 150: 153, 1994; gen. concept), Archer (*Biblhca Lichenol.* 69, 1997; Australia), Boqueras *et al.* (*Cryptog. Mycol.* 20: 303, 1999; Iberian spp.), Messuti & Lumbsch (*Biblhca Lichenol.* 75: 33, 2000; S America), Schmitt & Lumbsch (*Mol. Phylogen. Evol.* 33: 43, 2004; phylogeny, chemistry), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Schmitt *et al.* (*J. Hattori bot. Lab.* 100: 753, 2006; phylogeny).
- Ochrolechiaceae** R.C. Harris ex Lumbsch & I. Schmitt (2006), *Pertusariales*. 2 gen. (+ 2 syn.), 61 spp.
Lit.: Brodo (*CJB* 69: 733, 1991), Lumbsch *et al.* (*Biblhca Lichenol.* 57: 355, 1995), Schmitt *et al.* (*Biblhca Lichenol.* 86: 147, 2003), Schmitt *et al.* (*J. Hattori bot. Lab.* 100: 753, 2006).
- Ochromitra** Velen. (1934) = *Pseudorhizina* fide Petrak (*Sydowia* 1: 61, 1947).
- Ochronectria** Rossman & Samuels (1999), *Bionectriaceae*. 1, widespread (tropical). See Rossman *et al.* (*Stud. Mycol.* 42: 53, 1999), Rossman *et al.* (*Mycol.* 93: 100, 2001; phylogeny).
- Ochroporus** J. Schröt. (1888) = *Phellinus* fide Donk (*Persoonia* 1: 173, 1960).
- Ochropsora** Dietel (1895), ? *Uropyxidaceae*. 4 (on dicots), widespread (north temperate). See Soong (*Flora* 133: 345, 1939; morphology), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003; under *Chaconiaceae*), Ono (*Mycoscience* 47: 145, 2006; life cycle, basidium morph.).
- Ochrosphaera** Sawada (1959), *Pezizomycotina*. 1, Taiwan. See Sawada (*Special Publication College of Agriculture, National Taiwan University* 8: 50, 1959).
- Ochrosporellus** (Bondartseva & S. Herrera) Bondartseva & S. Herrera (1992) = *Phellinus* fide Ryvarden (*Syn. Fung.* 5: 312, 1991).
- ochrosporous**, having yellow or yellow-brown spores.
- Ocostaspora** E.B.G. Jones, R.G. Johnson & S.T. Moss (1983), *Halosphaeriaceae*. 1 (marine), widespread. See Jones *et al.* (*Bot. Mar.* 26: 353, 1983), Pang *et al.* (*CJB* 82: 485, 2004).
- Ocotomyces** H.C. Evans & Minter (1985), ? *Rhytismatales*. Anamorph *Uyucamyces*. 1 (on *Pinus*), Honduras. See Evans & Minter (*TBMS* 84: 57, 1985).
- Octaviana** Vittad. (1831), *Boletaceae*. 15, widespread.
- Octavianiaceae** Locq. ex Pegler & T.W.K. Young (1979) = *Boletaceae*.
- Octavianina**, see *Octaviana*.
- octo-** (in combinations), 8.
- Octojuga** Fayod (1889) = *Crepidotus* fide Kuyper (*in litt.*).
- Octomyces** Mello & L.G. Fern. (1918) ? = *Saccharomyces* fide Batra in Subramanian (Ed.) (*Taxonomy of fungi* 1: 187, 1978).
- octophore**, see *haerangium*.
- Octopodotus** Kohlm. & Volkm.-Kohlm. (2003), anamorphic *Pezizomycotina*. 1, USA. See Kohlmeyer & Volkmann-Kohlmeyer (*Mycol.* 95: 117, 2003).
- octopolar** (of incompatibility systems), having 3 loci, as in *Psathyrella coprobia* (Jurand & Kemp, *Genetical Res., Cambr.* 22: 125, 1973); cf. *tetrapolar*.
- Octospora** Hedw. (1789), *Pyronemataceae*. c. 84 (often bryophilous), widespread. See Dennis & Itzerott (*Kew Bull.* 28: 5, 1973; key), Khare & Tewari (*Mycol.* 67: 972, 1975), Dennis & Itzerott (*Kew Bull.* 31: 497, 1977; W. Eur.), Döbbeler (*Nova Hedwigia* 31: 817, 1980), Döbbeler & Itzerott (*Nova Hedwigia* 34: 127, 1981; biology), Caillet & Moyne (*BSMF* 103: 277, 1987; key 32 spp.), Caillet & Moyne (*Bull. Soc. Hist. nat. Doubs* 84: 9, 1991; keys), Wang (*NMNS Spec. Publ.*, 1992; key, N. American spp.), Yao & Spooner (*MR* 100: 175, 1996; key Brit. spp.), Moravec (*Czech Mycol.* 49: 149, 1997; sect. *Neottiellae*), Benkert (*Z. Pilzk.* 7: 39, 1998), Jakobson *et al.* (*Karstenia* 38: 1, 1998), Khare (*Nova Hedwigia* 77: 445, 2003), Benkert & Brouwer (*Persoonia* 18: 381, 2004; Netherlands), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- octospore**, one spore of an 8-spored ascus.
- Octosporea** Flu (1911), *Microsporidia*. 3.

- Octosporella** Döbbeler (1980), Pyronemataceae. 7 (on mosses and liverworts), Europe; Venezuela. See Döbbeler (*Mitt. bot. StSamml., München* 16: 471, 1980), Yao & Spooner (*Kew Bull.* 51: 193, 1996), Yao *et al.* (*Nova Hedwigia* 82: 483, 2006; key).
- Octosporomyces** Kudrjanzev (1960) = Schizosaccharomyces fide Sipiczki in Nasim *et al.* (Eds) (*Molecular biology of the fission yeast*, 1989), Kurtzman & Robnett (*Yeast* Chichester 7: 61, 1991).
- Octosporonites** Locq. & Sal.-Cheb. (1980), Fossil Fungi. 1, Cameroon.
- octosporous**, producing spores in 8s.
- Octotetraspora** I.V. Issi, Kadyrova, Pushkar, Khodzhayeva & S.V. Krylova (1990), Microsporidia. 1.
- ocular chamber**, see ascus.
- Oculimacula** Crous & W. Gams (2003), Helotiales. Anamorph *Helgardia*. 2 (causing eyespot disease of cereals), widespread. See Crous *et al.* (*Eur. J. Pl. Path.* 109: 845, 2003), Walsh *et al.* (*J. Phytopath.* 153: 715, 2005; molecular diagnostics).
- Odontia** Fr. (1835) = *Steccherinum* fide Donk (*Persoonia* 3: 199, 1964) but used by, Furukawa (*Bull. Govt For. Exp. Stn* 261, 1974).
- Odontia** Gray (1821) nom. dub. fide Stalpers (*in litt.*).
- Odontia** Pers. (1794) nom. rej. = *Caldesiella* fide Stalpers (*in litt.*).
- Odonticium** Parmasto (1968), Agaricomycetes. 6, widespread. *Hymenochaetales* or *Agaricales* (*Rickenella* clade). See Parmasto (*Consp. System. Corticiac.*: 126, 1968), Zmitrovich (*Mikol. Fitopatol.* 35: 9, 2001).
- Odontina** Pat. (1887) = *Steccherinum* fide Donk (*Taxon* 5: 69, 1956).
- Odontiochaete** Rick (1940) nom. dub., Cantharellales. See Donk (*Taxon* 5: 107, 1956).
- Odontiopsis** Hjortstam & Ryvarden (1980), Schizoporaaceae. 2, widespread (tropical). See Hjortstam & Ryvarden (*Mycotaxon* 12: 180, 1980).
- Odontium** Raf. (1817) = *Caldesiella* fide Donk (*Taxon* 5: 107, 1956).
- Odontodictyospora** Mercado (1984), anamorphic *Pezizomycotina*, Hso.#eH.11. 1, Cuba. See Mercado (*Acta Bot. Cubana* 22: 1, 1984).
- odontoid**, tooth-like; dentate.
- Odontoschizon** Syd. & P. Syd. (1914) = *Patinella* fide Clements & Shear (*Gen. Fung.*, 1931).
- Odontotrema** Nyl. (1858), Odontotremataceae. c. 18, widespread (temperate). See Sherwood-Pike (*Mycotaxon* 28: 137, 1987), Diederich *et al.* (*Lichenologist* 34: 479, 2002; lichenicolous spp.), Wedin *et al.* (*Lichenologist* 37: 67, 2005; phylogeny).
- Odontotremataceae** D. Hawksw. & Sherwood (1982), Ostropales. 15 gen. (+ 7 syn.), 78 spp.
Lit.: Sherwood-Pike (*Mycotaxon* 28: 137, 1987; cellulases), Triebel (*Biblthca Lichenol.* 35: 278 pp., 1989), Lumbsch & Hawksworth (*Biblthca Lichenol.* 38: 325, 1990), Döbbeler (*Nova Hedwigia* 62: 61, 1996), Holien & Triebel (*Lichenologist* 28: 307, 1996), Wedin *et al.* (*Lichenologist* 37: 67, 2005).
- Odontotremella** Rehm (1912) = *Odontura*.
- Odontura** Clem. (1909), Odontotremataceae. 1, Europe. See Sherwood *et al.* (*TBMS* 75: 479, 1980), Sherwood-Pike (*Mycotaxon* 28: 137, 1987).
- odour**, see Smell.
- Oedemium** Link (1824), anamorphic *Chaetosphaerella*, Hso.1 = eP.9. 2, widespread. See Hughes & Hennebert (*CJB* 41: 773, 1963), Réblová (*Mycotaxon* 70: 387, 1999; teleomorph).
- Oedemocarpus** Trevis. (1857) = *Mycoblastus* fide Hafellner (*Beih. Nova Hedwigia* 79: 241, 1984).
- Oedipus** Bataille (1908) = *Boletus* Fr. fide Singer (*Farlowia* 2: 223, 1945).
- oedocephaloid**, having a swelling at the end or tip, as conidiophores of *Oedocephalum* and *Cunninghamella*.
- Oedocephalum** Preuss (1851), anamorphic *Pezizales*, Hso.0eH.6. 9, widespread. Used for anamorphs of various genera in the *Pezizaceae* and *Pyronemataceae*. See Stalpers (*Proc. K. Ned. Akad. Wet. C* 77: 383, 1974; key), Watanabe (*Mycol.* 83: 524, 1991; Japan), Norman & Egger (*Mycol.* 91: 820, 1999; phylogeny).
- Oedogoniomyces** Tak. Kobay. & M. Ôkubo (1954), Oedogoniomycetaceae. 1, widespread (north tropical). See Emerson & Whisler (*Arch. Mikrobiol.* 61: 195, 1968), James *et al.* (*Mycol.* 98: 860, 2006; phylogeny).
- Oedogoniomycetaceae** D.J.S. Barr (1990), Monoblepharidales. 1 gen., 1 spp.
Lit.: Emerson & Whisler (*Archs Microbiol.* 61: 195, 1968), Barr in McLaughlin *et al.* (Eds) (*The Mycota A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research* 7A: 93, 2001).
- Oedomyces** Sacc. ex Trab. (1894) = *Physoderma* fide Karling (*Lloydia* 13: 29, 1950) = *Urophlyctis* (*Physodermat.*) fide, Ciferri (*Atti Ist. bot. Univ. Lab. crittog. Pavia sér.* 5 20: 246, 1963).
- Oedothea** Syd. (1930), anamorphic *Pezizomycotina*, Hsp.1eP.19. 1, S. America.
- oenology**, the study of wines; see wine making.
- Oerskovia** Prauser, M.P. Lechev. & H. Lechev. (1970), Actinobacteria. q.v.
- Oesophagomyces** Manier & Ormières (1980), Fungi. 1, France. See Manier & Ormières (*Annls Sci. Nat. Zool.*, sér. 13 2: 154, 1980).
- Oevstedalia** Ertz & Diederich (2004), Verrucariaceae (L). 1, Antarctic. See Ertz & Diederich (*Mycol. Progr.* 3: 232, 2004).
- Ogataea** Y. Yamada, K. Maeda & Mikata (1994), Saccharomycetales. Anamorph *Candida*. 1, widespread. See Mikata & Yamada (*Res. Commun. Inst. Ferm., Osaka* 17: 99, 1995), Kurtzman in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 273, 1998), Morais *et al.* (*FEMS Yeast Res.* 5: 81, 2004; phylogeny), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny), Limtong *et al.* (*Int. J. Syst. Evol. Microbiol.* 58: 302, 2008; phylogeny).
- Ohleria** Fuckel (1868), Melanommataceae. Anamorph *Monodictys*. 4 (on wood), widespread. See Samuels (*N.Z. Jl Bot.* 18: 515, 1980).
- Ohleriella** Earle (1902), ? Delitschiaceae. 1, N. America. See Ahmed & Cain (*CJB* 50: 419, 1972; synonym of *Sporormiella*), Barr (*SA* 6: 142, 1987), Barr (*N. Amer. Fl.* ser. 2 13: 129 pp., 1990), Barr (*Mycotaxon* 76: 105, 2000).
- Oichitonium** Durieu & Mont. [not traced] nom. dub., ? Fungi.
- oid** (suffix), like; having the form of. Most of the many mycological terms ending in this suffix (e.g. achlyoid, as in *Achlya*; daedaleoid, as *Daedalea*) have not been compiled in this *Dictionary*.
- Oideum** Ehrenb. (1818) = *Oidium* Link (1824).
- Oidiaceae** Link (1826) = *Erysiphaceae*.
- Oidiiodendron** Robak (1932), anamorphic *Byssoascus*, *Myxotrichum*, Hsy.0eP.38. 28, widespread (north

- temperate). See Barron (*CJB* 40: 589, 1962; key), Morrall (*CJB* 46: 204, 1968), Currah *et al.* (*CJB* 71: 1481, 1993; conidiogenesis), Hambleton *et al.* (*Mycol.* 90: 854, 1998; phylogeny), Lacourt *et al.* (*New Phytol.* 149: 565, 2001; phylogeny), Rice & Currah (*Mycotaxon* 79: 383, 2001; physiology, morphology), Rice & Currah (*MR* 106: 1463, 2002; ecology), Caldach *et al.* (*Stud. Mycol.* 50: 159, 2004; Spain), Rice & Currah (*Stud. Mycol.* 53: 83, 2005; review).
- oidiomycin**, an antigen prepared from *Candida albicans*, esp. for skin testing.
- oidiophore**, a structure producing oidia.
- Oidiopsis** Scalia (1902), anamorphic *Leveillula*, Hso.0eH.1. 7, widespread. See Braun (*Beih. Nova Hedwigia* 89: 700 pp., 1987; monogr.), Saenz & Taylor (*CJB* 77: 150, 1999; phylogeny), Liberato *et al.* (*Australas. Pl. Path.* 34: 409, 2005; on *Euphorbia*, Australasia).
- oidiospore**, see oidium.
- Oidites** Mesch. (1892), Fossil Fungi. 2 (Oligocene), Baltic.
- oidium** (pl. **oidia**), (1) spermatia formed on hyphal branches, esp. in heterothallic hymenomycetes; (2) flat-ended conidia formed by the breaking up (usually centripetally) of a hypha into cells, as in *Geotrichum candidum*; arthrospore; (3) a mildew.
- Oidium** Link (1809) nom. rej. = *Oidium* Link (1824) fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Oidium** Link (1824) nom. cons., anamorphic *Erysiphe*, Hso.0eH.23. c. 212, widespread. See Carmichael *et al.* (*Genera of Hyphomycetes*, 1980), Braun (*Beih. Nova Hedwigia* 89: 700 pp., 1987; monogr.), Gorter (*Phytophylactica* 20: 113, 1988; S Africa), Ialongo (*Mycotaxon* 47: 193, 1993; statistical characterization), Cook *et al.* (*MR* 101: 975, 1997; SEM, host range), Braun (*Schlechtendalia* 3: 48, 1999; gen. concept), Saenz & Taylor (*CJB* 77: 150, 1999; phylogeny), Braun *et al.* (*The Powdery Mildews A Comprehensive Treatise*: 13, 2001; review), Cunnington *et al.* (*Australas. Pl. Path.* 32: 421, 2003; molecular identification), Cunnington *et al.* (*Australas. Pl. Path.* 33: 281, 2004; on *Fabaceae*, Australia), Bolay (*Cryptogamica Helvetica* 20, 2005), Limkaisang *et al.* (*Mycoscience* 46: 220, 2005; on *Hevea*), Cook *et al.* (*MR* 110: 672, 2006; on *Catalpa*).
- Oidium** Sacc. (1880) nom. rej. prop. = *Oidium* Link (1824) fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- oidization**, dikaryotization by the fusion of an oidium with a haploid hypha.
- Oidospora** Will. (1878), Fossil Fungi ? Fungi. 1 (Carboniferous).
- Ojibwaya** B. Sutton (1973), anamorphic *Pezizomycotina*, Ccu.0eP.23. 1, widespread. See Sutton (*Mycol. Pap.* 132: 82, 1973), Mel'nik & Belomesyatseva (*Mikol. Fitopatol.* 35: 40, 2001; Belarus).
- Okeanomyces** K.L. Pang & E.B.G. Jones (2004), Halosphaeriaceae. 1 (marine), pantropical. See Pang *et al.* (*J. Linn. Soc. Bot.* 146: 228, 2004).
- old man's beard**, see beard moss.
- Oleina** Tiegh. (1887), ? Saccharomycetales. 2, Europe.
- Oleinis** Clem. (1931) ≡ *Oleina* fide Batra in Subramanian (Ed.) (*Taxonomy of fungi* 1: 187, 1978).
- oleocystidium**, see cystidium.
- oleoso-ocular** (of spores), having cells like drops of oil.
- Oletheriostrigula** Huhndorf & R.C. Harris (1996), Strigulaceae. 1, widespread (esp. mediterranean). See Huhndorf & Harris (*Brittonia* 48: 551, 1996), Liew *et al.* (*Mycol.* 94: 803, 2002; phylogeny).
- Oligoporus** Bref. (1888), Polyporaceae. Anamorph *Ptychogaster*. 10, Europe. See Niemelä & Kinnunen (*Karstenia* 45: 76, 2005).
- Oligosporidium** Codreanu-Balcescu, Codreanu & Traciuc (1981), Microsporidia. 1.
- oligosporous**, having few spores. Cf. myriosporous.
- Oligostroma** Syd. & P. Syd. (1914) = *Mycosphaerella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975), Aptroot (*CBS Diversity Ser.* 5, 2006).
- oligotrophic**, poor in nutrients; cf. eutrophic.
- Olivea** Arthur (1917), Chaconiaceae. 8 (on dicots, esp. *Verbenaceae*), widespread (tropical). See Ono & Hennen (*TMSJ* 24: 369, 1983).
- Oliveonia** Donk (1958), ? Auriculariales. Anamorph *Oliveorhiza*. 5, widespread. See Roberts (*Rhizoctonia-forming fungi*, 1999), Grosse-Brauckmann (*Z. Mykol.* 68: 135, 2002; Germany), Kotiranta & Saarenoksa (*Ann. bot. fenn.* 42: 237, 2005; Finland).
- Oliveoniaceae** P. Roberts (1998) ? = Auriculariales.
- Oliveorhiza** P. Roberts (1998), anamorphic *Oliveonia*. 1, Europe. See Roberts (*Rhizoctonia-forming fungi*, 1999).
- Olla** Velen. (1934), Hyaloscyphaceae. c. 12, Europe. See Baral (*SA* 13: 113, 1994; concept), Baral (*Nova Hedwigia* 69: 1, 1999).
- Ollula** Lév. (1863) = *Tubercularia* Tode fide Sutton (*Mycol. Pap.* 141, 1977).
- Olpidiaceae** J. Schröt. (1889), Chytridiomycetes (inc. sed.). 5 gen. (+ 7 syn.), 45 spp.
Lit.: Sampson (*TBMS* 23: 199, 1939), Sparrow (*Aquatic Phycomycetes* Edn 2: 1187 pp., 1960), Sahtiyanci (*Archs Microbiol.* 41: 187, 1962), Karling (*Chytriomyc. Iconogr.*: 414 pp., 1977), Lange & Insunza (*TBMS* 69: 377, 1977), Barr (*CJB* 58: 2380, 1980).
- Olpidiaster** Pascher (1917) ≡ *Asterocystis*.
- Olpidiella** Lagerh. (1888) = *Olpidium* fide Minden (*Krypt.-Fl. Brandenburg augr. Gebiete*, 1911).
- Olpidium** (A. Braun) J. Schröt. (1886), Olpidiaceae. c. 40 (in algae, aquatic fungi, rotifers etc.), widespread. *O. brassicae* (lettuce big vein virus vector); *O. uredinis* on rust spores. See Sampson (*TBMS* 23: 199, 1939), Litvinov (*Trudy Bot. Inst. Akad. nauk URSS ser. 2* 12: 188, 1959), Sparrow (*Aquatic Phycomycetes* Edn 2: 128, 1960; key), Sahtiyanci (*Arch. Mikrobiol.* 41: 187, 1962), Karling (*Chytriomyc. Iconogr.*, 1977), Lange & Insunza (*TBMS* 69: 377, 1977), Jiang & Hiruki (*Journal of Microbiological Methods* 26: 87, 1996; PCR on *Olpidium radicale*), Glockling (*MR* 102: 206, 1998; on rotifer), Koganezawa *et al.* (*Japanese Journal of Phytopathology* 70: 307, 2004; on crucifers), James *et al.* (*Mycol.* 98: 860, 2006; molecular phylogeny suggests relationship with *Basidiobolus*).
- Olpitrichum** G.F. Atk. (1894), anamorphic *Pezizomycotina*, Hso.0eH.10. 3, widespread. See Holubová-Jechová (*Folia geobot. phytotax.* 9: 425, 1974), Chen *et al.* (*J. Phytopath.* 153: 124, 2005; China).
- Omalycus** Raf. (1814) nom. rej. ? = *Calvatia* fide Stalpers (*in litt.*).
- Ombrophila** Fr. (1849), Helotiaceae. c. 11, widespread. See Verkley (*Persoonia* 15: 3, 1992; ultrastr.), Gamundí & Romero (*Fl. criptog. Tierra del Fuego* 10: 130 pp., 1998), Verkley (*Nova Hedwigia* 77: 271, 2003; ultrastr.), Wang *et al.* (*Mycol.* 98:

- 1065, 2006; phylogeny).
- Ombrophila** Quél. (1892) nom. conf., Fungi. See Donk (*Persoonia* 4: 219, 1966).
- Omega** B. Sutton & Minter (1988), anamorphic *Pezizomycotina*, Ccu.0fH.19. 1, Greece. See Sutton & Minter (*TBMS* 91: 715, 1988).
- Ommatomyces** Kohlm., Volkm.-Kohlm. & O.E. Erikss. (1995), Clypeosphaeriaceae. 3 (marine, on *Juncus*), N. America. See Kohlmeyer *et al.* (*Mycol.* 87: 532, 1995), Wang *et al.* (*Fungal Diversity* 4: 125, 2000).
- Ommatospora** Bat. & Cavalc. (1964) = *Microclava* fide Deighton (*TBMS* 52: 315, 1969).
- Ommatosporella** Bat., J.L. Bezerra & Poroca (1967), anamorphic *Pezizomycotina*, Hso.1eP.1. 1, Brazil. See Batista *et al.* (*Atas Inst. Micol. Univ. Pernambuco* 5: 424, 1967).
- Omnidemplus** P.F. Cannon & Alcorn (1994), Magnaporthaceae. Anamorph *Mycoleptodiscus*. 1, Australia. See Cannon & Alcorn (*Mycotaxon* 51: 483, 1994).
- omnivorous** (of parasites), attacking a number of different hosts.
- Omoriza** Paulet (1812) nom. conf., Fungi. Used for a range of *Ascomycota* and *Basidiomycota*. See Donk (*Taxon* 6: 85, 1957).
- Omorrhiza**, see *Omoriza*.
- Omphalaria** A. Massal. (1855) nom. rej. = *Anema* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Omphalaria** R. Girard & Dunal ex Nyl. (1855) = *Thyrea* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Omphalariaceae** Körb. (1855) = Lichinaceae.
- Omphalia** (Fr.) Staude (1857) ≡ *Omphalina*.
- Omphalia** (Pers.) Gray (1821) [non *Omphalea* L. 1759) nom. cons., *Euphorbiaceae*] = *Pseudoclitocybe* fide Donk (*Beih. Nova Hedwigia* 5: 203, 1963), Redhead & Weresub (*Mycol.* 70: 556, 1978).
- Omphaliaster** Lamoure (1971), Tricholomataceae. 7, widespread (north temperate). See Lamoure (*Svensk bot. Tidskr.* 65: 281, 1971).
- Omphalina** Quél. (1886) nom. cons., Tricholomataceae. c. (s.lat.) 50, widespread (esp. temperate). The genus is polyphyletic. See Bigelow (*Mycol.* 62: 1, 1970; key (s.lat.)), Lutzoni & Vilgalys (*CJB* 73: S649, 1995; phylogeny), Lutzoni (*Syst. Biol.* 46: 373, 1997; phylogeny), Moncalvo *et al.* (*Syst. Biol.* 49: 278, 2000; phylogeny), Redhead *et al.* (*Mycotaxon* 83: 19, 2002; phylogeny (s.str.)).
- Omphaliopsis** (Noordel.) P.D. Orton (1991) = *Entoloma* fide Kuyper (*in litt.*).
- Omphalius** Roussel (1806) = *Pseudoclitocybe* fide Kuyper (*in litt.*) A proposal to conserve *Pseudoclitocybe* over *Omphalius* has not been published.
- Omphalocystis** Balbiani (1889), Fungi. 1 (on *Cryptopus*), France.
- Omphalodiella** Henssen (1991), Parmeliaceae (L). 1, Argentina. See Henssen (*Lichenologist* 23: 334, 1991).
- Omphalodina** M. Choisy (1929) = *Rhizoplaca* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- omphalodisc** (1) an orbicular conical shaped disk; (2) (of *Umbilicaria* [*Omphalodiscus*]), an apothecium with a central knob of sterile hyphae.
- Omphalodiscus** Schol. (1934) = *Umbilicaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Omphalodium** Meyen & Flot. (1843), Parmeliaceae (L). c. 4, N. & S. America. See Henssen (*Lichenologist* 24: 27, 1992), Thell *et al.* (*Mycol. Progr.* 1: 335, 2002; phylogeny).
- Omphalodium** Rabenh. (1845) = *Umbilicaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Omphalomyces** Battarra ex Earle (1909) = *Russula* fide Singer (*Agaric. mod. Tax.*, 1951).
- Omphalophallus** Kalchbr. (1883) = *Phallus* fide Stalpers (*in litt.*).
- Omphalopsis** Earle (1909) [non *Omphalopsis* Grev. 1863, *Algae*] = *Xeromphalina*.
- Omphalora** T.H. Nash & Hafellner (1990), Parmeliaceae (L). 1, N. America. See Henssen (*Lichenologist* 24: 27, 1992).
- Omphalosia** Neck. ex Kremp. (1869) = *Umbilicaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Omphalospora** Theiss. & Syd. (1915), Dothideaceae. Anamorph *Podoplaconema*. 4, Europe. See Obris (*Phytopath. Z.* 35: 383, 1959).
- Omphalotaceae** Bresinsky (1985) = Marasmiaceae.
- Omphalotus** Fayod (1889), Marasmiaceae. 5, widespread. *O. olearius* is luminescent when fresh, and poisonous (Maretic, *Toxicon* 13: 379, 1975). See Bigelow *et al.* (*Mycotaxon* 3: 363, 1976; discussion), Kirchmair *et al.* (*Persoonia* 17: 583, 2002; chemotaxonomy, morphology), Kirchmair *et al.* (*Mycol.* 96: 1253, 2004; phylogeny).
- Onakawananus** Radforth (1958), Fossil Fungi (mycel.) Fungi. 1 (Cretaceous), Canada.
- Onchopus** P. Karst. (1879) = *Coprinus* fide Redhead *et al.* (*Mycotaxon* 50: 203, 2001).
- Oncidium** Nees (1823) [non *Oncidium* Sw. 1800, *Orchidaceae*] = *Myxotrichum*.
- Oncobasidium** P.H.B. Talbot & Keane (1971) = *Thanatephorus*. *O. theobromae*, vascular-streak dieback. fide Keane & Prior (*Phytopath. Pap.* 33, 1991), Roberts (*Rhizoctonia-forming fungi*, 1999).
- Oncobyrsa** C. Agardh (1827) nom. dub., ? Fungi.
- Oncocladium** Wallr. (1833), anamorphic *Gymnoascus*, Hso.0eH.38. 1 (from soil), Europe; Canada. See Hughes (*CJB* 46: 941, 1968), Sigler *et al.* (*Mycotaxon* 28: 119, 1987; relationship to *Malbranchea flava*).
- oncom merah (oncom hitah)**, Javanese fermented soya bean products in which the principal fungi are *Neurospora sitophila* and *Rhizopus oligosporus*, respectively (Hedger, *Bull. BMS* 12: 53, 1978); see Fermented food and drinks.
- Oncomyces** Klotzsch (1843) = *Auricularia* fide Saccardo (*Syll. fung.* 6: 762, 1888).
- Oncopodiella** G. Arnaud ex Rifai (1965), anamorphic *Pezizomycotina*, Hso.#eP.10. 7, Europe. See Rifai (*Persoonia* 3: 409, 1965), Révay (*Mycotaxon* 56: 479, 1995; Hungary), Zhao & Zhang (*Nova Hedwigia* 81: 421, 2005; China).
- Oncopodium** Sacc. (1904), anamorphic *Pezizomycotina*, Hsy.#eP.1. 7, Europe; N. America. See Hudson (*TBMS* 44: 406, 1961), Sutton (*Mycol.* 70: 793, 1978), Castañeda Ruiz *et al.* (*Mycotaxon* 61: 319, 1997), Zhao & Zhang (*Mycosystema* 22: 351, 2003; China).
- Oncopus**, see *Onchopus*.
- Oncospora** Kalchbr. (1880), anamorphic *Pezizomycotina*, Ccu.1eP.1. 7, widespread. See Chevassut

- (*BSMF* 106: 107, 1990; genus rev.).
- Oncosporella** P. Karst. (1887), anamorphic *Pezizomycotina*, Ccu.≡ eH.10. 1, Finland.
- Oncosporomyces** Bat. (1965) nom. dub., anamorphic *Pezizomycotina*, St.0fH.? (L). 1, Brazil. See Lücking *et al.* (*Lichenologist* 30: 121, 1998).
- Oncostroma** Bat. & Marasas (1966), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, S. Africa. See Batista & Marasas (*Bothalia* 9: 209, 1966).
- Ondiniella** E.B.G. Jones, R.G. Johnson & S.T. Moss (1984), Halosphaeriaceae. 1 (marine), widespread. See Jones *et al.* (*Bot. Mar.* 27: 136, 1984).
- Onnia** P. Karst. (1889), Hymenochaetaceae. 5, widespread. See Wagner & Fischer (*Mycol.* 94: 998, 2002).
- ontjom**, an Indonesian fermented food prepared from peanut press cake, surface inoculated with *Neurospora sitophila*.
- ontomycosis**, see mycosis.
- Ontostheca** Bat. (1963) = *Eudimeriolum* fide von Arx (*in litt.*).
- Ontoteliium** Syd. (1921) = *Uromyces* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- Onychocola** Sigler (1990), anamorphic *Arachnomycetes*, Hso.0-1eH.38. 1 (from humans), widespread. See Sigler (*J. Med. Vet. Mycol.* 28: 409, 1990), Sigler *et al.* (*J. Med. Vet. Mycol.* 32: 275, 1994; teleomorph), Midgley & Moore (*Revta Iberoamer. Micol.* 15: 113, 1998; review), Gibas *et al.* (*Stud. Mycol.* 47: 131, 2002; phylogeny), Gibas *et al.* (*Stud. Mycol.* 50: 525, 2004; mating type).
- onychomycosis**, see mycosis.
- Onychophora** W. Gams, P.J. Fisher & J. Webster (1984), anamorphic *Pezizomycotina*, Hso.0eH.15. 1 (coprophilous), British Isles. See Gams *et al.* (*TBMS* 82: 174, 1984), Hoog *et al.* (*Stud. Mycol.* 43: 107, 1999; phylogeny).
- Onygena** Pers. (1800), Onygenaceae. 5 (on feathers, bones, etc.), Europe; N. America. See Rammeloo (*Dumort.* 6: 1, 1977), Currah (*Mycotaxon* 24: 1, 1985), Sugiyama *et al.* (*Stud. Mycol.* 47: 5, 2002; phylogeny).
- Onygenaceae** Berk. (1857), Onygenales. 23 gen. (+ 16 syn.), 134 spp.
Lit.: Currah (*Mycotaxon* 24: 1, 1985), Currah (*SA* 7: 1, 1988), Cano & Guarro (*MR* 94: 355, 1990), Cano *et al.* (*MR* 100: 343, 1996), Guého *et al.* (*Mycoses* 40: 69, 1997), Hoog *et al.* (*Medical Mycology* 36 Suppl. 1: 52, 1998), Peterson & Sigler (*J. Clin. Microbiol.* 36: 2918, 1998), Sigler *et al.* (*CJB* 76: 1624, 1998), Sugiyama *et al.* (*Mycoscience* 40: 251, 1999), Bialek *et al.* (*J. Clin. Microbiol.* 38: 3190, 2000), Sugiyama *et al.* (*Stud. Mycol.* 47: 5, 2002), Untereiner *et al.* (*Stud. Mycol.* 47: 25, 2002), Untereiner *et al.* (*Mycol.* 96: 812, 2004), Stchigel & Guarro (*MR* 111: 1100, 2007).
- Onygenales** Cif. ex Benny & Kimbr. (1980). Eurotiomycetidae. 4 fam., 52 gen., 271 spp. Stromata absent. Ascomata formed from coiled initials, cleistothecial, sometimes aggregated, rarely stipitate, pale; peridium composed of loosely woven usually thick-walled hyphae, sometimes with complex appendages. Intercal tissue absent. Asci ? formed from croziers, ± globose, small, evanescent, 8-spored. Ascospores small, often brightly coloured, usually oblate, often ornamented, esp. with equatorial ridges. Anamorphs prominent, hyphomycetous, arthric. Keratinophilic or cellulolytic, some parasitic on humans and other animals (see ringworm, dermatophytes), also in soil, cosmop.
- The *Myxotrichaceae* is now excluded from the *Onygenales*. Fams:
- (1) **Ajellomycetaceae**
 - (2) **Arthrodermataceae**
 - (3) **Gymnoascaceae**
 - (4) **Onygenaceae**
- Lit.*: Currah (*Mycotaxon* 24: 1, 1985; *SA* 7: 1, 1988; key gen.; *in* Hawksworth, 1994: 281), Geiser *et al.* (*Mycol* 98: 1051, 2006), Geiser & LoBuglio (*in* McLaughlin *et al.* (Eds), *The Mycota* 7A: 201, 2001), Landvik *et al.* (*Mycoscience* 37: 237, 1997; phylogeny), Malloch & Cain (*CJB* 50: 61, 1972), Orr (*Mycotaxon* 5: 283, 1977; gen. septal swellings, *et al.*, 5: 466, 1977; gen. discoid-oblate spores), Sigler & Carmichael (*Mycotaxon* 4: 349, 1976; anamorphs), Sugiyama *et al.* (*Mycoscience* 40: 251, 1999; phylogeny), Takizawa *et al.* (*Mycoscience* 35: 327, 1994; ubiquinones).
- Onygenopsis** Henn. [not traced], Sordariomycetes. 1, widespread (tropical). See Petch (*Ann. R. bot. Gdns Peradeniya* 5: 265, 1912), Eriksson & Hawksworth (*SA* 5: 147, 1986; posn).
- Oochytrium** Renault (1895), Fossil Fungi, Chytridiomycetes. 1 (Carboniferous), France.
- oocyst**, the product of aposporous spore development in *Oomycetes* (Dick, *New Phytol.* 71: 1151, 1972).
- oogamy**, heterogamy in which the gametes are a non-motile egg and a small, motile sperm.
- Oogaster** Corda (1854) = *Tuber* fide Fischer (*Nat. Pflanzenfam.* 5b: viii, 1938), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- oogenesis**, the development of the oogonium after being fertilized.
- oogoniols**, *Achlya* hormones which induce oogonial formation. Cf. antheridiol.
- oogonium (oogone)**, uninucleate or coenocytic cell producing female gametes (oospheres).
- Oolithinia** M. Choisy & Werner (1932) = *Protoblastenia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Oomyces** Berk. & Broome (1851), Acrospermaceae. 1, Europe. See Petch (*J. Bot., Lond.* 75: 217, 1937), Eriksson (*Op. Bot.* 60, 1981; posn).
- ooplasm** (of *Peronosporales*), the protoplasm, at the centre of the oogonium, which becomes the oosphere; cf. periplasm and gonoplasm.
- ooplast** (of *Saprolegniaceae*), a large membrane bound inclusion of oospores formed by the fusion of dense body vesicles. See Howard & Moore (*Bot. Gaz.* 131: 311, 1970).
- oosphere** (of *Oomycetes*), the female gamete; the 'egg' of the oogonium; **compound** -, one having many functional nuclei.
- Oospora** Wallr. (1833) ≡ *Oidium* Link (1824) fide Donk (*Taxon* 12: 270, 1963), Sigler & Carmichael (*Mycotaxon* 4: 349, 1976).
- oospore** (of *Oomycetes*), the resting spore from a fertilized oosphere; a like structure produced by parthenogenesis.
- Oosporidium** Stautz (1931), anamorphic *Saccharomycetes*, Hso.0eH.10. 1, Europe; N. America. See Smith *in* Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 598, 1998).
- Oosporoidea** Sumst. (1913) = *Geotrichum* fide Carmichael (*Mycol.* 49: 820, 1957).
- Oostroma** Bonord. (1864) = *Pseudovalsa* fide Læssøe

- (SA 13: 43, 1994).
- Oothecium** Speg. (1919) = *Asterostomella* fide Farr (*Biblthca Mycol.* 35, 1973).
- Oothyrium** Syd. (1939), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, Africa.
- Oovorus** Entz (1930) nom. dub., Fungi. 'phycomycetes'.
- Opadorhiza** T.F. Andersen & R.T. Moore (1996), anamorphic *Sebacina*. 1, N. America. See Moore in Sneh *et al.* (Eds) (*Rhizoctonia Species Taxonomy, Molecular Biology, Ecology, Pathology and Disease Control*: 25, 1996).
- Opasterinella** Speg. (1917) = *Asterinella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Opeasterina** Speg. (1919) = *Asterina* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Opegrapha** Ach. (1809) nom. cons., Roccellaceae ($\pm$ L). c. 361 (some on lichens), widespread. See Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952; foliicolous spp.), Sérusiaux (*Lichenologist* 17: 1, 1985; spp. with goniocysts), Torrente-Paños (*Cryptog. Mycol.* 8: 159, 1987; asci), Torrente & Egea (*Biblthca Lichenol.* 32, 1989), Tehler (*CJB* 68: 2458, 1990; cladistics), Hawksworth (*J. Linn. Soc. Bot.* 109: 543, 1992; gen. nomencl.), Hafellner (*Herzogia* 10: 1, 1994; key 19 spp. on lichens), Letrouit-Galinou *et al.* (*Bull. Soc. linn. Provence* 45: 389, 1994; ultrastr.), Bartók & Crisan (*Studia Universitatis Babeş-Bolyai Ser. Biol.* 49: 33, 2004; Romania), Ertz *et al.* (*J. Linn. Soc. Bot.* 144: 235, 2004; spp. on *Pertusaria* and *Ochrolechia*), Ertz & Diederich (*Lichenologist* 39: 143, 2007; muriform-spored spp.).
- Opegrapha** Humb. (1793) nom. rej. = *Graphis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Opegraphaceae** Stizenb. (1862) = Roccellaceae.
- Opegraphales** M. Choisy ex D. Hawksw. & O.E. Erikss. (1986) = Arthoniales.
- Opegraphella** Müll. Arg. (1890) = *Opegrapha* Ach. fide Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952).
- Opegraphellomyces** Cif. & Tomas. (1953) = *Lep-topeltis*.
- Opegraphites** Debey & Ettingsh. (1859), Fossil Fungi, Ascomycota (L). 1 (Cretaceous), Belgium.
- Opegraphoidea** Fink (1933) = *Opegrapha* Ach. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Opegraphomyces** E.A. Thomas ex Cif. & Tomas. (1953) = *Opegrapha* Ach. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Opercularia** Stirt. (1878) [non *Opercularia* Gaertn. 1788, *Rubiaceae*] = *Phyllobathelium* fide Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952).
- operculate** (of an ascus or sporangium), opening by an apical lid to discharge the spores, as in the ascus of the *Pezizales*; see ascus; cf. inoperculate.
- Operculella** Khesw. (1941) = *Phacidiopycnis* fide Sutton (*Mycol. Pap.* 141, 1977).
- operculum**, a cover or lid.
- Opethyrium** Speg. (1919) nom. dub., Fungi. No spp. listed.
- ophiobolin** (cochliobolin), an antibiotic from *Cochliobolus miyabeanus* and *C. heterostrophus*; antibacterial, antifungal, anti-*Trichomonas vaginalis* (Ishibashi, *J. agric. Chem. Soc. Japan* 35: 257, 1961); phytotoxic to rice (Orsenigo, *Phytopath. Z.* 29: 189, 1957). See Tsuda *et al.* (*Tetrahedron Lett.* 35: 3369, 1967; nomencl.).
- Ophiobolus** Riess (1854), Leptosphaeriaceae. Anamorphs *Coniothyrium*, *Phoma*, *Rhabdospora*. c. 101, widespread. *O. herpotrichus* (on cereals), *O. heterostrophus*. See Berthet & Korf (*Nat. can.* 96: 247, 1969), Shoemaker (*CJB* 54: 2365, 1976; key 31 Can. spp.), Walker (*Mycotaxon* 11: 1, 1980; type, disposition 60 names), Scheuer (*Mycotaxon* 47: 67, 1993; nomencl.), Kruys *et al.* (*MR* 110: 527, 2006; phylogeny).
- Ophiocapnocomma** Bat. & Cif. (1963) = *Metacapnodium* fide Reynolds (*Mycotaxon* 23: 153, 1985; = synonymy with *Limacinia*), Eriksson & Hawksworth (*SA* 6: 124, 1987).
- Ophiocapnodium** Speg. (1918) ? = *Euantennaria* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Ophiocarpella** Theiss. & Syd. (1915) = *Sphaerulina* fide Barr (*Contr. Univ. Mich. Herb.* 9, 1972).
- Ophioceras** Sacc. (1883), Magnaporthaceae. 15 (wood etc., many spp. aquatic), widespread. See Conway & Barr (*Mycotaxon* 5: 376, 1977), Chen *et al.* (*Mycol.* 91: 84, 1999; phylogeny), Shearer *et al.* (*Mycol.* 91: 145, 1999), Tsui *et al.* (*Mycoscience* 42: 321, 2001; tropical spp.).
- Ophiochaeta** (Sacc.) Sacc. (1895) = *Acanthophiobolus*.
- Ophiociliomyces** Bat. & I.H. Lima (1955), Pseudoperisporiaceae. 4 (from living leaves), widespread (tropical). See Barreto & Evans (*MR* 98: 1107, 1994).
- Ophiocladium** Cavara (1893) = *Ramularia* Unger fide Sutton & Waller (*TBMS* 90: 55, 1988).
- Ophiocordyceps** Petch (1931), Ophiocordycipitaceae. Anamorphs *Syngliocladium*, *Hymenostilbe*, *Paraisaria*. c. 140 (on insects), widespread. See Seifert & Boulay (*Mycol.* 96: 929, 2004), Chaverri *et al.* (*Mycol.* 97: 433, 2005), Sung *et al.* (*Stud. Mycol.* 57, 2007; phylogeny).
- Ophiocordycipitaceae** G.H. Sung, J.M. Sung, Hywel-Jones & Spatafora (2007), Hypocreales. 10 gen. (+ 7 syn.), 260 spp. See Sung *et al.* (*Stud. Mycol.* 57: 1, 2007; phylogeny, monogr.), Sung *et al.* (*Mol. Phylogenet. Evol.* 44: 1204, 2007; phylogeny).
- Ophiodeira** Kohlm. & Volkm.-Kohlm. (1988), Halosphaeriaceae. 1 (marine), Caribbean. See Kohlmeyer & Volkmann-Kohlmeyer (*CJB* 66: 2062, 1988), Spatafora *et al.* (*Am. J. Bot.* 85: 1569, 1998; phylogeny), Campbell *et al.* (*Mycol.* 95: 530, 2003).
- Ophiodendron** Arnaud (1952) nom. dub., anamorphic *Pezizomycotina*. See Hennebert (*TBMS* 51: 13, 1968).
- Ophiodictyon** Sacc. & P. Syd. (1902) = *Trichothelium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Ophiodothella** (Henn.) Höhn. (1910), Phyllachoraceae. Anamorph *Acervicylpeatus*. 29, widespread (tropical). See Boyd (*Mycol.* 26: 456, 1934), Hanlin (*Mycotaxon* 39: 1, 1990), Hanlin *et al.* (*Mycotaxon* 44: 103, 1992; key 26 spp.), Pearce & Hyde (*MR* 97: 1272, 1993; spp. from Australia), Hyde & Cannon (*Mycol. Pap.* 175: 114 pp., 1999; on palms), Hanlin *et al.* (*Mycoscience* 43: 321, 2002; Venezuela), Hanlin (*Mycol.* 95: 506, 2003; conidiomatal development).
- Ophiodothis** Sacc. (1883) ? = *Balansia* fide Diehl (*USDA agric. Monogr.* 4, 1950), Ryley (*Mycotaxon* 95: 97, 2006).
- Ophiogene** Petr. (1931) = *Nematothecium* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Ophiogloea** Clem. (1903) = *Vibrissea* fide Sánchez &

- Korf (*Mycol.* 58: 733, 1966).
- Ophiognomonina** (Sacc.) Sacc. (1899), Diaporthales. 3, Europe; N. America. See Barr (*Mycol. Mem.* 7, 1978), Monod (*Beih. Sydowia* 9: 1, 1983), Wilson *et al.* (*Mycol.* 89: 537, 1997).
- Ophioirenina** Sawada & W. Yamam. (1959), Meliolaceae. 1 (from leaves), India; Taiwan. See Patil & Mahamulkar (*Indian Phytopath.* 52: 245, 1999).
- Ophiomassaria** Jacz. (1894), Pezizomycotina. 1 (on *Alnus*), Europe. See von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Ophiomeliola** Starbäck (1899), ? Parodiopsidaceae. 1 or 2, widespread (tropical). Material of the type species is effete fide Cannon (*in litt.*, 2001); possibly a synonym of *Ophioparodia* but probably based on discordant elements.
- Ophionectria** Sacc. (1878), Nectriaceae. Anamorph *Antipodium*. 2, widespread (tropical). See Rossman (*Mycol.* 69: 355, 1977; key redisposed spp.), Subramanian & Bhat (*Kavaka* 6: 55, 1979; anamorph, ontogeny), Rossman (*Mycol. Pap.* 150, 1983), Rossman *et al.* (*Stud. Mycol.* 42: 159, 1999), Castlebury *et al.* (*MR* 108: 864, 2004; phylogeny).
- Ophioparma** Norman (1852), Ophioparmaceae (L). 10, widespread (northern hemisphere). See Rogers & Hafellner (*Lichenologist* 20: 167, 1988), Kalb & Staiger (*Bibliotheca Lichenol.* 58: 191, 1995; America), Skult (*Ann. bot. fenn.* 34: 291, 1997), May in Glenn *et al.* (Eds) (*Lichenogr. Thomsoniana*: 77, 1998; N. Am.), Martínez & Aragón (*Bryologist* 106: 528, 2003; Spain), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Lumbsch *et al.* (*Nova Hedwigia* 86: 105, 2008; phylogeny, chemistry).
- Ophioparmaceae** R.W. Rogers & Hafellner (1988), Umbiliciales (L). 3 gen. (+ 1 syn.), 25 spp.
Lit.: Rogers & Hafellner (*Lichenologist* 20: 167, 1988), Kalb & Staiger (*Bibliotheca Lichenol.* 58: 191, 1995), Printzen & Rambold (*Herzogia* 12: 23, 1996), Skult (*Ann. bot. fenn.* 34: 291, 1997), Wedin *et al.* (*MR* 109: 159, 2005), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Lumbsch *et al.* (*Nova Hedwigia* 86: 105, 2008; phylogeny, chemistry).
- Ophioparodia** Petr. & Cif. (1932), Parodiopsidaceae. Anamorph *Septoideum*. 1, West Indies.
- Ophiopeltis** J.V. Almeida & Sousa da Câmara (1903) ? = *Micropeltis* fide Clements & Shear (*Gen. Fung.*, 1931).
- Ophiopodium** Arnaud (1954) nom. inval. = *Grallomyces* fide Deighton & Pirozynski (*Mycol. Pap.* 105, 1966).
- Ophiorosellinia** J.D. Rogers, A. Hidalgo, F.A. Fern. & Huhndorf (2004), Xylariaceae. 1, Costa Rica. See Rogers *et al.* (*Mycol.* 96: 172, 2004).
- Ophiosira** Petr. (1955), anamorphic *Pezizomycotina*, St.OffH.?. 1, Austria. See Petrak (*Sydowia* 9: 510, 1955).
- Ophiosphaerella** Speg. (1909), Phaeosphaeriaceae. Anamorph *Scolecosporella*. c. 9, widespread. See Walker (*Mycotaxon* 11: 1, 1980), Dong *et al.* (*MR* 102: 151, 1998), Wetzel *et al.* (*Pl. Dis.* 83: 1160, 1999; distrib.), Wetzel *et al.* (*MR* 103: 981, 1999; N. Am.), Câmara *et al.* (*Mycol.* 92: 317, 2000; phylogeny), Hsiang *et al.* (*CJB* 81: 307, 2003; mating types), Iriarte *et al.* (*Pl. Dis.* 88: 1341, 2004; genetic diversity), Kaminski *et al.* (*Pl. Dis.* 89: 980, 2005; molecular detection), Kaminski *et al.* (*Pl. Dis.* 90: 146, 2006; genetic diversity), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Ophiosphaeria** Kirschst. (1906) = *Acanthophiobolus* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Ophiosporella** Petr. (1947) = *Phloeosporina* fide Sutton (*Mycol. Pap.* 141, 1977).
- Ophiostoma** Syd. & P. Syd. (1919), Ophiostomataceae. Anamorphs *Graphilbum*, *Leptographium*, *Pesotum*, *Sporothrix*, *Hyalorhinocladiella*, *Phialocephala*. 188 (in wood and bark, usually associated with beetles), widespread. *O. novo-ulmi* (Dutch elm disease; Brasier *Mycopath.* 115: 151, 1991). See van Wyk & Wingfield (*Mycol.* 83: 698, 1991; ascospores), Berbee & Taylor (*Exp. Mycol.* 16: 87, 1992; 18S rRNA), Hausner *et al.* (*Mycol.* 84: 870, 1992; posn), Wolfaardt *et al.* (*S. Afr. J. Bot.* 58: 277, 1992; synoptic key, database), Grylls & Seifert in Wingfield *et al.* (Eds) (*Ceratocystis* and *Ophiostoma* Taxonomy, Ecology and Pathogenicity: 261, 1993; key), Hausner *et al.* (*CJB* 71: 52, 1993; gen. concept), Seifert *et al.* in Wingfield *et al.* (Eds) (*Ceratocystis* and *Ophiostoma* Taxonomy, Ecology and Pathogenicity: 269, 1993), Wingfield *et al.* (*Ceratocystis* and *Ophiostoma* Taxonomy, Ecology and Pathogenicity, 1993; many papers), Spatafora & Blackwell (*MR* 91: 1, 1994; posn), Benade *et al.* (*CJB* 74: 891, 1996), Benade *et al.* (*Mycotaxon* 68: 251, 1998; anam.), Jacobs *et al.* (*MR* 102: 289, 1998), Hintz (*Gene* 237: 215, 1999; chitin synthase gene), Wingfield *et al.* (*MR* 103: 1616, 1999; phylogeny), Hausner *et al.* (*CJB* 78: 903, 2000; phylogeny), Okada *et al.* (*Stud. Mycol.* 45: 169, 2000; anams), Brasier & Kirk (*MR* 105: 547, 2001; subspecies of *O. novo-ulmi*), Harrington *et al.* (*Mycol.* 93: 111, 2001; phylogeny, *O. piceae* complex), Kim & Breuil (*MR* 105: 331, 2001; sibling species), Marais & Wingfield (*MR* 105: 240, 2001; spp. on *Protea*), Beer *et al.* (*MR* 107: 469, 2003; *O. piceae* complex), Beer *et al.* (*Mycol.* 95: 434, 2003; phylogeny of *O. stenoceras* complex), Lim *et al.* (*FEMS Microbiol. Lett.* 237: 89, 2004; *O. clavigerum* agg.), Zhou *et al.* (*Mycol.* 96: 1306, 2004; typification, phylogeny), Roets *et al.* (*Stud. Mycol.* 55: 199, 2006; on *Proteaceae*), Spatafora *et al.* (*Mycol.* 98: 1018, 2006; phylogeny), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny), Zipfel *et al.* (*Stud. Mycol.* 55: 75, 2006; generic limit).
- Ophiostomataceae** Nannf. (1932), Ophiostomatales. 12 gen. (+ 4 syn.), 341 spp.
Lit.: Harrington (*Leptographium Root Diseases on Conifers*: 1, 1988), Malloch & Blackwell (*CJB* 68: 1712, 1990), Brasier (*Mycopathologia* 115: 151, 1991), Bates *et al.* (*MR* 97: 449, 1993), Grylls & Seifert in Wingfield *et al.* (Eds) (*Ceratocystis* and *Ophiostoma* Taxonomy, Ecology and Pathogenicity: 261, 1993), Hausner *et al.* (*CJB* 71: 1249, 1993), Hausner *et al.* (*CJB* 71: 52, 1993), Samuels (*Ceratocystis* and *Ophiostoma* Taxonomy, Ecology and Pathogenicity: 15, 1993), Seifert & Okada (*Ceratocystis* and *Ophiostoma* Taxonomy, Ecology and Pathogenicity: 27, 1993), Wingfield *et al.* (*Ceratocystis* and *Ophiostoma* Taxonomy, Ecology and Pathogenicity, 1993), Wyk *et al.* (*Ceratocystis* and *Ophiostoma* Taxonomy, Ecology and Pathogenicity: 133, 1993), Benade *et al.* (*MR* 101: 1108, 1997), Blackwell & Jones (*Biodiv. Cons.* 6: 689, 1997), Okada *et al.* (*Stud. Mycol.* 45: 169, 2000), Gorton *et al.* (*MR* 108: 759, 2004), Zipfel *et al.* (*Stud. Mycol.* 55: 75, 2006).
- Ophiostomatales** Benny & Kimbr. (1980). Sordariomycetidae. 1 fam., 12 gen., 341 spp. Stromata absent.

Ascomata perithecial, rarely cleistothecial, hyaline or black, thin-walled, membranous, usually long-necked, with ostiolar setae. Interascal tissue absent. Asci small, evanescent, formed in chains. Ascospores usually small, hyaline, mostly aseptate, often with eccentric wall thickening or sheaths. Anamorphs hyphomycetous, very varied. Necrotrophs of a wide range of plants, many economically important; some arthropod-associated, a few coprophilous; cosmop. Fam.:

Ophiostomataceae

Ceratocystis (*Ceratocystidaceae*) has almost indistinguishable teleomorphs, but quite different asexual forms, and is now considered to be allied to the *Microascales*.

Lit: Wingfield *et al.* (*Ceratocystis and Ophiostoma*, 1993; in Hawksworth, *Ascomycete Systematics*: 333, 1994).

Ophiostomella Petr. (1925) ? = *Scopinella* fide Cannon (*in litt.*).

Ophiotexis Theiss. (1916) = *Schweinitziella* fide von Arx (*Acta Bot. Neerl.* 7: 503, 1958).

Ophiotrichia Berl. (1893) = *Acanthophiobolus* fide Walker (*Mycotaxon* 11: 1, 1980).

Ophiotrichum Kunze (1849) nom. dub., anamorphic *Pezizomycotina*, Hso.≡ eP.?. 2, Europe; West Indies. See Nannfeldt (*in litt.*).

Ophiovalsa Petr. (1966) = *Cryptosporella* fide Glawe & Jensen (*Mycotaxon* 25: 645, 1986), Reid & Booth (*CJB* 65: 1320, 1987), Castlebury *et al.* (*Mycol.* 94: 1017, 2002; phylogeny), Mejía *et al.* (*MR* 112: 23, 2008; phylogeny).

Ophisthomastigomycota, see *Chytridiomycota*.

Ophryomyces L. Léger & E. Hesse (1909) nom. dub., ? Fungi.

Ophthalmidium Eschw. (1824) = *Porina* Müll. Arg. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Opisteria (Ach.) Vain. (1909) ≡ *Nephroma*.

opisthokont, having one or more flagella at the posterior end.

Opisthokonta, Rankless term introduced by Cavalier-Smith & Chao (*Proc. R. Soc. Lond. B* 261: 1, 1995) to include Animalia, Choanozoa and Fungi. The group is characterized by the presence of a single posterior cilium (or flagellum) together with non-discoid mitochondrial cristae. Based on current molecular phylogenies it would seem that the DRIPs clade and the Microsporidia should belong here also. This name was also used by Copeland (1956), at the rank of Phylum, for the Chytridiomycetes.

Oplophora Syd. (1921) = *Nyssopsora* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).

Oplotheciaceae Bat. & Cif. (1963) = *Trichosphaeriaceae*.

Oplotheciopsis Bat. & Cif. (1963) = *Neorehmia* fide Samuels & Barr (*CJB* 75: 2165, 1998).

Oplothecium P. Syd. (1923) = *Neorehmia* fide Samuels & Barr (*CJB* 75: 2165, 1998).

opportunistic (of fungi), normally saprobic and frequently common but on occasion able to cause disease in or grow on a host (esp. of humans or other animals), rendered susceptible by some predisposing factor(s).

opsis-form, see *Pucciniales*.

Opuntiella L. Léger & M. Gauthier (1932) nom. dub., Harpellales.

Oramasia Urries (1956) = *Vermiculariopsiella* fide

Nawawi *et al.* (*Mycotaxon* 37: 173, 1990).

Oraniella Speg. (1909), Pleosporales. 1, S. America. See Bose (*Phytopath. Z.* 41, 1961), Aptroot (*Nova Hedwigia* 66: 89, 1998).

Orbicula Cooke (1871), Pyronemataceae. 1, widespread (north temperate). See Hughes (*Mycol. Pap.* 42, 1951), Campbell *et al.* (*Mycologist* 5: 113, 1991), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Hansen *et al.* (*Mycol.* 97: 1023, 2005; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).

Orbilia Fr. (1849), Orbiliaceae (±L). Anamorphs *Arthrobotrys*, *Dactylella*, *Dicranidion*, *Dwayaangam*, *Helicoön*, *Monacrosporium*, *Trinacrium*. c. 58 (on wood etc., sometimes nematode-trapping), widespread. See Benny *et al.* (*CJB* 56: 2006, 1978; biol.), Spooner (*Biblthca Mycol.* 116, 1987; 7 spp. Australasia), Baral (*SA* 13: 113, 1994; concept), Pfister (*Mycol.* 86: 451, 1994; anamorph), Liou & Tzean (*Mycol.* 89: 876, 1997; DNA), Pfister (*Mycol.* 89: 1, 1997; review), Kohlmeyer *et al.* (*Mycol.* 90: 303, 1998), Webster *et al.* (*MR* 102: 99, 1998; anamorph), Hagedorn & Scholler (*Sydowia* 51: 27, 1999; DNA), Spatafora *et al.* (*Mycol.* 98: 1018, 2006; phylogeny), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006; phylogeny).

Orbiliaceae Nannf. (1932), Orbiliales (±L). 12 gen. (+ 12 syn.), 288 spp.

Lit.: Spooner (*Biblthca Mycol.* 116, 1987; key gen.), Spooner (*Biblthca Mycol.* 116: 711 pp., 1987), Pfister (*Mycol.* 86: 451, 1994; anamorphs), Liou & Tzean (*Mycol.* 89: 876, 1997), Pfister (*Mycol.* 89: 1, 1997; review), Sugiyama (*Mycoscience* 39: 487, 1998), Webster *et al.* (*MR* 102: 99, 1998), Hagedorn & Scholler (*Sydowia* 51: 27, 1999), Harrington *et al.* (*Mycol.* 91: 41, 1999), Tehler *et al.* (*Mycol.* 92: 459, 2000), Eriksson *et al.* (*Myconet* 9: 1, 2003), Yang *et al.* (*Proc. natn Acad. Sci. U.S.A.* 104: 8379, 2007; evolution).

Orbiliiales Baral, O.E. Erikss., G. Marson & E. Weber (2003). Orbiliomycetes. 1 fam., 12 gen., 288 spp. Fam.:

Orbiliaceae

For *Lit.* see under fam.

Orbiliaster Dennis (1954) = *Orbilia* fide Baral (*SA* 13, 1994).

Orbiliella Kirschst. (1938) = *Orbilia* fide Korf in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 249, 1973).

Orbiliomycetes O.E. Erikss. & Baral (2003), *Pezizomycotina*. 1 ord., 1 fam., 12 gen., 288 spp. Ord.:

Orbiliiales

For *Lit.* see ord. and fam.

Orbiliomycetidae, see *Orbiliomycetes*.

Orbiliopsis (Sacc.) Syd. & P. Syd. (1924), ? Helotiales. 1, New Zealand.

Orbiliopsis Höhn. (1926) ? = *Parorbiliopsis* fide Spooner & Dennis (*Sydowia* 38: 294, 1986).

orbilla (pl. **orbillae**), an apothecium (obsol.), (Sprengel, *Intr. study cryptog.*, 1807).

Orbiliopsis Velen. (1934), ? Helotiales. 1, former Czechoslovakia.

Orbimyces Linder (1944), anamorphic *Pezizomycotina*, Hso.0bP.10. 1 (marine), USA. See Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 34: 1, 1991).

Orcadia G.K. Sutherl. (1915), *Pezizomycotina*. 1 (on marine *Algae*), British Isles; Norway. Possibly allied to the *Pezizales*, but the ecology is quite different. See Kohlmeyer & Kohlmeyer (*Marine Mycology*: 454, 1979), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp.,

1999).

Orcella Kuntze ex Earle (1909) $\equiv$ Clitopilus.

Orceolina Hertel (1970), Trapeliaceae (L). 1, subantarctic islands. See Hertel (*Vortrag. Gesamtgeb. Bot. ser. 2* 4: 182, 1970), Lumbsch (*J. Hattori bot. Lab.* 83: 1, 1997), Poulsen *et al.* (*Lichenologist* 33: 323, 2001; phylogeny, morphology), Schmitt *et al.* (*Mycol.* 95: 827, 2003; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Lumbsch *et*

al. (MR 111: 1133, 2007).

Orcheomyces Burgeff (1909) nom. dub., Basidiomycota. Used for sterile mycelium associated with orchids; most of these belong in *Ceratobasidium* or *Thanatephorus*.

Orchesellaria Manier ex Manier & Lichtw. (1968), Asellariaceae. 4 (in *Collembola*), widespread. See Moss (*TBMS* 65: 115, 1975; ultrastr.), Manier (*Revue*

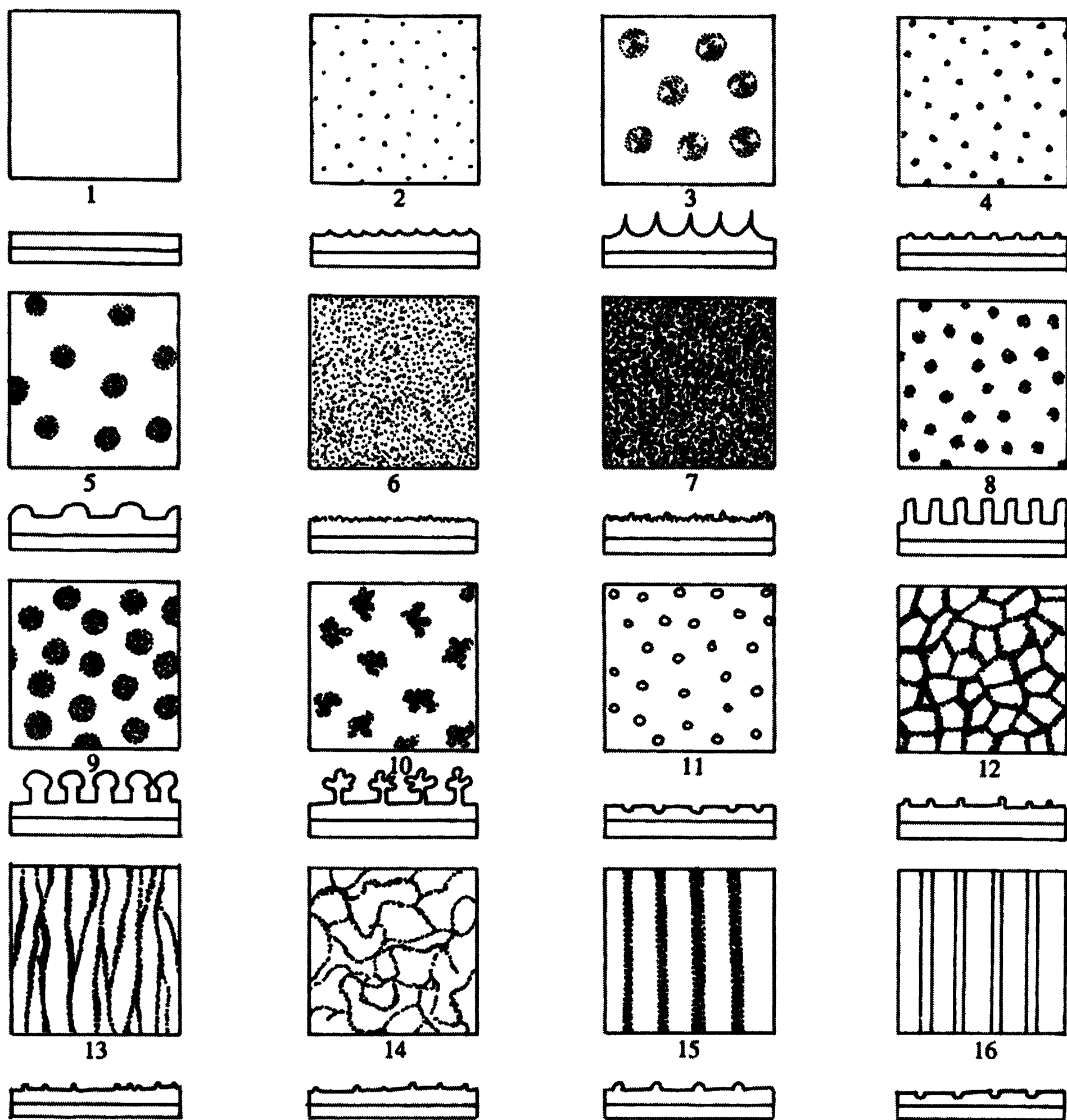


Fig. 20. Terminology for ornamentation (upper in surface view, lower in side view). 1, smooth (laevigate); 2, spinose (echinate); 3, aculeate; 4, granulate; 5, punctate (tuberculate); 6, verruculose; 7, verrucose; 8, baculate; 9, capitate; 10, irregularly projecting (see Sato & Sato, *Trans. Mycol. Soc. Jap.* 23: 51, 1982, for additional terms, esp. for aeciospores); 11, foveate; 12, reticulate; 13, striate; 14, rugose; 15, cicatricose; 16, canaliculate.

Mycol. Paris 43: 341, 1979), Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986; key), Valle (*Fungal Diversity* 21: 167, 2006; Spain), White *et al.* (*Mycol.* 98: 872, 2006; phylog-

eny).

orchil (orchill), see Dyeing.

orchinol (and **hircinol**), dihydrophenanthrenes produced by orchids as a response to infection by my-

- corrhizal fungi (Gäumann, *Phytopath. Z.* 49: 212, 1964).
- orculiform**, see polarilocular.
- Ordonia** Racib. (1909), Septobasidiaceae. 2, N. America; Indonesia. See Oberwinkler (*Op. Bot.* 100: 185, 1989).
- Ordospora** J.I.R. Larsson, D. Ebert & J. Vavra (1997), Microsporidia. 1. See Larsson *et al.* (*Eur. J. Protist.* 33: 432, 1997).
- Ordovicimycetes** M.K. Elias (1966), Fossil Fungi ? Fungi. 2 (Ordovician, ? Recent), USA.
- Ordus** K. Ando & Tubaki (1983), anamorphic *Pezizomycotina*, Hso.1bH.1. 1, Japan. See Ando & Tubaki (*TMSJ* 24: 274, 1983), Ando *et al.* (*Mycoscience* 38: 95, 1997), Watanabe *et al.* (*Mycoscience* 40: 383, 1999).
- orellanine**, see Mycetism (1).
- Oreophylla** Cif. (1954) = *Passalora* fide Ciferri (*Sydowia* 8: 253, 1954), Braun *et al.* (*N.Z. J. Bot.* 37: 297, 1999), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003).
- Organizations**, see Societies and organizations.
- Ormathodium** Syd. (1928) nom. dub., anamorphic *Pezizomycotina*. See Deighton (*Mycol. Pap.* 137: 4, 1974).
- Ormieresia** Vivarès, Bouix & Manier (1977), Microsporidia. 1.
- Ormomyces** I.I. Tav. (1985), Laboulbeniaceae. 1, Africa; Indonesia. See Tavares (*Mycol. Mem.* 9: 266, 1985).
- ornamented** (of organs, esp. spores), having the surface marked or sculptured with lines, wrinkles, warts, striations, ridges, reticulations, fibrils, scales etc.; not smooth. See Fig. 20 for terminology; also basidiospore, LO-analysis.
- Ornasporonites** Ramanujam & Rao (1979), Fossil Fungi. 1 (Miocene), India.
- Ornatinephroma** Gyeln. (1934) = *Nephroma* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Ornatispora** K.D. Hyde, Goh, Joanne E. Taylor, J. Fröhl. (1999), Sordariomycetes. Anamorph *Didymostilbe*-like. 5, S.E. Asia. See Hyde *et al.* (*MR* 103: 1432, 1999).
- Ornatisporites** M.G. Parsons & G. Norris (1999), Fossil Fungi. 1. See Parsons & Norris (*Palaeontographica* Abt. B 250: 117, 1999).
- Ornatopyrenis** Aptroot (1991) = *Mycomicrothelia* fide Aptroot *et al.* (*Bibliotheca Lichenol.* 64, 1997), Sipman & Aptroot (*Lichenologist* 37: 307, 2005).
- Ornithascus** Velen. (1934) = *Saccobolus* fide van Brummelen (*Persoonia* Suppl. 1: 1, 1967).
- ornithocoprophilous**, preferring habitats rich in bird droppings.
- Oropogon** Th. Fr. (1861), Parmeliaceae (L.). 30, widespread. See Esslinger (*Syst. Bot. Monogr.* 28, 1989; key), Chen (*Acta Mycol. Sin.* 15: 173, 1996; China).
- Orphanocoela** Nag Raj (1989), anamorphic *Pezizomycotina*, Cpd.#eH-P.1. 3 (on *Poaceae*), widespread. See Nag Raj (*CJB* 67: 3176, 1989).
- Orphanomyces** Savile (1974), ? Anthracoideaceae. 3 (on leaves of *Cyperaceae*), Europe; N. America; Asia. See Vánky (*Europ. Smut Fungi*: 570 pp., 1994; key), Vánky & McKenzie (*Fungal Diversity Res. Ser.* 8: 259 pp., 2002; New Zealand).
- Orphella** L. Léger & M. Gauthier (1932), Legeriomycetaceae. 7 (in *Plecoptera*), Europe; N. America. See Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986), Williams & Lichtwardt (*Mycol.* 79: 473, 1987), Lichtwardt *et al.* (*Mycol.* 83: 214, 1991), Santamaría & Girbal (*MR* 102: 174, 1998; Spain), Lichtwardt *et al.* (*Mycol.* 93: 764, 2001; Canada), Strongman & White (*CJB* 84: 1478, 2006; Canada), Valle & Santamaría (*Mycol.* 97: 1335, 2005; zygosporous), White *et al.* (*Mycol.* 98: 872, 2006; some species with possible affinities to *Kickxellales*).
- Orphniospora** Körb. (1874), ? Fuscideaceae (L.). 3, widespread. See Hertel & Rambold (*Mitt. bot. StSamml., München* 27: 111, 1988; posn).
- Orphniosporaceae** Bellem. & Hafellner (1984) ? = Fuscideaceae.
- Orphniosporomyces** Cif. & Tomas. (1953) = *Orphniospora*.
- Orphnodactylus** Malloch & A. Malik (1998), Phyllachoraceae. Anamorph *Hysterodiscula*. 2 (from living stems), widespread (circumboreal). See Malloch & Malik (*CJB* 76: 1265, 1998).
- Orpinomyces** D.J.S. Barr, H. Kudo, Jakober & K.J. Cheng (1989), Neocallimastigaceae. 2 (anaerobic rumen fungi), widespread. See Ho & Barr (*Mycol.* 87: 656, 1995; emend.), Ho *et al.* (*Fungal Diversity* 4: 37, 2000).
- Orromyces** B. Sur & G.R. Ghosh (1987), Gymnoascaceae. Anamorph *Chrysosporium*-like. 1, India. See Sur & Ghosh (*Kavaka* 13: 63, 1985).
- orthidium** (obsol.), conidiomata of *Pyrenotrichum*, sometimes incorrectly listed as if a generic name. See Hawksworth (*Bull. Br. Mus. nat. Hist., Bot.* 9: 59, 1981).
- Orthobellus** A.A. Silva & Cavalc. (1973), ? Schizothyriaceae. 2, S. America. See Silva & Cavalcanti (*Publicações Inst. Micol. Recife* 691: 4, 1973).
- Orthochaeta** Sawada (1943) = *Erysiphe* fide Zheng (*Mycotaxon* 22: 209, 1985).
- orthographic variant**, a variant spelling; under the Code the original spelling must be retained but typographic or orthographic errors should be corrected; orthographic variants should not be listed as synonyms, but when two or more generic names are so similar as to be confused they are treated as orthographic variants or, when based on different types, as homonyms. See Nomenclature.
- Orthomyces** Steinkr., Humber & J.B. Oliv. (1998), Entomophthoraceae. 1, USA. See Steinkraus *et al.* (*J. Invert. Path.* 72: 5, 1998), Keller & Petrini (*Sydowia* 57: 23, 2005; key).
- Orthomycotina** Steinkr., Humber & J.B. Oliv. (1998), Entomophthoraceae. 1, USA. See Steinkraus *et al.* (*J. Invert. Path.* 72: 5, 1998), Keller & Petrini (*Sydowia* 57: 23, 2005; key).
- Orthoscypha** Syd. (1927) = *Pocillum* fide Petrak (*Sydowia* 5: 328, 1951).
- Orthosomella** E.U. Canning, Wigley & R.J. Barker (1983), Microsporidia. 2.
- Orthothelohania** Codreanu & Codreanu-Balcescu (1974), Microsporidia. 1.
- orthotrophy**, Corda's (1842) term for the condition in which a basidiospore primordium develops at the apex of the apophysis in contrast to **heterotrophy** when the primordium develops laterally.
- Oscarbrefeldia** Holterm. (1898), Saccharomycetes. 1, Java.
- oscule** (obsol.) a pore of a rust spore (Tulasne).
- osis** (suffix), condition of; state caused by.
- osmophily** (adj. **-ilic**, **-ilous**), making growth under conditions of high osmotic pressure, as in *Xeromyces*

- (q.v.) and some yeasts on conc. sugar solutions. See Moustafa (*Can. J. Microbiol.* **21**: 1573, 1975; osmophilous spp. of Kuwait).
- Osmoporus** Singer (1944) = *Gloeophyllum* fide Donk (*Verh. K. ned. Akad. Wet.* tweede sect. **62**: 1, 1974).
- osmotolerant**, capable of growing in high osmotic pressure, e.g. some yeasts and filamentous fungi on concentrated sugar solutions.
- osmotrophic**, exhibiting absorptive nutrition as do fungi.
- Osoriomyces** Terada (1981), Laboulbeniaceae. 1, Taiwan. See Terada (*Mycotaxon* **13**: 412, 1981), Santamaría (*Mycol.* **96**: 761, 2004).
- Ospriosporium** Corda (1831) nom. dub., ? Fungi.
- Ossicaulis** Redhead & Ginns (1985), Lyophyllaceae. 2, widespread (north temperate). See Redhead & Ginns (*TMSJ* **26**: 362, 1985), Contu (*Bollettino dell'Associazione Micologica ed Ecologica Romana* **15**: 3, 1999), Cléménçon (*Mycol. Progr.* **4**: 167, 2005; rhizomorph anatomy *Ossicaulis lignatilis*).
- Osteina** Donk (1966) = *Postia* fide Ryvarden (*Syn. Fung.* **5**, 1991).
- Osteomorpha** G. Arnaud ex Watling & W.B. Kendr. (1979), anamorphic *Sistotrema*. 1, Europe. See Markovskaja *et al.* (*Botanica Lithuanica* **8**: 179, 2002; Lithuania).
- ostiole** (sing. **ostiolum**), the schizogenous, paraphysis-lined cavity, ending in a pore, in the papilla or neck of a perithecium (Miller, *Mycol.* **20**: 196, 1928); any pore by which spores are freed from an ascigerous or pycnidial fruit-body. See von Arx (*K. ned. Akad. Wet.*, C, **76**: 289, 1973; taxonomic importance in *Ascomycota*).
- Ostracoblabe** Bornet & Flahault (1891), ? Fungi. 1, Europe. *O. implexa* (hinge disease of European oysters). See Alderman in Jones (Ed) (*Recent Advances in Aquatic Mycology*: 223, 1973; morphology, disease), Eckblad & Kirstiansen (*MR* **94**: 706, 1990) Excluded from *Chromista* by Dick (*in press*).
- Ostracoderma** Fr. (1825), anamorphic *Peziza*, St.0eH.6. 3, widespread. See Hennebert (*Persoonia* **7**: 183, 1973), Martinez & Godeas (*Mycotaxon* **65**: 453, 1997).
- Ostracodermataceae** Malençon (1964) = *Pezizaceae*.
- Ostracodermidium** Mukerji (1973), anamorphic *Pezizomycotina*, Hso.0eP.6. 1, India. See Mukerji (*TMSJ* **14**: 175, 1973).
- Ostracodermis** Locq. (1982), Fossil Fungi. 1, Libya.
- Ostreichnion** Duby (1862), Mytilinidiaceae. 3, widespread. See Barr (*Mycotaxon* **3**: 81, 1975; key), Checa & Blanco (*Mycotaxon* **94**: 225, 2005; Spain).
- Ostreion** Sacc. (1883) = *Ostreichnion*.
- Ostreionella** Seaver (1926) = *Actidium* fide von Arx & Müller (*Stud. Mycol.* **9**, 1975).
- Ostreola** Darker (1963), Mytilinidiaceae. 4, Canada; India. See Tilak & Kale (*Indian Phytopath.* **21**: 289, 1968; key).
- Ostropa** Fr. (1825), Stictidaceae. 1, widespread (north temperate). See Sherwood (*Mycotaxon* **5**: 1, 1977).
- Ostropaceae** Rehm (1888) = *Stictidaceae*.
- ostropalean** (of asci), ones essentially unitunicate in structure and with a thickened apex penetrated by a narrow pore; see ascus.
- Ostropales** Nannf. (1932), ($\pm$ L). *Ostropomycetidae*. 11 fam., 131 gen., 2753 spp. Stromatic development usually weak, reduced to intramatrical hyphae, or absent, or with usually crustose thalli. Ascomata $\pm$ apothecial, often deeply immersed and appearing perithecial, with rather varied peridial structure. Interascal tissue of $\pm$ simple paraphyses, occ. gelatinized. Asci usually narrow, cylindrical, with a well-developed capitate apical thickening often pierced by a J- pore. Ascospores varied, often filiform. Anamorphs pycnidial, varied, sometimes absent. Usually saprobic on stems, bark or wood, some lichenized with green algae or lichenicolous, cosmop. A polymorphic order in both biology and morphology, and molecular studies suggest that further subdivision may be justified. Fams:
- (1) **Asterothyriaceae**
 - (2) **Coeonogoniaceae**
 - (3) **Gomphillaceae**
 - (4) **Graphidaceae**
 - (5) **Gyalectaceae**
 - (6) **Myeloconidiaceae**
 - (7) **Odontotremataceae**
 - (8) **Phlyctidaceae**
 - (9) **Porinaceae**
 - (10) **Stictidaceae**
 - (11) **Thelotremataceae**.
- Lit.*: Grube *et al.* (*MR* **108**: 1111, 2004), Lücking *et al.* (*Mycol.* **96**: 283, 2004), Lumbsch *et al.* (*MR* **111**: 257, 2007; phylogeny), Sherwood (*Mycotaxon* **5**: 1, 1977; monogr., keys), Winka *et al.* (*Lichenologist* **30**: 455, 1998; DNA; lichenized taxa).
- Ostropella** (Sacc.) Höhn. (1918), Melanommataceae. 5, widespread. See Huhndorf (*Mycol.* **85**: 490, 1993), Vasil'eva (*Mycoscience* **38**: 341, 1997), Huhndorf (*Mycol.* **90**: 527, 1998).
- Ostropomycetidae** Reeb, Lutzoni & Cl. Roux (2004), Lecanoromycetes. The second major subdivision of the *Lecanoromycetes*, including a number of non-lichenized taxa. Ords:
- (1) **Agyriales**
 - (2) **Baeomycetales**
 - (3) **Ostropales**
 - (4) **Pertusariales**
- Lit.*: Grube *et al.* (*MR* **108**: 1111, 2004), Hofstetter *et al.* (*Mol. Phylogenet. Evol.* **44**: 412, 2007), Lumbsch *et al.* (*Mol. Phylogenet. Evol.* **31**: 822, 2004), Lumbsch *et al.* (*MR* **111**: 257, 2007; phylogeny), Lutzoni *et al.* (*Am. J. Bot.* **91**: 1446, 2004), Miadlikowska *et al.* (*Mycol.* **98**: 1088, 2006), Wedin *et al.* (*MR* **109**: 159, 2005).
- Oswaldia** Rangel (1921) = *Apiosphaeria* fide Müller & von Arx in Ainsworth *et al.* (Eds) (*The Fungi* **4A**: 87, 1973).
- Oswaldina** Rangel (1921), anamorphic *Apiosphaeria*, St.0fH.15. 1, Brazil. See Dianese *et al.* (*Sydowia* **46**: 233, 1994; reinstatement gen.).
- Oswaldoa** Bat. & I.H. Lima (1959) ? = *Myriangiella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Otagoa** Lloyd (1922) nom. nud., ? Fungi.
- Otidea** (Pers.) Bonord. (1851), Pyronemataceae. c. 23, widespread (north temperate). See Kanouse (*Mycol.* **41**: 660, 1949), Harmaja (*Karstenia* **14**: 138, 1974; gen. concept), Cao *et al.* (*Mycol.* **82**: 734, 1990; key Chinese spp.), Landvik *et al.* (*Nordic Jl Bot.* **17**: 403, 1997; DNA), Harrington *et al.* (*Mycol.* **91**: 41, 1999; phylogeny), Hansen & Pfister (*Mycol.* **98**: 1029, 2006; phylogeny), Liu & Zhuang (*Fungal Diversity* **23**: 181, 2006), Perry *et al.* (*MR* **111**: 549, 2007; phylogeny).
- Otideaceae** Eckblad (1968) = *Pyronemataceae*.
- Lit.*: Landvik *et al.* (*Nordic Jl Bot.* **17**: 403, 1997).

- Otidella** Sacc. (1889) = *Caloscypha*.
- Otideopsis** B. Liu & J.Z. Cao (1987), Pyronemataceae. 2, China; Europe. See Moravec (*Mycol. Helv.* 3: 135, 1988), Liu & Zhuang (*Fungal Diversity* 23: 181, 2006), Liu & Zhuang (*Mycosystema* 25: 546, 2006; phylogeny).
- Otomyces** Hallier (1869) nom. dub., anamorphic *Pezizomycotina*.
- Otomyces** Wreden (1874) ? = *Aspergillus* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- otomycosis**, see mycosis.
- Othia** Nitschke ex Fuckel (1870), Botryosphaeriaceae. Anamorph *Diplodia*-like. c. 11, widespread. See Scheinpflug (*Ber. schweiz. bot. Ges.* 68: 325, 1958), Van Niekerc *et al.* (*Mycol.* 96: 781, 2004; phylogeny), Phillips *et al.* (*Mycol.* 97: 513, 2005).
- Othiella** (Sacc.) Sacc. & D. Sacc. (1905) = *Othia* fide Barr (*Rept. Kevo Subarct. Res. Stn* 11: 12, 1974).
- Otwaya** G.W. Beaton (1978), Hyaloscyphaceae. 1 (on *Nothofagus*), Australia. See Beaton (*TBMS* 71: 219, 1978).
- Oudemans** (Cornelius Anton Jan Abraham; 1825-1906; Netherlands). Medical degree, Leiden (1847); Lecturer, Rotterdam Medical School (1848-1859); Professor of Medicine & Botany, Amsterdam Athenaeum (1859-1877); Professor of Botany & Pharmacognosy, Amsterdam University (1877-1896); General Secretary, Royal Netherlands Academy of Sciences (1879-1895). Produced a great and still valuable catalogue of European fungi arranged by associated organisms. *Publs. Catalogue Raisonné des Champignons des Pays-Bas* (1905); *Enumeratio Systematica Fungorum* 5 vols (1919-1925) [published posthumously]. *Biogs, obits etc.* Moll (*Bericht der Deutschen Botanischen Gesellschaft* 26a: 12, 1908).
- Oudemansia** Speg. (1880) [non *Oudemansia* Miq. 1854, *Byttneriaceae*] = *Oudemansiella*.
- Oudemansiella** Speg. (1881), Physalacriaceae. c. 15, widespread (tropical; temperate). See Pegler & Young (*TBMS* 87: 583, 1987; key), Baroni & Ortiz (*Mycotaxon* 82: 269, 2002; Puerto Rico), Mizuta (*Nippon Kingakukai Kaiho* 46: 25, 2005; Japan).
- Outhovia** Nieuwl. (1916) = *Scopularia*.
- Ovadendron** Sigler & J.W. Carmich. (1976), anamorphic *Pezizomycotina*, Hso.0eH.38. 1 (from humans), Europe. See Sigler & Carmichael (*Mycotaxon* 4: 391, 1976).
- oval**, widely elliptical (Fig. 23.1).
- ovariicolous**, living in ovaries.
- ovate** (of a surface [or sometimes a solid]), **ovoid** (of a solid) (Fig. 23.11), like a hen's egg with the narrower end at the top (Fig. 23.1).
- Ovavesicula** T.G. Andreadis & J.L. Hanula (1987), Microsporidia. 1. See Andreadis & J.L. Hanula (*J. Protozool.* 34: 21, 1987), Vossbrinck & Andreadis (*J. Invert. Path.* 96: 270, 2007; phylogeny).
- Overeemia** Arnaud (1954) = *Brooksia* fide Deighton & Pirozynski (*Mycol. Pap.* 105, 1966).
- Oviascoma** Y.J. Yao & Spooner (1996), Pyronemataceae. 1, British Isles. See Yao & Spooner (*MR* 100: 102, 1996).
- Ovinus** (Lloyd) Torrend (1920) = *Albatrellus*.
- Ovipleistophora** M. Pekkarinen, J. Lom & F. Nilsen (2002), Microsporidia. 1. See Pekkarinen *et al.* (*Dis. Aq. Organ.* 48: 133, 2002).
- Ovosphaerella** Laib. (1922) = *Mycosphaerella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Ovularia** Sacc. (1880) = *Ramularia* Unger fide Hughes (*TBMS* 32: 34, 1949).
- Ovulariella** Bubák & Kabát (1912) nom. nud., anamorphic *Pezizomycotina*.
- Ovulariopsis** Pat. & Har. (1900), anamorphic *Phyllactinia*, Hsy.0eH.1. 9, widespread. See Braun (*Beih. Nova Hedwigia* 89: 700 pp., 1987).
- Ovularites** A.C. Whitford (1916), Fossil Fungi. 1 (Cretaceous), USA.
- Ovulinia** F.A. Weiss (1940), Sclerotiniaceae. Anamorph *Ovulitis*. 2, Europe; N. America. See Holst-Jensen *et al.* (*Mycol.* 89: 885, 1997; phylogeny), Holst-Jensen *et al.* (*Nordic Jl Bot.* 18: 705, 1999; phylogeny).
- Ovulitis** N.F. Buchw. (1970), anamorphic *Ovulinia*, Hso.0eH.10. 2, USA; British Isles. See Buchwald (*Friesia* 9: 328, 1970).
- Oxneria** S.Y. Kondr. & Kärnefelt (2003) = *Xanthomendoza* fide Kondratyuk & Kärnefelt (*Ukrainian Jour. Bot.* 60: 427, 2003), Gaya *et al.* (*MR* 112: 528, 2008).
- Oxodeora** K.D. Hyde & P.F. Cannon (1999), Phyllochoraceae. 1 (living palm leaves), Caribbean. See Hyde & Cannon (*Mycol. Pap.* 175: 114, 1999).
- oxydated** (of crustose lichens), having thalli tinged rust-red by iron oxides; oxydized.
- Oxydontia** L.W. Mill. (1933) = *Sarcodontia* fide Donk (*Taxon* 5: 69, 1956).
- Oxydothis** Penz. & Sacc. (1898), Xylariales. Anamorph *Selenosporella*. 41 (saprobic on palms etc.), widespread (esp. tropical). See Hyde (*Sydowia* 45: 226, 1993; Australia), Hyde (*Sydowia* 45: 204, 1993), Hyde (*Sydowia* 46: 265, 1994; revision), Wong & Hyde (*Fungal Diversity* 2: 181, 1999; ultrastr.), Shenoy *et al.* (*Nova Hedwigia* 80: 511, 2005; Hong Kong), Hidayat *et al.* (*Fungal Diversity* 23: 159, 2006; phylogeny).
- Oxyflavus** Ryvarden (1973) = *Leucophellinus* fide Ryvarden (*Syn. Fung.* 5, 1991).
- Oxyporus** (Bourdot & Galzin) Donk (1933), Agaricomycetes. 10, widespread. *Hymenochaetales* or *Agaricales* (*Oxyporus* clade). See Gilbertson & Ryvarden (*N. Amer. Polyp. Vol. 2 Megasporoporia - Wrightoporia*: 437, 1987), Ryvarden (*Syn. Fung.* 5: 363 pp., 1991), Martín & Montón (*Boletín de Sanidad Vegetal, Plagas* 30: 93, 2004; molecular identification *Oxyporus latemarginatus*).
- Oxysporium** Lév. (1863) = *Helminthosporium* fide Saccardo (*Syll. fung.* 10: 613, 1892).
- Oxystoma** Eschw. (1824) = *Graphis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- oyster mushroom** (-cap fungus), basidiomata of the edible *Pleurotus ostreatus*.
- Ozocladium** Mont. (1851) = *Polistroma* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Ozonium** Link (1809) nom. dub., anamorphic *Agaricomycotina*. Used for anamorphs of *Coprinus* and similar genera. See Hughes (*CJB* 36: 727, 1958).
- P**, see Metabolic products, Steiner's Stable PD solution.
- Paathramaya** Subram. (1956), anamorphic *Pezizomycotina*, Hsp.0eP.10. 3, India. See Bhat (*TBMS* 85: 101, 1985; key).
- Pachnocybaceae** Oberw. & R. Bauer (1989), Pachnocybales. 1 gen., 1 spp.
Lit.: Oberwinkler & Bandoni (*CJB* 60: 1726, 1982), Kropp & Corden (*Mycol.* 78: 334, 1986), Kleven & McLaughlin (*CJB* 67: 1336, 1989), Oberwinkler & Bauer (*Sydowia* 41: 224, 1989), McLaughlin *et al.* (*Mycol. Soc. Amer. Newsl.* 41: 28, 1990),

- Berres *et al.* (*Mycol.* 87: 821, 1995), Begerow *et al.* (*CJB* 75: 2045, 1998).
- Pachnocybales** R. Bauer, Begerow, J.P. Samp., M. Weiss & Oberw. (2006). Pucciniomycetes. 1 fam., 1 gen., 1 spp. Fam.:
- Pachnocybaceae**
- For *Lit.* see under fam.
- Pachnocybe** Berk. (1836), Pachnocybaceae. 1, Europe. See Begerow *et al.* (*CJB* 75: 2045, 1998; phylogeny), Bauer *et al.* (*Mycol. Progr.* 5: 41, 2006).
- Pachnodium** H.P. Upadhyay & W.B. Kendr. (1975) = *Pesotum* fide Upadhyay & Kendrick (*Mycol.* 67: 802, 1975), Okada *et al.* (*CJB* 76: 1495, 1998).
- Pachnolepia** A. Massal. (1855) = *Arthonia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pachyascaceae** Poelt ex P.M. Kirk, P.F. Cannon & J.C. David (2001), Lecanoromycetes (inc. sed.) (L). 1 gen., 1 spp.
- Lit.*: Poelt (*Sydowia* 38: 241, 1985).
- Pachyascus** Poelt & Hertel (1968), Pachyascaceae (L). 1 (in leaf axils of *Andreaea*), Europe. See Poelt & Hertel (*Ber. dt. bot. Ges.* 81: 210, 1968), Poelt (*Sydowia* 38: 241, 1985).
- Pachybasidiella** Bubák & Syd. (1915) = *Aureobasidium* fide de Hoog & Hermanides-Nijhof (*Stud. Mycol.* 15, 1977).
- Pachybasium** Sacc. (1885) = *Trichoderma* Pers. (1794) fide Hughes (*CJB* 36: 727, 1958), Bissett (*CJB* 69: 2373, 1991).
- Pachycladina** Marvanová (1987), anamorphic *Pezizomycotina*, Hso.1bH.10. 1 (from foam), Europe; N. America. See Marvanová (*TBMS* 87: 617, 1986), Marvanová & Bärlocher (*MR* 102: 750, 1998; Canada).
- Pachycudonia** S. Imai (1950), ? Helotiales. 3, Japan. See Imai (*Bot. Mag. Tokyo* 63: 235, 1950).
- Pachyderma** Schulzer (1876) [non *Pachyderma* Blume 1826, *Oleaceae*] = *Mycenastrum* fide Stalpers (*in litt.*).
- pachydermatous** (1) thick-skinned; (2) (of hyphae), having the outer wall thicker than the lumen.
- Pachydisca** Boud. (1885), ? Helotiaceae. 1, Europe. See Dumont (*Mycol.* 67: 162, 1975).
- Pachydiscula** Höhn. (1915) = *Cryptosporiopsis* fide Petrak (*Annls mycol.* 21: 182, 1923).
- Pachyella** Boud. (1907), Pezizaceae. c. 19, widespread. See Pfister (*CJB* 51: 2009, 1973; key), Pfister & Candoussau (*Mycotaxon* 13: 457, 1981), Häffner (*Rheinl.-Pfälz. Pilzj.* 2: 118, 1992), Pfister (*Mycotaxon* 54: 393, 1995), Norman & Egger (*Mycol.* 91: 820, 1999; phylogeny), Hansen *et al.* (*Mycol.* 93: 958, 2001; phylogeny), Harrington & Pfister (*Harvard Pap. Bot.* 6: 113, 2001; in culture), Hansen *et al.* (*Mol. Phylogen. Evol.* 36: 1, 2005; phylogeny).
- Pachykytospora** Kotl. & Pouzar (1963), Polyporaceae. 3, widespread. See Kotlaba & Pouzar (*Česká Mykol.* 33: 129, 1979; key), Piątek (*Ann. bot. fenn.* 42: 23, 2005; *Pachykytospora nanospora*).
- Pachykytosporaceae** Jülich (1982) = Polyporaceae.
- Pachylepyrium** Singer (1958), Strophariaceae. 7, widespread (north temperate). See Singer (*Sydowia* 11: 321, 1957), Moser (*Hoppea* 61: 267, 2000).
- Pachyma** Fr. (1822), anamorphic *Macrohyporia*, *Lentinus*, *Polyporus*. 1, N. America. See Weber (*Mycol.* 21: 113, 1929; sclerotia), Ginns & Lowe (*CJB* 61: 1672, 1984).
- Pachyospora** A. Massal. (1852), Hymeneliaceae (L). 1, widespread (arctic-alpine). See Hertel (*Willdenowia* 6: 225, 1971).
- Pachypatella** Theiss. & Syd. (1915), Parmulariaceae. 2, Asia.
- Pachyphiale** Lönnr. (1858), Gyalectaceae (L). 7, widespread. See Vězda (*Sborn. Vysoké Školy Zeměd. Lesn. Brno C* 1: 22, 1958), Vězda (*Ergebn. Forsch. Unternehmens Nepal Himalaya* 6: 127, 1974; key 5 spp.), Alvarez Andrés (*Nova Hedwigia* 77: 139, 2003; Iberian peninsula), Kauff & Büdel (*Bryologist* 108: 272, 2005; ontogeny).
- Pachyphlodes** Zobel (1854) = *Pachyphloeus* fide Fischer (*Nat. Pflanzenfam.* 5b: viii, 1938).
- Pachyphloeus** Tul. & C. Tul. (1844), Pezizaceae. 11 (hypogeous), widespread. See Gilkey (*N. Amer. Fl.* 2, 1954; key N. Am. spp.), Lange (*Dansk bot. Ark.* 16: 32, 1956; key Eur. spp.), Norman & Egger (*Mycol.* 91: 820, 1999; phylogeny), Percudani *et al.* (*Mol. Phylogen. Evol.* 13: 169, 1999; phylogeny), Hansen *et al.* (*Mycol.* 93: 958, 2001; phylogeny), Calonge *et al.* (*Boll. Gruppo Micol. 'G. Bresadola'* 45: 51, 2002; Spain), Colgan & Trappe (*Mycotaxon* 90: 281, 2004; USA), Frank *et al.* (*Mycotaxon* 98: 253, 2006; USA), Tedersoo *et al.* (*New Phytol.* 170: 581, 2006; mycorrhizas), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Pachyphysis** R.C. Harris & Ladd (2007), Porpidiaceae (L). 1, USA. See Harris & Ladd (*Opuscula Philo-lichenum* 4: 57, 2007).
- pachypleurous**, thick-walled.
- Pachyrhytisma** Höhn. (1917) = *Rhytisma* fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).
- Pachysacca** Syd. (1930), Dothideaceae. 1, Australia. See Swart (*TBMS* 79: 261, 1982).
- Pachysolen** Boidin & Adzet (1958), Saccharomycetales. 1, Europe. See Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Pachyspora** Kirschst. (1906) = *Delitschia* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Pachysporaria** (Malme) M. Choisy (1949) ? = *Rinodina* fide Marbach (*Biblthca Lichenol.* 74, 2000).
- Pachysterigma** Johan-Olsen ex Bref. (1888) = *Tulasnella* fide Rogers (*Annls mycol.* 31: 183, 1933).
- Pachythyrium** G. Arnaud ex Spooner & P.M. Kirk (1990), Microthyriaceae. 1, Europe. See Spooner & Kirk (*MR* 94: 223, 1990).
- Pachytichospora** Van der Walt (1978) = *Kazachstania* fide Augustyn *et al.* (*Syst. Appl. Microbiol.* 13: 44, 1990; fatty acid analysis), Kurtzman & Robnett (*FEMS Yeast Res.* 3: 417, 2003).
- Pachytrichum** Syd. (1925) = *Periconia* fide Linder (*Mycol.* 29: 659, 1937).
- Pachytrype** Berl. ex M.E. Barr, J.D. Rogers & Y.M. Ju (1993), ? Calosphaeriaceae. Anamorph *Cytospora*-like. 2 (bark and wood), widespread. See Barr *et al.* (*Mycotaxon* 48: 529, 1993), Fernández *et al.* (*Mycol.* 96: 175, 2004; Costa Rica), Mostert *et al.* (*Stud. Mycol.* 54: 115 pp., 2006).
- Pacispora** Oehl & E. Sieverd. (2004), Pacisporaceae. 3, widespread. See Oehl & Sieverding (*J. Appl. Bot. Angew. Bot.* 78: 74, 2004), Redecker & Raab (*Mycol.* 98: 885, 2006; phylogeny), Walker *et al.* (*MR* 111: 253, 2007; nomencl.).
- Pacisporaceae** C. Walker, Błaszk., A. Schüssler & Schwarzwott (2004), Diversisporales. 1 gen. (+ 1 syn.), 3 spp.
- Lit.*: Azcon-Aguilar & Barea (*Mycorrhiza* 6: 457, 1996), van der Heijden *et al.* (*Nature Lond.* 396: 69, 1998), Schüßler *et al.* (*MR* 105: 1413, 2001), Oehl &

- Sieverding (*J. Appl. Bot. Angew. Bot.* 78: 74, 2004), Walker & Schüssler (*MR* 108: 982, 2004), Walker *et al.* (*MR* 108: 707, 2004), Redecker (*Glomeromycota* Arbuscular mycorrhizal fungi and their relative(s), in *The Tree of Life Web Project*, <http://tolweb.org>: [unpaginated], 2005).
- Pactilia** Fr. (1837), anamorphic *Pezizomycotina*, Hsp.?? 2 or 3, Europe; S. America.
- PAD**, Istituto di Botanica e Fisiologia Vegetale, Padova (Italy); founded 1837; a state institution; see Montemartini Corte (*in* Minelli (Ed.), *The botanical garden of Padua 1545-1995*: 271, 1995; mycol. collns esp. Saccardo).
- paddy (paddi) straw mushroom**, see straw mushrooms.
- Padixonia** Subram. (1972), anamorphic *Xylaria*, Hsy.0eH.9. 1, Ghana. The connection with termiticolous *Xylaria* needs confirmation. See Subramanian (*Curr. Sci.* 41: 282, 1972), Dixon (*J. Linn. Soc. Bot.* 91: 203, 1985).
- Paecilomyces** Bainier (1907), anamorphic *Byssochlamys*, Hso.0eH.15. c. 76, widespread. See also *Isaria*. See Samson (*Stud. Mycol.* 6, 1974; key), Castro *et al.* (*J. Med. Vet. Mycol.* 28: 15, 1990; review of *Paecilomyces* in human infections), Mountfort & Rhodes (*Appl. Environm. Microbiol.* 57: 1963, 1991; anaerobic growth of marine *P. lilacinus*), Yaguchi *et al.* (*Mycoscience* 37: 55, 1996; ubiquinones), Cantone & Vandenberg (*MR* 102: 209, 1998; genetic diversity), Domenech *et al.* (*Microbiology Reading* 145: 2789, 1999; cell wall chemistry), Azevedo *et al.* (*Scientia Agricola* 57: 729, 2000; genetic diversity), Pitt *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 9, 2000; accepted names), Oborník *et al.* (*Can. J. Microbiol.* 47: 813, 2001; polyphyly), Haugland *et al.* (*Syst. Appl. Microbiol.* 27: 198, 2004; quantitative PCR), Luangsa-ard *et al.* (*Mycol.* 96: 773, 2004; polyphyly, generic limits), Luangsa-ard *et al.* (*Kasetsart Journal Natural Sciences* 38: 94, 2004; Thailand), Luangsa-ard *et al.* (*MR* 109: 581, 2005; removal of entomopathogenic spp.).
- Paepalopsis** J.G. Kühn (1882), Urocystidaceae. 3 (on *Primulaceae*), Europe; N. America; Asia. See Kirk (*in litt.*).
- Pagidospora** Drechsler (1960), anamorphic *Agaricomycetes*, Hsy.0eH.1/41. 1 (with clamp connexions, on amoebae), USA. See Drechsler (*Sydowia* 14: 246, 1960).
- Paidania** Racib. (1909) = *Erikssonia* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Paipalopsis**, see *Paepalopsis*.
- Palaeachlya** F.R.S. Duncan (1876), Fossil Fungi, Oomycota. 2 (Silurian – Recent), widespread.
- Palaeancistrus** R.L. Dennis (1970), Fossil Fungi, Agaricomycetes. 1 (Carboniferous), USA.
- Palaeoagaracites** Poinar & Buckley (2007), Fossil Fungi, Agaricomycetes. 1.
- Palaeoamphisphaerella** Ramanujam & Srisailam (1980), Fossil Fungi, Ascomycota. 2 (Miocene), India.
- Palaeoasterina** S. Mitra, Bera & Manju Banerjee (2002), Fossil Fungi. 1, India. See Mitra *et al.* (*Phytomorphology* 52: 286, 2002).
- Palaeocephala** Singer (1962), Agaricales. 1, Sierra Leone. Belongs either to the *Marasmiaceae* or the *Physalacriaceae*. See Singer (*Sydowia* 15: 60, 1961), Antonín (*Fungus Flora of tropical Africa* 1, 2007).
- Palaeocercospora** S. Mitra & Manju Banerjee (2000), Fossil Fungi, Pezizomycotina. 1, India. See Mitra & Banerjee (*Journal of Mycopathological Research* 38: 8, 2000).
- Palaeocirrenalia** Ramanujam & Srisailam (1980), Fossil Fungi, anamorphic *Pezizomycotina*. 2 (Miocene), India.
- Palaeoclavaria** Poinar & A.E. Br. (2003), Fossil Fungi. 1, Myanmar. See Poinar & Brown (*MR* 107: 765, 2003).
- Palaeocolletotrichum** S. Mitra & Manju Banerjee (2000), Fossil Fungi, Pezizomycotina. 1, India. See Mitra & Banerjee (*Journal of Mycopathological Research* 38: 10, 2000).
- Palaeocybe** Dörfelt & Striebig (2000), Fossil Fungi, Psathyrellaceae. 1, Germany. See Dörfelt & Striebig (*Z. Mykol.* 66: 31, 2000).
- Palaeocytophaera** R.B. Singh & G.V. Patil (1980), Fossil Fungi, anamorphic *Pezizomycotina*. 1 (Cretaceous), India.
- Palaeodikaryomyces** Dörfelt (1998), Fossil Fungi. 1 (Triassic), Germany. See Dörfelt & Schäfer (*Z. Mykol.* 64: 145, 1998).
- Palaeodiplodites** Watanabe, H. Nishida & Kobayashi (1999), Fossil Fungi. 1. See Watanabe *et al.* (*Int. J. Pl. Sci.* 160: 440, 1999).
- Palaeofibula** J.M. Osborn, T.N. Taylor & J.F. White (1989), Fossil Fungi. 1 (middle Triassic), Antarctica.
- Palaeoglomus** D. Redecker, Kodner & L.E. Graham (2002), Fossil Fungi, Glomerales. 1, USA. See Redecker *et al.* (*Mycotaxon* 84: 35, 2002).
- Palaeoleptosphaeria** Barlinge & Paradkar (1982), Fossil Fungi, Ascomycota. 1 (Cretaceous), India.
- Palaeomycelites** Bystrov (1956), Fossil Fungi (mycel.) Fungi. 1 (Devonian), former USSR.
- Palaeomyces** Renault (1896), Fossil Fungi (mycorrhizal endomycobiont) Fungi. 3 (Carboniferous), France; British Isles. See Butler (*TBMS* 22: 274, 1939).
- Palaeomycites** Mesch. (1902) = *Palaeomyces*.
- Palaeopede** D.E. Ether. (1899), Fossil Fungi ? Fungi. 1 (Devonian), Australia.
- Palaeopericonia** C.G. Ibáñez & Zamuner (1996), Fossil Fungi. 1, Argentina. See Ibáñez & Zamuner (*Mycotaxon* 59: 138, 1996).
- Palaeoperone** D.E. Ether. (1891), Fossil Fungi ? Fungi. 1 (Permo-Carboniferous), Australia.
- Palaeophoma** Singhai (1975), Fossil Fungi, anamorphic *Pezizomycotina*. 1 (Eocene), India.
- Palaeophthora** Singhai (1978), Fossil Fungi, Oomycota. 1 (Eocene), India. See Singhai (*Palaeobotanist* 25: 481, 1978).
- Palaeosclerotium** G.W. Rothwell (1972), Fossil Fungi ? Ascomycota. 1 (Carboniferous), USA. See Dennis (*Science N.Y.* 192: 66, 1976), Singer (*Mycol.* 69: 850, 1977), Pirozynski & Weresub *in* Kendrick (Ed.) (*The Whole Fungus* 1: 687, 1979).
- Palaeosordaria** Sahni & H.S. Rao (1943), Fossil Fungi, Xylariales. 1 (Tertiary), India.
- Palambages** Whetzel (1961), Fossil Fungi (? sclerotia) Fungi. 3 (Cretaceous, Tertiary), Canada; Europe; Malaysia.
- Palavasciaceae** Manier ex Manier & Lichtw. (1968), Eccliniales. 1 gen., 3 spp.
- Palawania** Syd. & P. Syd. (1914), Microthyriaceae. 1, Asia.
- Palawaniella** Doidge (1921), Parmulariaceae. 5, S. America; S. Africa. See Inácio *et al.* (*Mycol. Progr.*

- 4: 133, 2005).
- Palawaniopsis** Bat., Cif. & Nascim. (1959), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, S. Africa. See Batista *et al.* (*Mycopath. Mycol. appl.* 11: 75, 1959).
- Paleoarcyria** M. Jacq.-Fél., C.N. Mill. & Locq. (1983), Fossil Fungi. 1, France.
- Paleobasidiospora** Locq. (1983), Fossil Fungi. 1, France.
- Paleoblastocladia** W. Remy, T.N. Taylor & Hass (1994), Fossil Fungi. 1 (lower Devonian). See Remy *et al.* (*Am. J. Bot.* 81: 690, 1994).
- Paleocatenaria** Locq. (1983), Fossil Fungi. 1, British Isles.
- Paleoguttulina** Locq. & Mišík (1983), Fossil Fungi. 1, former Czechoslovakia.
- Paleomastigomycetes**, Form class name proposed (Taylor *et al.* *Mycol.* 84: 901, 1992) for fossil chytrid-like fungi.
- paleomycology**, the study of fossil fungi (q.v.).
- Paleopyrenomycites** Taylor, Hass, Kerp, M. Krings & Hanlin (2004), Fossil Fungi. 1, British Isles. See Taylor *et al.* (*Mycol.* 96: 1404, 2004).
- Paleoserenomycetes** Currah, Stockey & B.A. LePage (1998), Fossil Fungi. 1. See Currah *et al.* (*Mycol.* 90: 668, 1998).
- Paleoslimacomycetes** Kalgutkar & Sigler (1995), Fossil Fungi, anamorphic *Pezizomycotina*. 1 (Palaeocene – Eocene), Canada. See Kalgutkar & Sigler (*MR* 99: 521, 1995).
- Palifer** Stalpers & P.K. Buchanan (1991), Schizoporaaceae. 4, widespread. See Hjortstam & Ryvarden (*Syn. Fung.* 22: 9, 2007).
- Paliphora** Sivan. & B. Sutton (1985), anamorphic *Pezizomycotina*, Hso.0-1eH.27. 3, Australia; Malaysia. See Sivanesan & Sutton (*TBMS* 85: 249, 1985), Kuthubutheen (*TBMS* 89: 270, 1987), Alcorn (*Mycotaxon* 59: 145, 1996).
- palisade fungi**, see *Agaricomycotina*.
- palisade plectenchyma**, plectenchyma in the cortex of a lichen thallus composed of hyphae arranged perpendicular to the surface.
- palisade-cells** (of lichens), the end cells of the hyphae of a fastigiate cortex.
- palisoderm** (of basidiomata), an outer layer composed of several strata of cells or hyphal tips; see *derm*.
- pallid**, light-coloured; pale.
- pallisadoplectenchyma**, see *plectenchyma*.
- palmate**, having lobes radiating from a common centre but not extending to the point of insertion. Cf. *chiroid*, *digitate*.
- Palmella** Lyngb. (1819), Algae. Algae.
- Palmellathyrites** Locq., D. Pons & Sal.-Cheb. (1981), Fossil Fungi. 1, France.
- Palmicola** K.D. Hyde (1993), Xylariales. 1, Australia; Ecuador. Affinities uncertain. See Hyde (*Sydowia* 45: 15, 1993), Goh & Hyde (*MR* 100: 714, 1996).
- Palmomyces** K.D. Hyde, J. Fröhl. & Joanne E. Taylor (1998) nom. illegit., ? Phyllachorales. 1 (on living *Palmae* leaf), Australia. See Hyde *et al.* (*Sydowia* 50: 21, 1998), Wang & Hyde (*Fungal Diversity* 3: 159, 1999; posn).
- Palmomyces** Maire (1926) = *Andreaeana*.
- Palomyces** Höhnk (1955) = *Halosphaeria* fide Kohlmeyer (*CJB* 50: 1951, 1972).
- paludal**, living in wet places (marshes).
- Palynomorphites** L.R. Moore (1963), Fossil Fungi. 1 (Carboniferous), British Isles.
- Pampolysporium** Magnus (1900) = *Guignardia* fide Eriksson (*SA* 5: 147, 1986).
- Panaeolina** Maire (1933), Agaricales. 2, widespread. Belongs either to the *Inocybaceae* or the *Psathyrellaceae*. See Gerhardt (*Bibliotheca Botanica* 147: 149 pp., 1996), He (*Mycosystema* 23: 150, 2004; China).
- Panaeolopsis** Singer (1969), Agaricaceae. 4, widespread. See Singer (*Nova Hedwigia Beihefte* 29: 367, 1969).
- Panaeolus** (Fr.) Quél. (1872) nom. cons., Agaricales. c. 15 (coprophilous), widespread. Belongs either to the *Inocybaceae* or the *Psathyrellaceae*. See Hora (*Naturalist* Hull: 77, 1957), Ola'h (*Revue Mycol. Mém. Hors Sér.* 10, 1970), Pegler (*Kew Bull. Addit. Ser.* 6, 1977; E. Afr. spp.), Gerhardt (*Taxonomische Revision der Gattungen Panaeolus und Panaeolina*, 1996), Bon & Courtecuisse (*Docums Mycol.* 32: 75, 2003; key).
- Panama disease**, A disease of banana caused by *Fusarium oxysporum* f.sp. *cubense*. See Stover (*Phytopath. Pap.* 4, 1962), Stover & Buddenhagen (*Fruits* 41: 175-191, 1986), Pegg & Langdon (*in* Persley & De Langhe (Eds), *Banana and plantain breeding strategies*: 119, 1987), Ploetz (Ed.) (*Fusarium wilt of banana*, 1990, *Int. J. of Pest Manag.* 40: 326, 1994).
- Panchanania** Subram. & N.G. Nair (1966), anamorphic *Pezizomycotina*, Hsy.1eP.10. 1, India. See Bhat (*TBMS* 85: 101, 1985; synonymy with *Paathramaya*).
- Pandanicola** K.D. Hyde (1994), Xylariales. 2, pantropical. See Hyde (*Sydowia* 46: 35, 1994), Lu & Hyde (*Mycoscience* 41: 83, 2000).
- Pandora** Humber (1989), Entomophthoraceae. 32, widespread. See Humber (*Mycotaxon* 34: 441, 1989), Miller & Keil (*Mycotaxon* 38: 227, 1990), Keller & Petrini (*Sydowia* 57: 23, 2005; key), Keller (*Sydowia* 59: 75, 2007; Switzerland, n.sp.).
- Panellaceae** Jülich (1982) = *Mycenaceae*.
- Panellus** P. Karst. (1879), *Mycenaceae*. c. 55, widespread. See Miller (*Mich. Bot.* 9: 17, 1970), Burdsall & Miller (*Beih. Nova Hedwigia* 51, 1975), Corner (*Gdms' Bull. Singapore* 39: 103, 1986; Malaysian spp.), O'Kane *et al.* (*Mycol.* 82: 595, 1990; bioluminescence), Hibbett *et al.* (*Nature* 407: 506, 2000; relationship with *Clavariaceae* suggested), Jin *et al.* (*Mycotaxon* 79: 7, 2001; phylogeny), Jin *et al.* (*Mycol.* 93: 309, 2001; biogeography *Panellus stypticus*).
- Pannaria** Delise ex Bory (1828), *Pannariaceae* (L.). 51, widespread (esp. tropical). See Jørgensen (*Op. Bot.* 45, 1978; Eur. spp.), Jørgensen (*J. Hattori bot. Lab.* 76: 197, 1994), Jørgensen (*N.Z. J. Bot.* 37: 257, 1999; NZ spp.), Jørgensen (*Nova Hedwigia* 71: 405, 2000; subg. *Chrysopannaria*), Jørgensen (*Bryologist* 103: 670, 2000; N America), Jørgensen (*Bibliotheca Lichenol.* 78: 109, 2001; Australia), Jørgensen & Kashiwadani (*J. Jap. Bot.* 76: 1, 2001; Japan), Ekman & Jørgensen (*CJB* 80: 625, 2002; phylogeny), Jørgensen (*Lichenologist* 35: 11, 2003; Africa), Jørgensen (*Nova Hedwigia* 76: 245, 2003; isidiate taxa), Wiklund & Wedin (*Cladistics* 19: 419, 2003; phylogeny), Jørgensen (*Bibliotheca Lichenol.* 88: 229, 2004; S hemisphere), Jørgensen & Arvidsson (*Symb. bot. upsal.* 34 no. 1: 113, 2004; Ecuador), Jørgensen & Sipman (*Nova Hedwigia* 78: 311, 2004; S America), Miadlikowska & Lutzoni (*Am. J. Bot.* 91: 449, 2004; phylogeny), Jørgensen & Sipman (*J. Hattori bot. Lab.* 100: 695, 2006; New Guinea), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Pannariaceae** Tuck. (1872), *Peltigerales* (L.). 18 gen.

- (+ 8 syn.), 328 spp.
Lit.: Galloway & James (*Lichenologist* 17: 173, 1985), Galloway & Jørgensen (*Lichenologist* 19: 345, 1987), Jørgensen & Galloway (*Lichenologist* 21: 295, 1989), Lumbsch & Kothe (*Mycotaxon* 43: 277, 1992), Øvstedal & Smith (*Cryptog. Bryol.-Lichénol.* 14: 337, 1993), Jørgensen (*J. Jap. Bot.* 69: 383, 1994), Henssen (*Symb. bot. upsal.* 32: 75, 1997), Jørgensen (*Lichenologist* 30: 533, 1998), Jørgensen (*N.Z. J. Bot.* 37: 257, 1999), Jørgensen & Wedin (*Lichenologist* 31: 341, 1999), Makhija & Adawadkar (*Mycotaxon* 71: 323, 1999), Jørgensen (*Bryologist* 103: 104, 2000), Jørgensen (*Bryologist* 103: 670, 2000; N. Am.), Ekman & Jørgensen (*CJB* 80: 625, 2002), Wiklund & Wedin (*Cladistics* 19: 419, 2003), Wedin & Wiklund (*Symb. bot. upsal.* 34 no. 1: 469, 2004), Miądlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny), Jørgensen (*Nordic Lichen Flora* 3: Cyanolichens: 96, 2007).
- Pannariella** (Vain.) Gyeln. (1935) = *Heppia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pannoparmelia** (Müll. Arg.) Darb. (1912), Parmeliaceae (L.). 5, widespread. See Sato (*Miscnea bryol. lichen., Nichinan* 4: 45, 1966), Yoshimura (*Bibliotheca Lichenol.* 25: 185, 1987), Yoshimura & Elix (*J. Hattori bot. Lab.* 74: 287, 1993), Galloway & Sammy (*Flora of Australia* 55: 86, 1994), Blanco *et al.* (*Mol. Phylogen. Evol.* 39: 52, 2006; phylogeny).
- pannose (panniform)**, having the appearance of felt or woollen cloth.
- Pannucia** P. Karst. (1879) = *Psathyrella* fide Singer (*Agaric. mod. Tax.*, 1951).
- Pannularia** Nyl. (1886) = *Placynthium* fide Jørgensen (*Op. Bot.* 45, 1986).
- Panomycetes** Nyl. (1886) = *Placynthium* fide Jørgensen (*Op. Bot.* 45, 1986).
- Panorbis** J. Campb., J.L. Anderson & Shearer (2003), Halosphaeriaceae. 1. See Campbell *et al.* (*Mycol.* 95: 544, 2003).
- pantherine**, a metabolite of *Amanita pantherina*, etc., toxic to humans and flies (*Musca* sp.); muscimol; amanita factor B.
- pantonemic** (of e.g. *Oomycota*, *Hyphochytriomycota*), presumed to have evolved from algae. Pantonemic 'fungi' exhibit the diaminopimelate pathway for lysine synthesis; the dominant sterols are cholesterol (not ergosterol); and the storage product is mycolaminarin (not glycogen).
- Pantonemomycota**. Phylum proposed by Olive (*The mycetozoans*, 1975) for the fungi placed in *Oomycota* and *Hyphochytriomycota* in this *Dictionary*.
- Pantospora** Cif. (1938) = *Pseudocercospora* fide Deighton (*Mycol. Pap.* 140, 1976), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003).
- Panus** Fr. (1838) nom. cons., Polyporaceae. 25 (on wood), widespread. See Corner (*Beih. Nova Hedwigia* 69, 1981), Pegler (*Kew Bull. Addit. Ser.* 10, 1983; world monogr., as *Lentinus* subgen. *Panus*), Hibbett & Vilgalys (*Mycol.* 83: 425, 1991; phylogeny), Hibbett & Vilgalys (*Syst. Bot.* 18: 409, 1993; phylogeny) See also Luminescent fungi.
- Paoayensis** Cabanela, Jeewon & K.D. Hyde (2007), Sordariomycetes. 1, Philippines. See Cabanela *et al.* (*Cryptog. Mycol.* 28: 301, 2007).
- paper** (fungi on), see Biodeterioration.
- papilionaceous**, variegated; mottled; marked with different colours as the lamellae of certain *Panaeolus* spp.
- Papilionospora** V.G. Rao & B. Sutton (1976), anamorphic *Pezizomycotina*, Hsy.0eP.10. 1, Myanmar; Italy. See Rao & Sutton (*Kavaka* 3: 23, 1975).
- Papilionovela** Aptroot (1997), Ostropales. 1 (from bark), Papua New Guinea. See Aptroot (*MR* 101: 266, 1997).
- Papiliotrema** J.P. Samp., M. Weiss & R. Bauer (2002), Tremellaceae. 1, Portugal. See Sampaio *et al.* (*Mycol.* 94: 875, 2002), Sampaio (*Frontiers in Basidiomycote Mycology*: 49, 2004).
- papilla**, a small rounded process.
- papillae** (of host tissue), localized wall thickenings on the inner surface of plant cell walls at sites penetrated by fungi; callosity, lignituber, callus, 'sheath', are whole or part synonyms (Aist, *Ann. Rev. Phytopath.* 14: 145, 1976).
- Papillaria** J. Kickx f. (1835) nom. rej. prop. ≡ *Pycnothelia*.
- papillate**, having a papilla (Fig. 23.40).
- Pappimyces** B. Sutton & Hodges (1975), anamorphic *Pezizomycotina*, Hso.0fH.6. 1, Brazil. See Sutton & Hodges (*Nova Hedwigia* 26: 527, 1975).
- Papulare** Tomas. & Cif. (1952) ≡ *Phragmothele*.
- Papularia** Fr. (1825) [non *Papularia* Forssk. 1775, *Aizoaceae*] = *Arthrimum* fide Ellis (*Mycol. Pap.* 103, 1965).
- Papulariomyces** Cif. & Tomas. (1953) ≡ *Papulare*.
- Papulaspora** Preuss (1851), anamorphic *Chaetomium*, *Melanospora*, Hso.#eP.1. c. 24, widespread. *P. byssina* is the brown plaster mould of mushroom beds; wood pulp is damaged by other spp.; *P. stoveri* is a mycoparasite of *Rhizoctonia*. The hyphae bear 'papulospores' (q.v.), small rounded propagules comprising one or more enlarged central cells surrounded by a sheath of smaller cells. Forms having 'bulbils' (q.v.) are excluded as *Burgoa* and *Minimedusa* by Weresub & LeClair (*CJB* 49: 2203, 1971; gen. key). See Tubaki *et al.* (*TMSJ* 32: 31, 1991).
- Papulasporites** Shete & A.R. Kulk. (1978), Fossil Fungi. 1 (Tertiary), India.
- Papulosa** Kohlm. & Volkm.-Kohlm. (1993), Papulaceae. 1 (*Juncus* culms), USA. See Kohlmeyer & Volkmann-Kohlmeyer (*SA* 11: 95, 1993), Winka & Eriksson (*Mycoscience* 41: 97, 2000; DNA), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Papulaceae** Winka & O.E. Erikss. (2000), Sordariomycetidae (inc. sed.). 1 gen., 1 spp.
Lit.: Winka & Eriksson (*Mycoscience* 41: 97, 2000; DNA).
- papulose**, covered with pimples or pustules.
- Papulospora**, see *Papulaspora*.
- papulospore**, asexual spore in e.g. *Papulaspora sepe-donioides* (Weresub & LeClair, *CJB* 49: 2203, 1971).
- Papulosporonites** Schmied. & A.J. Schwab (1964), Fossil Fungi. 1 (Eocene), Germany.
- Papyrodiscaceae** Jülich (1982) = Corticiaceae.
- Papyrodiscus** D.A. Reid (1979), ? Corticiaceae. 1, Papua New Guinea. See Reid (*Beih. Sydowia* 8: 333, 1979).
- Paraaoria** R.K. Verma & Kamal (1987), anamorphic *Pezizomycotina*, St.0eP.19. 1, Nepal. See Verma & Kamal (*TBMS* 87: 645, 1986).
- Paraarthrocladium** Matsush. (1993), anamorphic *Pezizomycotina*, Hso.≡ eH.1/10. 1, Peru. See Matsushima (*Matsush. Mycol. Mem.* 7: 58, 1993).
- Parabotryon** Syd. (1926) ? = *Eudarlucula* fide Müller &

- von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Paracainiella** Lar.N. Vassiljeva (1983), Amphisphaeriaceae. 1 (on *Dryas*), Siberia. See Kang *et al.* (*MR* 103: 53, 1999).
- paracapillitium** (of *Lycoperdales*), a capillitium composed of thin-walled, hyaline, septate hyphae in contrast to a true capillitium of thick-walled, brown, aseptate hyphae (Kreisel, 1962).
- Paracapnodium** Speg. (1909) = *Scorias* fide Hughes (*Mycol.* 68: 693, 1976).
- Paracarpidium** Müll. Arg. (1883) = *Endocarpon* fide Zahlbruckner (*Catalogus Lichenum Universalis* 1, 1921).
- paracephalodium** (pl. -ia), a hyphal mat covering cyanobacteria arising from a squamulose lichen thallus which has a green alga as the photobiont (Poelt & Mayrhofer, *Pl. Syst. Evol.* 158: 265, 1988).
- Paraceratocladium** R.F. Castañeda (1987), anamorphic *Pezizomycotina*, Hso.1eH.15. 2, pantropical. See Castañeda (*Fungi Cubenses* 2: 8, 1987), Goh & Hyde (*Nova Hedwigia* 71: 95, 2000; Malaysia), Whitton *et al.* (*Fungal Diversity* 7: 175, 2001; Seychelles), Caldusch *et al.* (*Mycol.* 94: 1071, 2002; Brazil).
- Paracercospora** Deighton (1979) = *Pseudocercospora*. Widely used for the causal organisms of Sigatoka disease of banana. fide Deighton (*Mycol. Pap.* 144: 47, 1979), Crous *et al.* (*Mycol.* 93: 1081, 2001; phylogeny), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003).
- Paracesatiella** Petr. (1929) = *Schweinitziella* fide von Arx (*Acta Bot. Neerl.* 7: 503, 1958).
- Parachinomyces** Thaung (1979), anamorphic *Pezizomycotina*, Hso.≡ eH.10. 1 (on *Acroconidiellina*), Myanmar. See Thaung (*TBMS* 72: 333, 1979).
- Parachionomyces** Thaung (1979), anamorphic *Pezizomycotina*, Hso.≡ eH.10. 1 (on *Acroconidiellina*), Myanmar.
- Parachnopeziza** Korf (1978), *Hyaloscyphaceae*. 8, widespread. See Arendholz & Sharma (*Mycotaxon* 20: 633, 1984), Korf & Zhuang (*Mycotaxon* 22: 483., 1985), Gamundí & Giaioti (*Sydowia* 46: 12, 1994), Zhuang (*Mycotaxon* 69: 359, 1998; 2 spp. China).
- Paracoccidioidaceae** Redaelli & Cif. (1937) = *Ajellomycetaceae*.
- Paracoccidioides** F.P. Almeida (1930), anamorphic *Ajellomycetaceae*, Hso.0eH.3. 1 (on humans), S. America. *P. brasiliensis* (paracoccidioidomycosis; q.v.). See Restrepo *et al.* (*RMVM* 8: 97, 1973; 183 refs), Takeo *et al.* (*MR* 94: 1118, 1990; cytoplasmic and plasma membrane ultrastructure), San-Blas & San-Blas (*Jap. J. Med. Mycol.* 32: 75, 1991; morphogenesis), Franco *et al.* (Eds) (*Paracoccidioidomycosis*, 1994), Le Clerc *et al.* (*J. Med. Vet. Mycol.* 32: 331, 1994; syst. posn), Vidal *et al.* (*Revista do Instituto de Medicina Tropical de São Paulo* 37: 43, 1995; from armadillo), San-Blas *et al.* (*Microbiology Reading* 143: 197, 1997; biometrics), Sandhu *et al.* (*J. Clin. Microbiol.* 35: 1894, 1997; molecular detection), Calcagno *et al.* (*J. Clin. Microbiol.* 36: 1733, 1998; biogeography), Cano *et al.* (*J. Clin. Microbiol.* 36: 742, 1998; karyotypes), Hamilton (*Medical Mycology* 36: 351, 1998; serological diagnostics), Wanke & Londero (*Topley & Wilson's Microbiology and Microbial Infections* Edn 9. Vol. 4 Medical Mycology: 395, 1998; review), Montoya *et al.* (*Medical Mycology* 37: 219, 1999; karyotypes), Sano *et al.* (*Mycopathologia* 143: 165, 1998; comparison between human and armadillo strains), Bialek *et al.* (*J. Clin. Microbiol.* 38: 3190, 2000; phylogeny), Niño-Vega *et al.* (*Medical Mycology* 38: 437, 2000; geographical isolation), Hahn *et al.* (*Revta Iberoamer. Micol.* 19: 49, 2002; RAPD characterization), San-Blas *et al.* (*Medical Mycology* 40: 225, 2002; molecular approaches), Feitosa *et al.* (*Fungal Genetics Biol.* 39: 60, 2003; chromosomes), Hebeler-Barbosa *et al.* (*J. Clin. Microbiol.* 41: 5733, 2003; phylogeny), Nascimento *et al.* (*J. Clin. Microbiol.* 42: 5007, 2004; microsatellites), Borba *et al.* (*Antonie van Leeuwenhoek* 88: 257, 2005; polyphasic characterization), Oliveira *et al.* (*MR* 109: 707, 2005; cDNA), San-Blas *et al.* (*J. Clin. Microbiol.* 43: 4255, 2005; molecular detection), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny), Matute *et al.* (*J. Clin. Microbiol.* 44: 2153, 2006; microsatellites, phylogenetic species), Matute *et al.* (*Mol. Biol. Evol.* 23: 65, 2006; cryptic speciation), Soares *et al.* (*Mycopathologia* 165: 179, 2008; review).
- paracoccidiomycosis**, see *Paracoccidioides*.
- Paraconiothyrium** Verkley (2004), anamorphic *Montagnulaceae*. Anamorph *Paraphaeosphaeria*. 6, widespread. See Verkley *et al.* (*Stud. Mycol.* 50: 327, 2004), Damm *et al.* (*Persoonia* 20: 9, 2008; on woody plants).
- Paracoreomyces** R.A. Poiss. (1929) = *Coreomyces* fide Thaxter (*Memoirs of the American Academy of Arts and Sciences* 16: 1, 1931).
- Paracostantinella** Subram. & Sudha (1989), anamorphic *Pezizomycotina*, Hso.0eH.10. 1, India. See Subramanian & Sudha (*Kavaka* 15: 12, 1987).
- Paracryptophiale** Kuthub. & Nawawi (1994), anamorphic *Pezizomycotina*, Hso.#eH-P.15. 2, Malaysia; China. See Kuthubutheen & Nawawi (*MR* 98: 125, 1994), Wu & Sutton (*Fungal Diversity* 14: 265, 2003).
- Paracudonia** Petr. (1927) = *Roesleria* fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).
- Paracytosporea** Petr. (1925), anamorphic *Pezizomycotina*, St.0eH.?. 1, N. America.
- Paradactylaria** Subram. & Sudha (1989), anamorphic *Pezizomycotina*, Hsy.1eH.10. 1, India. See Subramanian & Sudha (*Kavaka* 15: 16, 1987).
- Paradactylella** Matsush. (1993), anamorphic *Pezizomycotina*, Hso.≡ eH.2. 1, Peru. See Matsushima (*Matsush. Mycol. Mem.* 7: 59, 1993).
- Paradendryphiopsis** M.B. Ellis (1976), anamorphic *Pezizomycotina*, Hso.≡ eP.25. 3, Europe; S. Africa. See Révay (*Stud. Bot. Hung.* 18: 65, 1985).
- Paradietioarthrinium** Matsush. (1996), anamorphic *Pezizomycotina*, Hso.?.?. 1, Transvaal. See Matsushima (*Matsush. Mycol. Mem.* 9: 18, 1996).
- Paradidymella** Petr. (1927) = *Discostroma* fide Dennis (*British Ascomycetes*, 1968), Hawksworth & Sivanesan (*TBMS* 67: 39, 1976).
- Paradidymobotryum** C.J.K. Wang & B. Sutton (1984), anamorphic *Pezizomycotina*, Hsy.1eP.4. 1, USA. See Wang & Sutton (*Mycol.* 76: 570, 1984).
- Paradiplodia** Speg. ex Trotter (1931), anamorphic *Pezizomycotina*, St.1eP.?. 7, widespread. See Zambettakis (*BSMF* 70: 219, 1955; as *Paradiplodiella*), Petrak (*Sydowia* 16, 1963).
- Paradiplodiella** Zambett. (1955) = *Botryodiplodia* fide Sutton (*Mycol. Pap.* 141, 1977).
- Paradiscloridium** Bhat & B. Sutton (1985), anamorphic *Pezizomycotina*, Hso.≡ eP.15. 1, Ethiopia; New Zealand. See Bhat & Sutton (*TBMS* 84: 723, 1985).
- Paradiscina** Benedix (1969) = *Gyromitra* fide Benedix

- (*Kulturpflanz.* 19: 163, 1972), Harmaja (*Karstenia* 15: 33, 1976).
- Paradiscula** Petr. (1941), anamorphic *Pezizomycotina*, Cpd.0eH.15. 1, Europe. See Morgan-Jones (*Mycotaxon* 2: 167, 1975).
- Paradoxa** Mattir. (1935), Tuberaceae. 1 (hypogeous), Italy. See Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Paradoxomyces** Matzer (1996), Arthoniaceae (L). 1 (on lichens), Indonesia. See Matzer (*Mycol. Pap.* 171: 93, 1996), Grube (*Bryologist* 101: 377, 1998).
- Paraeccilia** Largent (1994) = *Entoloma* fide Kuyper (*in litt.*).
- Paraepicoccum** Matsush. (1993), anamorphic *Pezizomycotina*, Hsp.#eP.2. 1, Peru. See Matsushima (*Matsush. Mycol. Mem.* 7: 59, 1993).
- Paraeutypa** Subram. & Ananthap. (1988) = *Lep-toperidia* fide Rappaz (*Mycol. Helv.* 3: 281, 1989).
- Parafulvia** Kamal, A.N. Rai & Morgan-Jones (1983), anamorphic *Pezizomycotina*, Hso.≡ eP.10. 1, India. See Kamal *et al.* (*Mycotaxon* 18: 67, 1983).
- Paragaemannomyces** Matsush. (2003), Sordariomycetes. 1, Japan. See Matsushima (*Matsush. Mycol. Mem.* 10: 156, 2001).
- Paraglomeraceae** J.B. Morton & D. Redecker (2001), Paraglomerales. 1 gen., 3 spp.
Lit.: Azcon-Aguilar & Barea (*Mycorrhiza* 6: 457, 1996), van der Heijden *et al.* (*Nature Lond.* 396: 69, 1998), Morton & Redecker (*Mycol.* 93: 183, 2001), Schüßler *et al.* (*MR* 105: 1413, 2001), Redecker (*Glomeromycota* Arbuscular mycorrhizal fungi and their relative(s). Version 01 July 2005. <http://tolweb.org/Glomeromycota/28715/2005.07.01> in The Tree of Life Web Project, <http://tolweb.org>: [unpaginated], 2005).
- Paraglomerales** C. Walker & A. Schüssler (2001). Glomeromycetes. 1 fam., 1 gen., 3 spp. Fam.:
Paraglomeraceae
 For *Lit.* see under fam.
- Paraglomus** J.B. Morton & D. Redecker (2001), Paraglomeraceae. 3, widespread. See Morton & Redecker (*Mycol.* 93: 188, 2001), Redecker & Raab (*Mycol.* 98: 885, 2006; phylogeny), Walker *et al.* (*MR* 111: 253, 2007; nomencl.).
- Paragranatisporites** Kalgutkar & Janson. (2000), Fossil Fungi. 1.
- Paragranatisporites** Zhong Y. Zhang (1980), Fossil Fungi. 1. See Zhang (*Acta Palaeont. Sin.* 19: 298, 1980).
- paragynous** (of *Pythiaceae*), having the antheridium at the side of the oogonium.
- Paragyrodon** (Singer) Singer (1942), Paxillaceae. 1, N. America. See Bruns *et al.* (*Mol. Ecol.* 7: 257, 1998; phylogeny).
- Parahaplotrichum** W.A. Baker & Partridge (2001), anamorphic *Botryobasidium*. 1, USA. See Partridge *et al.* (*Mycotaxon* 77: 360, 2001).
- Paraharknessia** Matsush. (2003), anamorphic *Pezizomycotina*, Hso.???. 1, Japan. See Matsushima (*Matsush. Mycol. Mem.* 10: 30, 2001).
- Parahelminthosporium** Subram. & Bhat (1989) = *Polytretophora* fide Sutton (*in litt.*).
- Parahendersonia** A.W. Ramaley (1995), anamorphic *Chaetoplea*, Cpd.???. 2, USA. See Ramaley (*Aliso* 14: 152, 1995).
- Parahyalotiopsis** Nag Raj (1976), anamorphic *Pezizomycotina*, Cpd.≡ eP.19. 1, Myanmar. See Nag Raj (*CJB* 54: 1370, 1976).
- Parahydraeomyces** Speg. (1915) = *Hydraeomyces* fide Siemaszko & Siemaszko (*Polsk. Pismo Entom.* 12: 125, 1933).
- Paraisaria** Samson & B.L. Brady (1983), anamorphic *Ophiocordyceps*, Hsy.0eH.15. 1 (on larvae of *Hepialus*), British Isles; Germany. See Samson & Brady (*TBMS* 81: 285, 1983).
- Paralaestadia** Sacc. ex Vain. (1921) nom. rej. prop. ? = *Lichenochora* fide Hoffmann & Hafellner (*Biblthca Lichenol.* 77: 1, 2000).
- Paralepista** Raithelh. (1981) = *Lepista* fide Kuyper (*in litt.*).
- Paraleptonia** (Romagn. ex Noordel.) P.D. Orton (1991) = *Entoloma* fide Kuyper (*in litt.*).
- Paralethariicola** Calatayud, Etayo & Diederich (2001), Odontotremataceae. 1, Spain. See Calatayud *et al.* (*Lichenologist* 33: 478, 2001), Diederich *et al.* (*Lichenologist* 34: 479, 2002).
- Paraliomyces** Kohlm. (1959), Pleosporales. 1 (marine), India. See Read *et al.* (*CJB* 70: 2223, 1993; ultrastr.), Tam *et al.* (*Bot. Mar.* 46: 487, 2003; phylogeny).
- Paramassariothea** Subram. & Muthumary (1979), anamorphic *Pezizomycotina*, St.≡ eH.19. 1, India. See Subramanian & Muthumary (*CJB* 57: 2427, 1979).
- Paramazzantia** Petr. (1927) = *Mazzantia* fide Barr (*Mycol. Mem.* 7: 232 pp., 1978).
- Paramenisporopsis** Matsush. (2003), anamorphic *Pezizomycotina*, Hso.???. 1, Japan. See Matsushima (*Matsush. Mycol. Mem.* 10: 26, 2001).
- Paramicrothallites** K.P. Jain & R.C. Gupta (1970), Fossil Fungi, Microthyriaceae. 2 (Miocene), India.
- Paramitra** Benedix (1962) = *Peziza* Fr. fide Nannfeldt (*Ann. bot. fenn.* 3: 309, 1966).
- Paramoeciella** Zebrowski (1936), Fossil Fungi ? Chytridiomycetes. 1 (Cambrian to ? Recent), Australia.
- paramorph**, a neutral term proposed by Huxley (*The new systematics*: 37, 1940) for any form differing from the mean of the group; advocated for use in fossil fungi lacking characters essential for their proper placement, but believed to have affinities with particular non-fossil groups by Reynolds (*Mycotaxon* 23: 141, 1985).
- paramorphogen**, a compound (e.g. validomycin A, L-sorbose) able to induce a reversible morphological change in fungi (Tatum *et al.*, *Science* 109: 509, 1949, Jejewolo *et al.*, *TBMS* 91: 653, 661, 1988).
- Paramphisphaeria** F.A. Fern., J.D. Rogers, Y.M. Ju, Huhndorf & L. Umaña (2004), Xylariaceae. 1, Costa Rica. See Fernández *et al.* (*Mycol.* 96: 175, 2004).
- Paramyces** Oehm (1937) nom. inval. = *Ptychogaster* fide Donk (*Taxon* 11: 94, 1962).
- Paranectria** Sacc. (1878), Bionectriaceae. 3 (lichenicolous), Europe. See Hawksworth & Pirozynski (*CJB* 55: 2555, 1977; nomencl.), Hawksworth (*Notes R. bot. Gdn Edinb.* 40: 375, 1982), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Paranectriella** (Henn. ex Sacc. & D. Sacc.) Höhn. (1910), Tubeufiaceae. Anamorphs *Araneomyces*, *Ti-taea*. 7, widespread (tropical). See Hawksworth & Pirozynski (*CJB* 55: 2555, 1977; nomencl.), Rossman (*Mycol. Pap.* 157, 1987; key).
- Paraniesslia** K.M. Tsui, K.D. Hyde & Hodgkiss (2001), Niessliaceae. 1, Hong Kong. See Tsui *et al.* (*Mycol.* 93: 1002, 2001).
- Paranosema** Y.Y. Sokolova, V.V. Dolgikh, E.V. Morzhina, E.S. Nassonova, I.V. Issi, R.S. Terry, J.E. Ironside, J.E. Smith & C.R. Vossbrinck (2003), Microsporidia. 2. See Sokolova *et al.* (*J. Invert. Path.*

- 84: 159, 2003).
- Paranthostomella** Speg. (1910) ? = *Anthostomella* fide Francis (*Mycol. Pap.* 139, 1975), Læssøe (*SA* 13: 43, 1994), Lu & Hyde (*Fungal Diversity Res. Ser.* 4, 2000).
- Paraparmelia** Elix & J. Johnst. (1986) = *Xanthoparmelia* fide Elix & Johnston (*Mycotaxon* 32: 399, 1988; 15 spp. S. Hemisph.), Elix (*Bryologist* 96: 359, 1993), Elix (*Biblthca Lichenol.* 80, 2001; revision), Elix (*Mycotaxon* 87: 395, 2003), Blanco *et al.* (*Taxon* 53: 959, 2004).
- Parapaxillus** Singer (1942) nom. inval.; nom. prov. = *Paxillus* fide Kuyper (*in litt.*).
- Parapeltella** Speg. (1919) = *Micropeltis* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Parapericonia** M.B. Ellis (1976), anamorphic *Pezizomycotina*, Hsp.0eP.1/10. 2, Africa; Australia. See Alcorn & Kirk (*TBMS* 85: 561, 1985; amendment gen.).
- Parapericoniella** U. Braun, Heuchert & K. Schub. (2006), anamorphic *Pezizomycotina*, H?..?. 1, W. Africa. See Braun *et al.* (*Schlechtendalia* 13: 59, 2006).
- Paraphaeoisaria** de Hoog & Morgan-Jones (1978), anamorphic *Pezizomycotina*, Hso.0eH.10. 1, USA. See de Hoog & Morgan-Jones (*Mycotaxon* 7: 133, 1978).
- Paraphaeosphaeria** O.E. Erikss. (1967), Montagnulaceae. Anamorph *Paraconiothyrium*. 23, Europe; N. America. See Crivelli (*Über die heterogene Ascomycetengattung Pleospora Rbh.*, 1983; key), Shoemaker & Babcock (*CJB* 63: 1284, 1985; key), Ramaley (*Mycotaxon* 61: 347, 1997), Câmara *et al.* (*MR* 105: 41, 2001; morphology, DNA), Câmara *et al.* (*MR* 107: 516, 2003; revision, phylogeny), Verkley *et al.* (*Stud. Mycol.* 50: 323, 2004; anamorph).
- Paraphelaria** Corner (1966), *Pucciniomycotina*. 2, Java; south Pacific. See Corner (*Persoonia* 4: 346, 1966).
- Paraphelariaceae** Jülich (1982) = *Auriculariaceae*.
- Paraphialocephala** Budathoki (1997), anamorphic *Pezizomycotina*, Hso.???. 1, Nepal. See Budathoki (*Himalayan Microbial Biodiversity Part 1 Recent Researches in Ecology, Environment and Pollution* 10: 122, 1997).
- Paraphoma** Morgan-Jones & J.F. White (1983) = *Phoma* Sacc. fide van der Aa *et al.* (*Stud. Mycol.* 32: 1, 1990).
- paraphysis** (pl. **paraphyses**), a sterile upward growing, basally attached hyphal element in a hymenium, esp. in ascomycetes where they are generally filiform, unbranched or branched, and the free ends frequently make an epithecium over the asci, see hamathecium; in basidiomycetes, see hyphidium; **apical paraphyses**, the downward growing hyphae with free tips in the centrum of hypocrealean fungi (Luttrell, *TBMS* 48: 135, 1965), periphysoids; **asco-**, a multicellular diploid storage hypha originating from the base of the ascus in *Erysiphaceae* (Speer, *Sydowia* 27: 1, 1976); **paraphysate**, having paraphyses.
- paraphysoid** (1) (of ascomycetes), see hamathecium; (2) (of basidiomycetes), a sterile accessory hymenial structure; see basidiole, cystidiole, hyphidium; **-network**, branched and anastomosing paraphysoids surrounding asci in some ascolocular ascomycetes.
- Paraphysorma** A. Massal. (1852) nom. rej. = *Staurothele* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Paraphysotheca** Bat. (1961) = *Schizothyrium* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Paraphysothele** Zschacke (1934) = *Thelidium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Parapithomyces** Thaung (1976), anamorphic *Pezizomycotina*, Hso.#eP.10. 2, Myanmar; Australia. See Alcorn (*Aust. Syst. Bot.* 5: 711, 1992).
- Paraplacidiopsis** Servit (1953) = *Placidiopsis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Paraplacodium** Motyka (1996) nom. inval. = *Aspicilia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- paraplectenchyma**, *plectenchyma* (q.v.) composed of cells which have isodiametric lumina and unthickened walls (see Yoshimura & Shimada, *Bull. Kochi Gakuen Jun. Coll.* 11: 13, 1980).
- Parapleistophora** I.V. Issi, Kadyrova, Pushkar, Khodzhaeva & S.V. Krylova (1990), *Microsporidia*. 1.
- Parapleurotheciopsis** P.M. Kirk (1982), anamorphic *Pezizomycotina*, Hso.= eH-P.3. 3, British Isles; Japan; Cuba. See Castañeda Ruiz *et al.* (*Mycotaxon* 59: 203, 1996).
- Parapolyporites** Tanai (1987), *Fossil Fungi*. 1, Japan.
- Paraporpidia** Rambold & Pietschm. (1989), *Porpidiaceae* (L). 3, Australasia; China; Indonesia. See Rambold & Pietschmann (*Biblthca Lichenol.* 34: 243, 1989).
- Parapterulicium** Corner (1952), *Pterulaceae*. 3, Brazil. See Corner (*Ann. Bot., Lond.* n.s. 16: 285, 1952).
- Parapyrenis** Aptroot (1991), *Requienellaceae*. 8, widespread (tropical). See Eriksson (*in litt.*), Aptroot (*Nova Hedwigia* 60: 325, 1995; key).
- Parapyricularia** M.B. Ellis (1972), anamorphic *Pezizomycotina*, Hso.= eP.10. 2, Asia; Brazil. See Ellis (*Mycol. Pap.* 131: 12, 1972), Silva *et al.* (*Mycotaxon* 92: 43, 2005).
- Pararobillarda** Matsush. (1996), anamorphic *Pezizomycotina*, Cpd.???. 1, Cape Province. See Matsushima (*Matsush. Mycol. Mem.* 9: 18, 1996).
- Parasaccharomyces** Beurm. & Gougerot (1909) nom. rej. = *Candida* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Parasarcopodium** Melnik, S.J. Lee & Crous (2004), anamorphic *Pezizomycotina*. 1, S. Africa. See Mel'nik *et al.* (*Mycol. Progr.* 3: 22, 2004).
- Parascedosporium** Gilgado, Gené, Cano & Guarro (2007), anamorphic *Microascaceae*. 1. See Gilgado *et al.* (*Int. J. Syst. Evol. Microbiol.* 57: 2171, 2007).
- Parasclerophoma** Petr. (1924) ? = *Dothichiza* fide Clements & Shear (*Gen. Fung.*, 1931).
- Parascorias** J.M. Mend. (1930) = *Rizalia* fide Pirozynski (*Kew Bull.* 31: 595, 1977).
- Parascutellinia** Svrček (1975), *Pyronemataceae*. 3, Europe. See Benkert (*Gleditschia* 13: 147, 1985), Donadini (*Boll. Gruppo Micol. 'G. Bresadola'* 29: 273, 1986), Schumacher (*Mycotaxon* 33: 149, 1988), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- parasexual cycle**. A mechanism discovered by Pontecorvo (q.v.) & Roper in 1952 in filamentous fungi by which re-combination of hereditary properties is based not on sexual reproduction (meiosis) but on the mitotic cycle. The essential features of the process are: (1) the production of diploid nuclei in a heterokaryotic haploid mycelium; (2) the multiplication of

the diploid nuclei along with haploid nuclei in a heterokaryotic mycelium; (3) the sorting out of a diploid homokaryon; (4) segregation and recombination by crossing-over at mitosis; (5) haploidization of the diploid nuclei.

The results are similar to those achieved by meiosis but instead of a regular sequence of events in time as in the meiotic cycle, in the parasexual cycle the various processes may all be occurring at one time in one mycelium, at rates which have been estimated. The parasexual cycle may (as in *Aspergillus nidulans*) or may not (*A. niger*) be accompanied by a sexual cycle. Although the details of the mechanism of the parasexual cycle are unknown, Pontecorvo and his school obtained data from the parasexual cycle for mapping the 8 chromosomes of *Aspergillus nidulans*, results which showed good agreement with those for the same fungus obtained by the analysis of the sexual cycle. See Pontecorvo *et al.* (*Advances in genetics* 5: 141, 1953), Pontecorvo & Käfer (*Advances in Genetics* 9: 71, 1958). For other aspects see Pontecorvo (*Ann. Rev. Microbiol.* 10: 393, 1956), Pontecorvo *et al.* (*J. gen. Microbiol.* 8: 198, 1953; *Aspergillus niger*, 11: 94, 1954; *Penicillium chrysogenum*), Buxton (*J. gen. Microbiol.* 15: 133, 1956; *Fusarium oxysporum*). See protosexual.

Parasiphula Kantvilas & Grube (2006), Coccotremataceae (L). 1, Australasia. See Grube & Kantvilas (*Lichenologist* 38: 241, 2006).

parasite, an organism living on or in, and obtaining its nutrients from, its host, another living organism; a biotroph or necrotroph. Cf. parasymbiont, pathogen, symbiosis.

Parasitella Bainier (1903), Mucoraceae. 1 (facultative parasite of *Mucorales*), widespread (north temperate). See Schipper (*Stud. Mycol.* 17: 65, 1978), Kellner *et al.* (*Mycologist* 5: 120, 1990; parasitism, genetic transfer), Burmester & Wöstemeyer (*Curr. Genet.* 26: 456, 1994; genetics), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny), Schultze *et al.* (*Gene* 348: 33, 2005; sexuality & parasitism), Wöstemeyer & Schimek in Heitman *et al.* (Eds.) (*Sex in Fungi*: 431, 2007; trisporic acid & mating).

parasol mushroom, basidioma of the edible *Macrolepiota procera* (syn. *Lepiota procera*).

Parasola Redhead, Vilgalys & Hopple (2001), Psathyrellaceae. 20, widespread. See Jørgensen & Stalpers (*Taxon* 50: 909, 2001; nomencl.), Redhead *et al.* (*Taxon* 50: 203, 2001; nomencl.), Keirle *et al.* (*Fungal Diversity* 15: 33, 2004; Hawaii), Gams (*Taxon* 54: 520, 2005; nomencl.).

parasoredium, soredium-like structure, originally used for a structured plectenchyma in the upper thallus layer of the *Umbilicaria hirsuta* aggr. (see Codogno *et al.*, *Pl. Syst. Evol.* 165: 55, 1989).

Parasphaeria Syd. (1924) nom. dub. ? = *Massarina* fide von Arx & Müller (*Stud. Mycol.* 9, 1975), Aptroot (*Nova Hedwigia* 66: 89, 1998).

Parasphaeropsis Petr. (1953), anamorphic *Pezizomycotina*, Cpd.0fH.?. 1, Hawaii. See Petrak (*Sydowia* 7: 364, 1953).

Paraspora Grove (1884), anamorphic *Pezizomycotina*, Hsp.≡ eH.?. 2, Europe.

Parastempellia Khodzaeva (1988), Microsporidia. 1.

Parastenella J.C. David (1991), anamorphic *Pezizomycotina*, Hso.≡ eP.10. 1, USA. See Morgan-Jones (*Mycotaxon* 66: 421, 1998), Schubert & Braun (*Mycol. Progr.* 4: 101, 2005).

Parastereopsis Corner (1976), Cantharellaceae. 1, Borneo. See Corner (*Nova Hedwigia* 27: 331, 1976).

Parasteridiella H. Maia (1960) = *Asteridiella* fide Hughes (*in litt.*).

Parasteridium Speg. (1923) nom. dub., ? Meliolaceae. No species included. See Eriksson & Hawksworth (*SA* 7: 59, 1988).

Parasterina Theiss. & Syd. (1917) = *Asterina* fide Doidge (*Bothalia* 4: 273, 1942).

Parasterinella Speg. (1924), Asterinaceae. 2, S. America. See Arambarri (*Sydowia* 38: 1, 1986).

Parasterinopsis Bat. (1960), Asterinaceae. 3, widespread (tropical). See Batista (*Atas Inst. Micol. Univ. Recife* 1: 327, 1960).

Parastigmatea Doidge (1921), ? Polystomellaceae. 3, widespread (tropical).

Parastigmatellina Bat. & C.A.A. Costa (1959), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, Philippines; Australia. See Batista & Costa (*Mycopath. Mycol. appl.* 11: 61, 1959), Reynolds & Gilbert (*Aust. Syst. Bot.* 18: 265, 2005).

parasymbiont (obsol.), a fungus or lichen living on a lichen thallus but not causing any obvious damage (Zopf, *Ber. dtsh. bot. Ges.* 15: 90, 1897); a commensalistic or gall-forming lichenicolous fungus (Hawksworth, *Bot. J. Linn. Soc.* 96: 3, 1988). See Fungicolous fungi, Lichenicolous fungi.

Parasymphodiella Ponnappa (1975), anamorphic *Pezizomycotina*, Hso.≡ eH.39. 6, widespread. See Tokumasu (*TMSJ* 28: 19, 1987), Castañeda Ruiz *et al.* (*Mycotaxon* 65: 93, 1997).

Parataeniellaceae Manier & Lichtw. (1968), Eccriniales. 2 gen., 7 spp.

Paratalaromyces Matsush. (2003), Trichocomaceae. Anamorph *Penicillium*. 1, Taiwan. See Matsushima (*Matsush. Mycol. Mem.* 10: 111, 2001).

Paratetraploa M.K.M. Wong & K.D. Hyde (2002), anamorphic *Pezizomycotina*, H??.?. 1, Hong Kong. See Wong *et al.* (*Cryptog. Mycol.* 23: 196, 2002).

Parathalle Clem. (1909) = *Arthrorhaphis* fide Poelt & Hafellner (*Phyton Horn* 17: 213, 1976).

parathecium (1) (of apothecia), the outside hyphal layer, esp. if darker in colour (obsol.); (2) ectal excipulum (q.v.).

Paratheliaceae Zahlbr. (1903) = Pyrenulaceae.

Parathelium Nyl. (1862) = *Pyrenula* Ach. (1809) fide Upreti & Singh (*J. Econ. Taxon. Bot.* 10: 236, 1987; India), Harris (*Mem. N. Y. bot. Gdn* 49, 1989).

Parathelohania Codreanu (1966), Microsporidia. 9.

Paratomenticola M.B. Ellis (1976), anamorphic *Pezizomycotina*, Hso.≡ eP.10. 1, USA. See Ellis (*More Dematiaceous Hyphomycetes*: 175, 1976).

Paratorulopsis E.K. Novák & Zsolt (1961) = *Candida* fide Lodder (*Yeasts, a taxonomic study* 2nd edn, 1970).

Paratrichaegum Faurel & Schotter (1966) = *Epicoccum* fide Kendrick & Carmichael in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 390, 1973).

Paratrichaptum Corner (1987), Schizoporaceae. 1, Sumatra. See Corner (*Beih. Nova Hedwigia* 86: 136, 1987), Hattori (*Mycoscience* 42: 19, 2001).

Paratricharia Lücking (1997), Gomphillaceae (L). 1, Costa Rica. See Lücking (*Biblhca Lichenol.* 65: 77, 1997).

Paratrichoconis Deighton & Piroz. (1972), anamorphic *Pezizomycotina*, Hso.≡ eH.11. 4, widespread (esp. tropical).

Paratrichophaea Trigaux (1985), Pyronemataceae. 4,

- Europe; N. America. See Pfister (*Mycol.* **80**: 515, 1988; key 3 spp.), Perry *et al.* (*MR* **111**: 549, 2007; phylogeny).
- paratype**, see type.
- Paraulocladium** R.F. Castañeda (1986), anamorphic *Pezizomycotina*, Hso.#eP.26. 1, Cuba. See Castañeda (*Fungi Cubenses* **1**: 12, 1986).
- Parauncinula** S. Takam. & U. Braun (2005), Erysiphaceae. 2, Japan. See Takamatsu *et al.* (*Mycoscience* **46**: 14, 2005), Wang *et al.* (*Mycol.* **98**: 1065, 2006; phylogeny).
- Paravalsa** Ananthap. (1990), ? Valsaceae. 1, India. See Ananthapadmanaban (*MR* **94**: 275, 1990).
- paraxonemal body (PAR)**, proteinaceous structure restricted to particular region of the flagellum in chromophytes and euglenoids; also manifest as flagellar spines in male gametes of oogamous phaeophytes.
- Parberya** C.A. Pearce & K.D. Hyde (2001), Phyllachoraceae. 2, Australia. See Pearce & Hyde (*Fungal Diversity* **6**: 83, 2001).
- Parencoelia** Petr. (1950), Helotiaceae. 4 (on *Phyllachoraceae*), C. America; West Indies. See Zhuang (*Mycotaxon* **32**: 85, 1988), Zhuang (*Mycotaxon* **38**: 117, 1990).
- Parendomyces** Queyrat & Laroche (1909) nom. rej. = *Candida* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Parenglerula** Höhn. (1910), Englerulaceae. 5, widespread (tropical).
- parenthesome**, a curved double membrane (which may be perforate, imperforate, or vesiculate; see Moore, *Bot. Marina* **23**: 362, 1980) on each side of a dolipore septum (Moore & McAlear, *Am. J. Bot.* **49**: 86, 1962); see Fig. 13 'dolipore'; septal pore cap.
- Parepichloë** J.F. White & P.V. Reddy (1998), Clavicipitaceae. 7 (Epibiotic on grasses), pantropical. See White & Reddy (*Mycol.* **90**: 226, 1998), White *et al.* (*Stud. Mycol.* **45**: 95, 2000).
- Pareutypella** Y.M. Ju & J.D. Rogers (1996), Xylariales. 2, Taiwan. See Ju & Rogers (*Mycol.* **88**: 6, 1996).
- parietal**, fixed to the wall, e.g. of asci in a perithecium.
- parietin (physcion)**, a bright yellow-orange to red anthraquinone pigment (in *Teloschistaceae*) giving a crimson-purple reaction with K (q.v.). Also known in some species of *Aspergillus*, *Penicillium*, *Polygonum* (Angiosp.), *Rheum* (Angiosp.) and *Ventilago* (Angiosp.). See Metabolic products, Pigments.
- pariobasidium**, see basidium.
- Paris inch (Paris line)**, see line.
- Parkerella** A. Funk (1976) = *Lahmia* fide Eriksson (*Mycotaxon* **27**: 347, 1986).
- Parksia** E.K. Cash (1945) = *Chloroscypha* fide Korf in Ainsworth *et al.* (Eds) (*The Fungi* **4A**: 249, 1973).
- Parmastomyces** Kotl. & Pouzar (1964), Fomitopsidaceae. 7, widespread. See Kotlaba & Pouzar (*Reprim nov. Spec. Regni. veg.* **69**: 138, 1964).
- Parmathyrites** K.P. Jain & R.C. Gupta (1970), Fossil Fungi, Microthyriaceae. 2 (Tertiary), India.
- Parmelaria** D.D. Awasthi (1987), Parmeliaceae (L.). 2, Himalaya. See Blanco *et al.* (*Mycol.* **97**: 150, 2005; phylogeny), Blanco *et al.* (*Mol. Phylogen. Evol.* **39**: 52, 2006; phylogeny).
- Parmelia** Ach. (1803) nom. cons., Parmeliaceae (L.). 1322 s.lat.; s.str. 95, widespread (esp. temperate). This genus has been segregated into many smaller genera, not all of which are of value. See also *Lit.* under segregate names, esp. *Bulbothrix*, *Flavoparmelia*, *Hypotrachyna*, *Melanelia*, *Parmelina*, *Parmotrema*, *Pseudoparmelia*, *Punctelia*, *Relicina* and *Xanthoparmelia*. See Krog (*J. Hattori bot. Lab.* **52**: 303, 1982; conidia, gen. concepts), Galloway & Elix (*N.Z. Jl Bot.* **21**: 397, 1983), Hale (*Smithson. Contr. bot.* **66**, 1987; monogr. s. str., key), Eriksson & Hawksworth (*SA* **8**: 72, 1989; typification), Adler (*Mycotaxon* **38**: 331, 1990; key to segregates), Elix (*Bryologist* **96**: 359, 1993), Eriksson & Hawksworth (*SA* **13**: 146, 1994; concept), Hawksworth in Hawksworth (Ed.) (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. **269**: 383, 1994; gen. concepts), Kurokawa (*J. Jap. Bot.* **69**: 121, 1994; Japan spp.), Kurokawa (*J. Jap. Bot.* **69**: 204, 1994; Japan spp.), Kurokawa (*J. Jap. Bot.* **69**: 61, 1994; Japan spp.), Crespo *et al.* (*Lichenologist* **29**: 275, 1997; DNA), Crespo & Cubero (*Lichenologist* **30**: 369, 1998; segregate genera), Crespo *et al.* (*Pl. Syst. Evol.* **217**: 177, 1999; genetics, recolonization), Hale & DePriest (*Bryologist* **102**: 462, 1999; checklist parmelioid species), Wedin *et al.* (*MR* **103**: 1152, 1999; phylogeny), Smith & Hyde (*Fungal Diversity* **7**: 89, 2001; mtDNA phylogeny), Adler & Calvelo (*Mitteilungen aus dem Institut für Allgemeine Botanik Hamburg* **30-32**: 9, 2002; S America), Crespo *et al.* (*MR* **106**: 788, 2002; phylogeny, *P. saxatilis*), Thell *et al.* (*Mycol. Progr.* **1**: 335, 2002; phylogeny), Molina *et al.* (*Lichenologist* **36**: 37, 2004; phylogeny), Thell *et al.* (*Mycol. Progr.* **3**: 297, 2004; phylogeny), Thell *et al.* (*Symb. bot. upsal.* **34** no. 1: 429, 2004; Scandinavia), Blanco *et al.* (*Mol. Phylogen. Evol.* **39**: 52, 2006; phylogeny), Miadlikowska *et al.* (*Mycol.* **98**: 1088, 2006; phylogeny), Honegger & Zippler (*MR* **111**: 424, 2007; mating systems).
- Parmeliaceae** Zenker (1827), Lecanorales (L.). 88 gen. (+ 38 syn.), 2489 spp.
- Lit.*: Beltman (*Bibliotheca Lichenol.* **11**, 1978; thallus str.), Awasthi (*J. Hattori bot. Lab.* **65**: 207, 1989), Adler (*Mycotaxon* **38**: 331, 1990; key gen. *Parmelia* s.l.), Grgurinovic (Ed.) (*Flora of Australia* **32**: 41, 1990), Kärnefelt & Thell (*Pl. Syst. Evol.* **180**: 181, 1992), Elix (*Bryologist* **96**: 359, 1993; syn. key 64 gen.), Smith (*Bryologist* **96**: 326, 1993; key 115 spp. Hawaii), Orchard (Ed.) (*Flora of Australia* **55**, 1994; keys 31 gen.), Thell *et al.* (*Cryptog. Bot.* **5**: 120, 1995; ascus types), Elix (*Bibliotheca Lichenol.* **62**: 150 pp., 1996), Calvelo in Marcelli & Seaward (Eds) (*Lichenology in Latin America. History, Current Knowledge and Applications* [Proceedings of GLAL-3, Terceiro Encontro do Grupo Latino-Americano de Liqueólogos, São Paulo, Brazil, 24-28 September, 1997]: 117, 1998; keys to S Am. spp.), Crespo & Cubero (*Lichenologist* **30**: 369, 1998; DNA), Ingold (*Mycologist* **12**: 161, 1998), Kärnefelt (*Cryptog. Bryol.-Lichénol.* **19**: 93, 1998; rels with *Teloschistales*), Kärnefelt *et al.* (*Nova Hedwigia* **67**: 71, 1998; usneoid spp.), Lumbsch (*Lichenologist* **30**: 357, 1998), Mattsson & Wedin (*Lichenologist* **30**: 463, 1998), Saag (*Dissertationes Biologicae Universitatis Tartuensis* **34**, 1998; cetrarioid genera), Crespo *et al.* (*Lichenologist* **31**: 451, 1999; comparison of data types), Crespo *et al.* (*Pl. Syst. Evol.* **217**: 177, 1999), Grube *et al.* (*Curr. Genet.* **35**: 536, 1999), Mattsson & Wedin (*Lichenologist* **31**: 431, 1999), Stevens (*Bibliotheca Lichenol.* **72**: 128, 1999; usneoid taxa, Australia), Thell (*Lichenologist* **31**: 441, 1999), Wedin *et al.* (*MR* **103**: 1152, 1999; phylogeny), Esslinger

- (*Bryologist* 103: 568, 2000; S Afr. brown-spored spp.), Crespo *et al.* (*Taxon* 50: 807, 2001), Kurokawa & Lai (*Mycotaxon* 77: 225, 2001; Taiwan), Thell *et al.* (*Mycol. Progr.* 3: 297, 2004), Blanco *et al.* (*Mycol.* 97: 150, 2005), Blanco *et al.* (*Mol. Phylogen. Evol.* 39: 52, 2006), Divakar *et al.* (*Mol. Phylogen. Evol.* 40: 448, 2006), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Arup *et al.* (*Mycol.* 99: 42, 2007; sister group relations with *Parmeliaceae*), Crespo *et al.* (*Mol. Phylogen. Evol.* 44: 812, 2007), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny).
- Parmeliella** Müll. Arg. (1862), *Parmeliaceae* (L). c. 92, widespread (esp. tropical). See Jørgensen (*Op. bot. Soc. bot. Lund* 44, 1978; Eur.), Jørgensen (*Lichenologist* 30: 533, 1998), Makhija & Adawadkar (*Mycotaxon* 71: 323, 1999; Andamans), Jørgensen (*Lichenologist* 32: 139, 2000; C. & S. Am.), Jørgensen & Kashiwadani (*J. Jap. Bot.* 76: 288, 2001; Japan), Ekman & Jørgensen (*CJB* 80: 625, 2002; phylogeny), Jørgensen (*Bryologist* 106: 121, 2003; subtropics), Wedin & Wiklund (*Symb. Bot. Upsal.* 34 no. 1, 2004), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Parmelina** Hale (1974), *Parmeliaceae* (L). 22, widespread (esp. Europe; Asia). See Hale (*Smithson. Contr. bot.* 33, 1976), Elix & Johnston (*Brunonia* 9: 155, 1986; Australasia), Elix (*Flora of Australia* 55: 124, 1994), Thell *et al.* (*Symb. bot. upsal.* 34 no. 1: 429, 2004; Scandinavia), Blanco *et al.* (*Mol. Phylogen. Evol.* 39: 52, 2006; phylogeny), Argüello *et al.* (*Biol. J. Linn. Soc.* 91: 455, 2007; cryptic species), Honegger & Zippler (*MR* 111: 424, 2007; mating systems).
- Parmelinella** Elix & Hale (1987), *Parmeliaceae* (L). 4, widespread (esp. tropical). See Elix (*SA* 7: 110, 1988; nomencl.), Elix (*Flora of Australia* 55: 130, 1994), Blanco *et al.* (*Mol. Phylogen. Evol.* 39: 52, 2006; phylogeny), Divakar *et al.* (*Mol. Phylogen. Evol.* 40: 448, 2006; phylogeny, reln with *Bulbothrix*).
- Parmelinopsis** Elix & Hale (1987) = *Hypotrachyna* fide Elix & Hale (*Mycotaxon* 29: 242, 1987), Adler & Elix (*Mycotaxon* 43: 283, 1992; Argentina), Elix (*Flora of Australia* 55: 131, 1994), Crespo *et al.* (*Lichenologist* 31: 451, 1999; phylogeny, chemistry), Thell *et al.* (*Mycol. Progr.* 3: 297, 2004; phylogeny), Masson (*Cryptog. Mycol.* 26: 205, 2005; France), Blanco *et al.* (*Mol. Phylogen. Evol.* 39: 52, 2006; phylogeny), Divakar *et al.* (*Mol. Phylogen. Evol.* 40: 448, 2006; phylogeny, synonymy).
- Parmeliomyces** E.A. Thomas ex Cif. & Tomas. (1953) = *Parmelina* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Parmeliopsis** (Nyl. ex Stizenb.) Nyl. (1866) nom. cons., *Parmeliaceae* (L). 8, widespread (north temperate). See Meyer (*Mycol.* 74: 592, 1982), Hinds (*Mycotaxon* 72: 271, 1999; N. Am.), Crespo *et al.* (*Taxon* 50: 807, 2001; mtDNA phylogeny), Tehler & Källersjö (*Lichenologist* 33: 403, 2001), Thell *et al.* (*Symb. bot. upsal.* 34 no. 1: 429, 2004; Scandinavia), Blanco *et al.* (*Mol. Phylogen. Evol.* 39: 52, 2006; phylogeny).
- Parmentaria** Fée (1824) = *Pyrenula* Ach. (1809) fide Upreti & Singh (*Candollea* 43: 109, 1988; key 11 spp. India), Harris (*Mem. N. Y. bot. Gdn* 49, 1989).
- Parmentariomyces** Cif. & Tomas. (1953) = *Parmentaria*.
- Parmentieria** Trevis. (1860) = *Parmentaria*.
- Parmocarpus** Trevis. (1861) = *Xanthoria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Parmophora** M. Choisy (1950) = *Umbilicaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Parmosticta** Nyl. (1875) = *Crocodia*.
- Parmostictina** Nyl. (1875) nom. rej. = *Pseudocyphellaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Parmotrema** A. Massal. (1860), *Parmeliaceae* (L). c. 348, widespread (esp. tropical). See Hale (*Contr. US natn Herb.* 36: 193, 1965), Krog & Swinscow (*Bull. Br. Mus. nat. hist. Bot.* 9: 143, 1981), Krog & Swinscow (*Lichenologist* 15: 127, 1983), Louwhoff & Elix (*Biblthca Lichenol.* 73, 1999; New Guinea), Louwhoff & Crisp (*Bryologist* 103: 541, 2000), Kurokawa & Lai (*Mycotaxon* 77: 225, 2001; Taiwan), Louwhoff (*Biblthca Lichenol.* 78: 223, 2001; biogeography), Eliasaro & Donha (*Revista Brasileira de Botânica* 26: 239, 2003; Brazil), Blanco *et al.* (*Mycol.* 97: 150, 2005; phylogeny), Divakar *et al.* (*Lichenologist* 37: 55, 2005; phylogeny), Egan *et al.* (*Bryologist* 108: 402, 2005; Americas), Blanco *et al.* (*Mol. Phylogen. Evol.* 39: 52, 2006; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Ohmura *et al.* (*Bryologist* 109: 43, 2006; genetics).
- Parmotremopsis** Elix & Hale (1987), *Parmeliaceae* (L). 2, C. America; West Indies. See Elix & Hale (*Mycotaxon* 29: 243, 1987), Louwhoff & Crisp (*Bryologist* 103: 541, 2000; phylogeny, ? synonymy with *Parmotrema*).
- Parmularia** Lév. (1846), *Parmulariaceae*. 2, S. America. See Batista & Vital (*Atas Inst. Micol. Univ. Recife* 1: 159, 1960), Inácio & Cannon (*MR* 107: 82, 2003).
- Parmularia** Nilson (1907) = *Lecanora* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Ryan & Nash (*Nova Hedwigia* 64: 111, 1997).
- Parmulariaceae** E. Müll. & Arx ex M.E. Barr (1979), ? *Dothideomycetes* (inc. sed.). 34 gen. (+ 24 syn.), 119 spp.
Lit.: Stevens & Ryan (*Ill. biol. monogr.* 17 no. 2: 1, 1939), Doidge (*Bothalia* 4: 273, 1942; S. Afr.), von Arx & Müller (*Stud. Mycol.* 9, 1975; connexion), Bustin & Marmolejo (*Revta Mex. Micol.* 4: 9, 1988), Vasil'eva (*Mikol. Fitopatol.* 22: 388, 1988), Zhuang (*Mycotaxon* 32: 85, 1988), Sivanesan & Sinha (*MR* 92: 246, 1989), Inácio (*A monograph of the Parmulariaceae* [Thesis (PhD), University of London]: 417 pp., 2003), Inácio & Cannon (*MR* 107: 82, 2003).
- Parmulariella** Henn. (1904), *Dothideomycetes*. 1, S. America.
- Parmulariopsella** Sivan. (1970), *Parmulariaceae*. 1, Sierra Leone. See Sivanesan (*TBMS* 55: 509, 1970).
- Parmulariopsis** Petr. (1954), *Parmulariaceae*. 1, Borneo. See Petrak (*Sydowia* 8: 186, 1954).
- parmuliform**, shield-shaped with the margins slightly upturned.
- Parmulina** Theiss. & Syd. (1914), *Parmulariaceae*. 5, Asia; America.
- Parodiella** Speg. (1880), *Parodiellaceae*. Anamorph *Ascochytopsis*. 1 (on *Leguminosae*), widespread. See Sydow & Petrak (*Annls mycol.* 29: 190, 1931), von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Parodiellaceae** Theiss. & Syd. ex M.E. Barr (1987), *Pleosporales*. 2 gen. (+ 3 syn.), 5 spp.
Lit.: Cannon (*IMI Descr. Fungi Bact.* 141: [22] pp.,

- 1999).
- Parodiellina** Henn. ex G. Arnaud (1918), Parodiopsidaceae. Anamorph *Exosporinella*. 1, widespread (tropical).
- Parodiellina** Viégas (1944) = *Botryostroma* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Parodiellinaceae** G. Arnaud (1918) = Parodiopsidaceae.
- Parodiellinopsis** Hansf. (1946) ? = *Chevalieropsis* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Parodiodia** Bat. (1960) = *Apiosporina* Höhn. fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Parodiopsidaceae** Toro (1952), ? Dothideomycetes (inc. sed.). 20 gen. (+ 32 syn.), 94 spp.
Lit.: Sivanesan (*Mycol. Pap.* 146: 38 pp., 1981), von Arx & Müller (*Sydowia* 37: 6, 1984), Farr (*Sydowia* 38: 65, 1985), Hughes (*Mycol. Pap.* 166: 255 pp., 1993), Rodríguez Hernández (*Revta Jardín bot. Nac. Univ. Habana* 21: 127, 2000).
- Parodiopsis** Maubl. (1915) = *Perisporiopsis* Henn. fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Paropodia** Cif. & Bat. (1956) = *Triposporiopsis* fide Hughes (*Mycol.* 68: 693, 1976).
- Paropsis** Speg. (1918) = *Treubiomyces* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Parorbiliopsis** Spooner & Dennis (1986), Helotiaceae. c. 5, Europe. See Svrček (*Česká Mykol.* 45: 134, 1992), Svrček (*Česká Mykol.* 46: 149, 1993).
- parsimonious** (parsimony), see Cladistics.
- part spore**, one of the 1-celled spores resulting from the breaking up of a 2 or more celled ascospore.
- parthenogamy**, the state of an oospore formed with a diploid nucleus resulting from restitution at telophase I or telophase II of meiosis (note that the parthenogametic state cannot be presumed from the absence of an antheridium).
- parthenogenesis**, the apomitic development of haploid cells (Gäumann).
- parthenomixis**, see parthenogamy.
- Parthenope** Velen. (1934), ? Helotiales. 1, former Czechoslovakia.
- parthenospore**, an oospore (aboospore) or zygospor (azygospor) produced by parthenogenesis.
- partial veil** (or **inner veil**) (of agarics), a layer of tissue, developed from the stipe, which joins the stipe to the pileus edge during hymenium development, and which later may become an annulus or cortina; = *velum* (Persoon).
- partridge wood** (1) wood attacked by a pocket rot, e.g. one caused by *Stereum frustulatum*; [(2) wood of *Caesalpinia*].
- Paruephaedria** Zukal (1891) = *Dactylospora* fide Döbbeler & Triebel (*Bot. Jahrb. Syst.* 107: 503, 1985).
- Parvacoccum** R.S. Hunt & A. Funk (1988), Rhytismataceae. 1, Canada. See Hunt & Funk (*Mycotaxon* 33: 51, 1988).
- Parvobasidium** Jülich (1975), Cystostereaceae. 3, widespread. See Jülich (*Persoonia* 8: 302, 1975).
- Parvodontia** Hjortstam & Ryvarden (2004), ? Cystostereaceae. 1, Brazil. See Hjortstam & Ryvarden (*Syn. Fung.* 18: 28, 2004).
- Parvomycetes** Santam. (1995), Laboulbeniaceae. 1, Spain. See Santamaría (*MR* 99: 1071, 1995).
- Parvosympodium** A.W. Ramaley (2002), anamorphic *Pezizomycotina*, H??.?. 1, USA. Synanamorph *Stomiopeltopsis*. See Ramaley (*Mycotaxon* 83: 329, 2002).
- Parvulago** R. Bauer, M. Lutz, Piątek, Vánky & Oberw. (2007), Ustilaginaceae. 1 (on *Eleocharis* (Cyperaceae)), Europe (southern). See Bauer *et al.* (*MR* 111: 1199, 2007).
- Paryphydria**, see *Paruephaedria*.
- Pasania** fungus, the edible *Cortinellus shiitake*. See shiitake.
- Paschelkiella** Sherwood (1987), Odontotremataceae. 1, Europe; N. America. See Sherwood-Pike (*Mycotaxon* 28: 137, 1987).
- Pascherinema** De Toni (1936) nom. dub., anamorphic *Pezizomycotina*.
- Pasithoe** M.J. Decne. (1840) = *Paulia* Fée.
- paspalitrem**, a tremorgenic mycotoxin from *Phomopsis* sp. (Bills *et al.*, *MR* 96: 977, 1992).
- Paspalomycetes** Linder (1933), anamorphic *Pezizomycotina*, Hso.1eP.10. 1, USA.
- paspalum staggers**, see ergot.
- passage**, the experimental infection of a host with a parasite which is subsequently re-isolated; [a method used to increase the virulence of the parasite].
- Passalora** Fr. (1849), anamorphic *Mycosphaerella*, Hso.1 = eP.10. 581, Europe; N. America. *P. graminis* (leaf spot of cereals and grasses). See Deighton (*Mycol. Pap.* 112, 1967; key), Medeiros & Dianese (*Mycotaxon* 51: 509, 1994; key), Braun (*Schlechtendalia* 2: 1, 1999), Braun (*Cryptog. Mycol.* 20: 155, 1999; gen. concepts), Stewart *et al.* (*MR* 103: 1491, 1999), Crous *et al.* (*Stud. Mycol.* 45: 107, 2000; review), Crous *et al.* (*Mycol.* 93: 1081, 2001; phylogeny), Goodwin *et al.* (*Phytopathology* 91: 648, 2001; phylogeny), Braun *et al.* (*Mycol. Progr.* 2: 3, 2003; phylogeny), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003; nomenclator), Crous *et al.* (*Mycosphaerella Leaf Spot Diseases of Bananas: Present Status and Outlook* Proceedings of the 2nd International Workshop on *Mycosphaerella* Leaf Spot Diseases Held in San José, Costa Rica, 20-23 May 2002: 43, 2003; polyphasic systematics), Crous *et al.* (*Stud. Mycol.* 50: 457, 2004; on *Acacia*), Crous *et al.* (*Stud. Mycol.* 50: 195, 2004; on *Eucalyptus*), Hunter *et al.* (*Stud. Mycol.* 55: 147, 2006; on *Eucalyptus*).
- Passeriniella** Berl. (1891) nom. dub., Dothideomycetes. 2, Europe. See Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 34: 1, 1991), Khashnobish & Shearer (*MR* 100: 1341, 1996).
- Passerinula** Sacc. (1875), Pleosporales. 1 or 2 (on stromata of other fungi), Europe. See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Pasteur** (Louis; 1822-1895; France). Born in Dole, Jura; student, École Normale Supérieure, Paris; Professor of Physics, Dijon Lycée (1848); Professor of Chemistry, Stassbourg University (1849); Dean, Faculty of Sciences, University of Lille (1854); Director of Scientific Studies, École Normale Supérieure, Paris (1855). The work of this noted scientist, who was by training a chemist, has strongly affected biological thought and work. Among Pasteur's early investigations was a study of the isomeric forms of tartaric acid from which he discovered that only one of the two forms (the *d*-) in a racemic (*dl*-) mixture was used by '*Penicillium glaucum*'. This gave him an interest in fermenting processes and from 1854 onwards he made detailed studies on wine and beer making. One important outcome of this work was demonstration by experiment of the general principle

'omne vivum e vivo' (every living thing from a living thing). In 1865-1869, as a result of an investigation suggested by the chemist Dumas, he made clear the nature of the 'pébrine' and 'flacherie' diseases of silkworms and methods for their control. Pasteur's most important work was a development from Jenner's vaccination against small-pox (1796). His studies on chicken cholera (*Pasteurella aviseptica*), anthrax (*Bacillus anthracis*), and rabies in dogs and man made it clear that active immunization of man and animals against pathogenic organisms and viruses could be a generally applicable method. In 1888 the Institut Pasteur opened in Paris for development of his discoveries. *Publs. Note relative au Penicillium glaucum et à la dissymétrie moléculaire des produit organiques naturelles. Comptes Rendus Hebdomadaire des Séances de l'Académie des Sciences, Paris* (1860); *Études sur le Vin* (1866); *Études sur le Vinaigre* (1868); *Études sur la Maladie des Vers à Soie* (1870); *Études sur la Bière* (1876). *Biogs, obits etc.* Debré & Forster (*Louis Pasteur*, 1998); Dubos (*Louis Pasteur*, 1951); Tiner (*Louis Pasteur, Founder of Modern Medicine*, 1990); Valléry-Radot (*Vie de Pasteur*, 1900) [English translation Devonshire, 1911].

Pasteur effect, Increased respiration and decreased fermentation in the presence of oxygen and vice versa in the absence of oxygen; - **filter**, an unglazed porcelain tube for sterilization by filtration; - **pipette**, a short length of glass tubing with one end drawn out into a sealed capillary and the other plugged with cotton wool and sterilized, the tip of the capillary is broken before use; **pasteurization**, freeing a liquid or other material from pathogenic microorganisms by heat.

Patella F.H. Wigg. (1780) nom. rej. $\equiv$ Scutellinia fide Korf (*Taxon* 35: 378, 1986).

Patellaria Fr. (1822), Patellariaceae. c. 10, widespread (esp. temperate). See Butler (*Mycol.* 331: 612, 1939), Tilak & Srinivasulu (*Beih. Nova Hedwigia* 47: 459, 1974; Indian spp.), Bellemère *et al.* (*Cryptog. Mycol.* 7: 47, 1986; asci), Hawksworth (*Taxon* 35: 787, 1986; nomencl.), Kutorga & Hawksworth (*SA* 15: 1, 1997).

Patellaria Hoffm. (1789) = Diploschistes fide Santesson in Eriksson (*Op. Bot.* 60, 1981).

Patellaria Pers. (1794) = Caloplaca fide Riedl (*Taxon* 27: 302, 1978).

Patellariaceae Corda (1838), Patellariales. 15 gen. (+ 7 syn.), 38 spp.

Lit.: Bellemère (*Annl. Sci. Nat. Bot.*, sér. 12 12: 429, 1971; ultrastr.), Kamat *et al.* in Subramanian (Ed.) (*Taxonomy of fungi*, 1978; ascocarp structure), Bellemère *et al.* (*Cryptog. Mycol.* 7: 113, 1986), Kutorga & Hawksworth (*SA* 15: 1, 1997), Magnes *et al.* (*Mycotaxon* 68: 321, 1998), Silva-Hanlin & Hanlin (*MR* 103: 153, 1999; DNA), Liew *et al.* (*Mol. Phylogen. Evol.* 16: 392, 2000).

Patellariales D. Hawksw. & O.E. Erikss. (1986), ($\pm$ L). Dothideomycetes. 1 fam., 15 gen., 38 spp. Thallus crustose or immersed within the host tissues, or absent. Stromata absent or weakly developed, composed of intramatrical hyphae. Ascomata erumpent, eventually apothecial, sometimes strongly cupulate, sometimes elongated, the margin well-developed, frequently inrolled when dry. Interascal tissue of narrow anastomosing pseudoparaphyses, initially attached at apex and base but eventually becoming free

at the apex. Asci cylindrical, fissitunicate, J-, often with a well-developed ocular chamber. Ascospores hyaline or brown, transversely septate or muriform, usually without a sheath. Anamorphs coelomycetous where known. Saprobes on bark or wood or lichenized with green algae, a few lichenicolous, cosmop. Fam.:

Patellariaceae (syn. *Lecanidiaceae*)

Lit.: Bellemère (*Ann. Sci. nat., Bot.* sér. 12 12: 429, 1971; asci), Honegger (*Ber. dtsh. bot. Ges.* 91: 579, 1978, *Lichenologist* 12: 157, 1980; asci), Kamat (*in* Subramanian (Ed.), *Taxonomy of fungi* 1: 292, 1978; ontogeny), Pirozynski & Reid (*CJB* 44: 655, 1966).

Patellariopsis Dennis (1964), Helotiales. 5, Europe; Australia. See Dennis (*Kew Bull.* 19: 114, 1964), Nauta & Spooner (*Mycologist* 14: 65, 2000; UK).

Patellea (Fr.) Sacc. (1884) = Xylogramma fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).

patelliform, like a round plate having a well-marked edge.

Patellina Grove ex Petch (1943) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).

Patellina Speg. (1880) = Catinula fide Höhnelt (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt. 1* 124: 49, 1915).

Patellonectria Speg. (1919) = Aspidothelium fide Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952).

patent, stretching out; spreading.

Patent protection. The principle under which an 'inventor' of a new product or process by publicly disclosing details of his/her 'invention' is granted for a limited period a legally enforceable right to exclude others from exploiting the invention. Procedures, requirements and rights vary considerably in different countries. In general, it is possible to patent discoveries (and under certain circumstances organisms, including fungi) which are novel, show evidence of an inventive step, and are of utility (industrial applicability). The procedure for taking out a patent is complex and professional advice should be sought. It is recommended that the patent disclosure procedure should include the depositing in a genetic resource collection of a culture any fungus or other organism which forms part of the 'invention'. The Budapest Treaty allows for a single deposit in a recognized International Depository Authority (IDA), removing the need for deposits to be made in all countries where patent protection is sought. For fungi, recognized depositories include the American Type Culture Collection (www.atcc.org), Centraalbureau voor Schimmelcultures (www.cbs.knaw.nl) and IMI (q.v.).

The Convention on Biological Diversity (1992) also has implications for the patenting of genetic material from nature (Fritze, 1994).

Lit.: Budapest treaty on the international recognition of the deposit of microorganisms for the purpose of patent procedures (World Intellectual Property Organization, 1981), Bousfield (*in* Hawksworth & Kirsop (Eds), *Filamentous fungi* : 115, 1988), Crespi (*Patents: a basic guide to patenting in biotechnology* [Cambridge studies in biotechnology 6], 1988), Fritze (*in* Kirsop & Hawksworth (Eds), *The biodiversity of micro-organisms and the role of microbial resource centres*: 37, 1994). See Bioprospecting.

Patescospora Abdel-Wahab & El-Shar. (2002), Aliquandostipitaceae. 1, Egypt. See Pang *et al.* (*MR* 106: 1033, 2002), Campbell *et al.* (*CJB* 85: 873, 2007;

- phylogeny).
- pathogen**, a parasite able to cause disease in a particular host or range of hosts (*TBMS* 33: 155, 1950); **-ic**, disease-causing or able to be so; **-icity**, the condition of being pathogenic.
- pathotoxin**, see toxin.
- pathotype**, see pathovar.
- pathovar** (pv.) (of bacteria), an infrasubspecific subdivision characterized by a pathogenic reaction in one or more hosts; a pathotype (not recommended) See Young *et al.* (*ROPP* 70: 213, 1991).
- Patila** Adans. (1763) $\equiv$ *Oncomyces*.
- Patinella** Sacc. (1875), Helotiales. 3, widespread. See Spooner (*Bibliotheca Mycol.* 116, 1987).
- Patinellaria** H. Karst. (1885), Helotiaceae. 1, Europe; Mexico. See Dennis (*Mycol. Pap.* 62, 1956), Medel & Chaçon (*Rev. Mex. Micol.* 4: 251, 1988).
- Patouillard** (Narcisse Théophile; 1854-1926; France). A pharmacist, Paris (1881-1922); Préparateur de Cryptogamie, École Supérieure de Pharmacie, Paris (1893-1900); Assistant de la Chaire de Cryptogamie du Muséum d'Histoire Naturelle, Paris (1922 onwards). Noted for his work on anatomy and biology of larger fungi, and for contributions to the mycotas of north Africa, the Caribbean, France, North America, Oceania, South America and Spain. Collections mostly in FH, but some types in PC. *Publs. Les Hyménomycètes d'Europe* (1887); *Essai Taxonomique sur les Familles et les Genres des Hyménomycètes* (1900) [reprint, 1963]; also more than 200 papers [reprint, 3 vols, 1978]. *Biogs, obits etc.* Heim (*Annales de Cryptogamie Exotique* 1: 25, 1928); Heim (*Revue de Mycologie* 36 (2): i, 1972) [history, portrait]; Grumann (1974: 292); Mangin (*BSMF* 43: 8, 1927) [bibliography, portrait]; Pfister (Annotated index to fungi described by N. Patouillard. *Contributions of Reed Herbarium* 25, 1977); Stafleu & Cowan (*TL-2* 3: 94, 1981).
- Patouillardea** Roum. (1885) = *Dendrodochium* fide Höhnelt in Falk (*Mykol. Unters.* 1: 360, 1923).
- Patouillardiella** Speg. (1889), anamorphic *Pezizomycotina*, Hsp.1eH.?. 1, Brazil. See Petrak & Sydow (*Annls mycol.* 34: 11, 1936).
- Patouillardina** Bres. (1906), Auriculariales. 1, widespread (tropical). See Martin (*Mycol.* 31: 507, 1939), Donk (*Taxon* 7: 238, 1958).
- Patouillardina** G. Arnaud (1917) = *Meliolaster* Höhn. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Patouillardinaceae** Jülich (1982) Auriculariales.
- Patouillardiella**, see *Patouillardiella*.
- Patriciomyces** D. Hawksw. (2001), anamorphic *Pezizomycotina*. 1, USA. See Cole & Hawksworth (*Mycotaxon* 77: 327, 2001).
- patulin** (clavacin, clavatin, claviformin, expansin, mycoin, penicidin), a mycotoxin from *Aspergillus clavatus*, *Penicillium patulum*, *P. claviforme*, *P. expansum*, etc.; also antibacterial and antifungal (Raistrick *et al.*, *Lancet* 2: 625, 1943); toxic to plants and animals (carcinogenic to mice) and the cause of neurotoxicosis in cattle; can also occur in apple and pear juice (from *P. expansum*).
- Pauahia** F. Stevens (1925), Meliolaceae. 1 (from leaves), Hawaii. See Hughes (*Mycol.* 87: 702, 1995).
- Paucithecium** Lloyd (1923), Xylariaceae. 1, Brazil. See Læssøe (*SA* 13: 43, 1994; ? synonym of *Xylaria*).
- Paulia** Fée (1836), Lichinaceae (L). 10, widespread (tropical). See Henssen (*Lichenologist* 18: 201, 1986; key), Henssen & Tretiach (*Nova Hedwigia* 60: 297, 1995), Schultz *et al.* (*Bryologist* 102: 61, 1999; Socotra), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key), Schultz & Büdel (*Lichenologist* 35: 151, 2003).
- Paulia** Lloyd (1916) $\equiv$ *Xenosoma*.
- Paullicorticium** J. Erikss. (1958), Hydnaceae. 5, N. America; Europe. See Liberta (*Brittonia* 13: 219, 1962; key).
- Paurocotylis** Berk. ex Hook. f. (1855), Pyronemataceae. 1 (hypogeous), Europe; New Zealand. See Dennis (*Kew Bull.* 30: 345, 1974), Pegler *et al.* (*British truffles*, 1993), Crous *et al.* (*S. Afr. J. Bot.* 62: 89, 1996), Landvik *et al.* (*Nordic Jl Bot.* 17: 403, 1997; DNA), O'Donnell *et al.* (*Mycol.* 89: 48, 1997; phylogeny), Liu & Zhuang (*Mycosystema* 25: 546, 2006; phylogeny), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Paxillaceae** Lotsy (1907), Boletales. 9 gen. (+ 15 syn.), 78 spp.
Lit.: Beaton *et al.* (*Kew Bull.* 40: 573, 1985), Liu *et al.* (*Acta Mycol. Sin.* 8: 210, 1989), Montecchi & Lazzari (*Micol. Ital.* 18: 33, 1989), Besl *et al.* (*Z. Mykol.* 62: 195, 1996), Calonge & Siquier (*Boln Soc. Micol. Madrid* 23: 91, 1998), Bresinsky *et al.* (*Pl. Biol.* 1: 327, 1999), Hahn & Agerer (*Nova Hedwigia* 69: 241, 1999), Jarosch & Bresinsky (*Pl. Biol.* 1: 701, 1999), Kretzer & Bruns (*Mol. Phylogen. Evol.* 13: 483, 1999), Höhnelt *et al.* (*Mycorrhiza* 9: 315, 2000), Claridge *et al.* (*Aust. Syst. Bot.* 14: 273, 2001), Grubisha *et al.* (*Mycol.* 93: 82, 2001), Binder & Bresinsky (*Mycol.* 94: 85, 2002), Bruns & Shefferson (*CJB* 82: 1122, 2004), Becerra *et al.* (*Mycorrhiza* 15: 7, 2005), Nouhra *et al.* (*Mycol.* 97: 598, 2005).
- Paxillogaster** E. Horak (1966), Boletaceae. 1, S America. Basidioma gasteroid. See Horak & Moser (*Nova Hedwigia* 10: 332, 1966).
- Paxillopsis** E.-J. Gilbert (1931) nom. nud. = *Paxillus* fide Singer (*Agaric. mod. Tax.*, 1951).
- Paxillopsis** J.E. Lange (1940) $\equiv$ *Clitopilus*.
- Paxillus** Fr. (1836), Paxillaceae. 15 (ectomycorrhizal), widespread. See Singer (*Nova Hedwigia* 7: 93, 1964; S. Am. spp.), McNabb (*N.Z. Jl Bot.* 7: 349, 1969; NZ spp.), Corner (*Nova Hedwigia* 20: 793, 1970; Malaysia), Watling (*British Fungus Flora* 1, 1970; key Brit. spp.), Horak (*Sydowia* 32: 154, 1980; Australasia), Fries (*Mycotaxon* 24: 403, 1985; taxonomy), Singer *et al.* (*Beih. Nova Hedwigia* 98: 12, 1990; key C. Am. spp.), Bruns *et al.* (*Mol. Ecol.* 7: 257, 1998; phylogeny) The saprotrophic species are referred to *Tapinella*, Wallander & Söderström (*Paxillus – Ectomycorrhizal fungi, key genera in profile*, 1999; ecology).
- Paxina** Kuntze (1891) $\equiv$ *Acetabula*.
- Payosphaeria** W.F. Leong (1990), Hypocreales. 1 (wood, marine), Malaysia. See Leong *et al.* (*Bot. Mar.* 33: 511, 1990).
- Pazschkea** Rehm (1898) = *Tapellaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pazschkeella** Syd. & P. Syd. (1901), anamorphic *Microcycclus*, St.1eH.?. 2, Brazil; Philippines.
- PC**, Laboratoire de Cryptogamie, Museum National d'Histoire Naturelle (Paris, France); founded 1904; supported by the Ministry for Education; genetic resource collection LCP; see Anon. (*La Chaire de Cryptogamie du Museum National d'Histoire Naturelle*, 1954).
- PCA**, see Media.
- PCP**, see *Pneumocystis*.

PCR, see Molecular biology.

PD, see Metabolic products; Steiner's Stable PD solution.

PDA, see Media.

peach leaf curl, leaf hypertrophy caused by *Taphrina deformans*.

peat mould, *Chromelosporium fulvum*.

Peccania A. Massal. ex Arnold (1858) nom. cons., Lichinaceae (L). 8, Europe; N. Africa. See Moreno & Egea (*Acta Bot. Barcinon.* 41: 1, 1992), Schultz & Büdel (*Mycotaxon* 84: 21, 2002), Schultz & Büdel (*Lichenologist* 35: 151, 2003; phylogeny).

Peccaniomyces Cif. & Tomas. (1953) = *Peccania*.

Peccaniopsis M. Choisy (1949) = *Peccania* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Peck (Charles Horton; 1833-1917; USA). Student, Union College, Schenectady (1855-1859); teacher, Sandlake and Albany (1859-1867); Botanist to the State Cabinet of Natural History [later the New York State Museum], Albany, New York (1867-1913). He proposed more than 2,700 fungal names [for list 1867-1908, see Peck, *Bulletin of the New York State Museum* 131: 59, 1909; 1905-1915, see Gilbertson, *Mycol.* 54: 460, 1962]. *Publs.* Report of the Botanist. *Annual Report on the New York State Museum of Natural History* (1872-1913) [reprint, 6 vols, 1980]. *Biogs, obits etc.* Atkinson (*Botanical Gazette* 65: 103, 1918); Barr *et al.* (An annotated catalogue of the pyrenomycetes described by Peck. *Bulletin of the New York State Museum* 459, 1986); Burnham (*Mycol.* 11: 33, 1919); Grumann (1974: 194); Jenkins (*Mycotaxon* 7: 23, 1978, *Amanita* types); Lloyd (*Mycological Notes* 4: 509, 1912) [portrait]; Petersen (*Mycol.* 68: 304, 1976) [cantharelloid species]; Stafleu & Cowan (*TL-2* 4: 135, 1983).

Peckia Clinton (1878) [non *Peckia* Vell. 1825, *Myrsinaceae*] = *Drudeola*.

Peckiiella (Sacc.) Sacc. (1891) = *Hypomyces* fide Rogerson & Samuels (*Mycol.* 81: 413, 1, 1989), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).

Peckifungus Kuntze (1891) = *Appendiculina*.

Peckiomycetes Sacc. & Trotter (1913) nom. nud., Fungi. See Welch (*Mycol.* 18: 82, 1926).

pecky cypress, decay of *Taxodium distichum* by *Stereum taxodii* (Davidson *et al.*, *Mycol.* 52: 260, 1961).

pectic enzymes, components of the macerating enzymes of a number of fungal parasites; two types distinguished by Wood (*Physiological plant pathology*, 1967: 138; q.v. for details) are **pectinesterases** (syn. pectinmethylesterases), specific enzymes which saponify methyl ester groups of pectinic acid; and **polygalacturonases**, which break polygalacturonide chains by hydrolysis at the glycosidic linkages.

pectinate, like the teeth of a comb.

pectinate hyphae, comb-like hyphae of e.g. *Microsporum audouinii*.

Pectinotrichum Varsavsky & G.F. Orr (1971), Onygenaceae. Anamorph *Chrysosporium*. 1, Venezuela. See Sugiyama *et al.* (*Mycoscience* 40: 251, 1999; DNA), Sugiyama & Mikawa (*Mycoscience* 42: 413, 2001; phylogeny).

Pediascus Chardón & Toro (1934) = *Vestergrenia* Rehm fide von Arx & Müller (*Stud. Mycol.* 9, 1975).

pedicel, a small stalk.

pedicellate, having a pedicel.

Pedilospora Höhn. (1902) = *Dicranidion* fide Hughes (*CJB* 31: 607, 1953).

pedogamy, pseudomixis between mature and immature cells, e.g. copulation between a yeast mother cell and its bud.

pedogenesis (1) reproduction in young or immature organisms; (2) soil formation (see Weathering).

Pedumispora K.D. Hyde & E.B.G. Jones (1992), Diaporthales. 1 (on *Rhizophora*), Seychelles. See Hyde & Jones (*MR* 96: 78, 1992).

Peethambara Subram. & Bhat (1978), Hypocreales. Anamorph *Didymostilbe*. 1 (from decaying wood), widespread (pantropical). See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Rossman *et al.* (*Mycol.* 93: 100, 2001; phylogeny), Castlebury *et al.* (*MR* 108: 864, 2004; phylogeny), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).

Peethasthabeeja P. Rag. Rao (1981), anamorphic *Pezizomycotina*, Hso.0eP.10. 1, India. See Rao (*Indian J. Bot.* 4: 132, 1981).

peg, see hyphal peg.

Peglerochaete Sarwal & Locq. (1983), Tricholomataceae. 1, Sikkim. See Sarwal & Locquin (*Compt. Rend. Congr. Natl. Soc. Savantes Sec. Sci.*, 1983: 193, 1983).

Pegleromyces Singer (1981), Tricholomataceae. 1, Brazil. See Singer (*Mycol.* 73: 500, 1981).

Peglionia Goid. (1937) = *Gyrophthrix* fide Hughes & Pirozynski (*N.Z. J. Bot.* 9: 39, 1971).

Pegmatheca E.I. Hazard & Oldacre (1975), Microsporidia. 2.

peitschengeissel (obsol.) unornamented flagellum.

Pekilo, protein from *Paecilomyces* sp. used in animal feeds.

Pelicothallus Dilcher (1965), Fossil Fungi, Microthyriaceae. 1 (Eocene), USA. See Pirozynski (*Ann. Rev. Phytopath.* 14: 237, 1976), Sherwood-Pike (*Lichenologist* 17: 114, 1985).

pellet, a three dimensional colony in a liquid culture (particularly a shaken culture).

pellicle (1) outermost living layer lying below any non-living secreted material, containing plasma membrane plus underlying epiplasm or other membranes and may show ridges, folds or distinct crests; (2) a growth on the surface of a liquid culture; (3) (of agaric basidiomata), a detachable, skin-like cuticle of the pileus.

pellicular veil, a very thin partial veil of a sporophore not having a stipe (Singer, 1962). Cf. cortina.

Pellicularia Cooke (1876) = *Ceratobasidium* fide Roberts (*Rhizoctonia-forming fungi*, 1999).

pelliculose, like a thin crust, as is the hymenial layer in *Thelephoraceae*.

Pellidiscus Donk (1959), Inocybaceae. 3, Europe. See Donk (*Persoonia* 1: 89, 1959), Hjortstam (*Windahlia* 15: 59, 1985).

Pellionella (Sacc.) Petch (1924) nom. inval., anamorphic *Pezizomycotina*. Cited in *ING* (1979) but Petch (*Ann. R. bot. Gdn Peradeniya* 8: 170, 1924) did not make the transfer.

Pellionella Sacc. (1902), anamorphic *Pezizomycotina*, St.1eP.1. 1, Java.

pellis, the cellular cortical layers, not belonging to the veils, of a basidioma (Bas, *Persoonia* 5: 327, 1969); cuticle. Bas distinguished different layers of the pellis as **supra-**, **medio-**, and **sub-**, and different topographies of the pellis as **pilei-**, etc.

Pelloporus Quéf. (1886) = *Coltricia*.

Pellucida Dulym., Sivan., P.F. Cannon & Peerally (2001), Hyponectriaceae. 1, Mauritius. See Dulyma-

- mode *et al.* (*MR* 105: 247, 2001).
- pellucid-striate** (of a pileus), having a somewhat transparent top so that the gills are seen through it as rays.
- Pelodiscus** Clem. (1901) nom. dub., ? Fungi. See Seaver (*North American Cup Fungi* (Operculates), 1928; synonym of *Patella*), Eckblad (*Nytt Mag. Bot.* 15: 1, 1968).
- Peloronectria** Möller (1901) nom. dub., ? Hypocreales. 1 or 2, S. America. Type material is lost. See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Peloronectriella** Yoshim. Doi (1968) = *Nectriopsis* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- peloton**, see mycorrhiza.
- Peltaster** Syd. & P. Syd. (1917), anamorphic *Dothideomycetes*, Cpt.0eH.?. 6, Philippines; S. America. See Johnson *et al.* (*Mycol.* 88: 114, 1996), Williamson & Sutton (*Pl. Dis.* 84: 714, 2000; pathology), Williamson *et al.* (*Mycol.* 96: 885, 2004), Batzer *et al.* (*Mycol.* 97: 1268, 2005; phylogeny).
- Peltasterales** (obsol.). Anamorphic fungi with superficial shield-like conidiomata; anamorphs of *Microthyriaceae*. Batista & Ciferri (*Mycopath.* 11: 6, 1959; 6 fam., keys, host index), Batista & Ciferri (*Atti Ist. bot. Univ. Pavia* ser. 5 16: 86, 1959).
- Peltasterella** Bat. & H. Maia (1959), anamorphic *Pezizomycotina*, Cpt.0eH.?. 6, widespread (tropical). See Batista & Maia (*Mycopath. Mycol. appl.* 11: 37, 1959).
- Peltasterinostroma** Punith. (1975), anamorphic *Pezizomycotina*, Cpt.0eH.15. 1, British Isles. See Punithalingam (*TBMS* 64: 541, 1975).
- Peltasteropsis** Bat. & H. Maia (1959), anamorphic *Pezizomycotina*, Cpt.0eH.?. 7, widespread (tropical). See Batista & Maia (*Mycopath. Mycol. appl.* 11: 29, 1959).
- peltate**, in the form of a round plate with a stalk from the centre of the underside (Fig. 23.29).
- Peltella** Syd. & P. Syd. (1917) = *Muyocopron* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Peltidea** Ach. (1803) = *Peltigera* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Peltideaceae** Körb. (1846) = *Peltigeraceae*.
- Peltideomyces** E.A. Thomas (1939) nom. inval. = *Peltigera* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Peltidium** Kalchbr. (1862) [non *Peltidium* Zollik. 1820, *Compositae*] = *Pachyella*.
- Peltigera** Willd. (1787) nom. cons., *Peltigeraceae* (L.). c. 91, widespread. See Thomson (*Am. midl. Nat.* 44: 1, 1950), Kurokawa *et al.* (*Bull. natn. Sci. Mus. Tokyo*, B 9: 101, 1966), Chen (*Acta Mycol. Sin.* 5: 18, 1986; key 28 spp., China), Holtan-Hartwig (*Sommerfeltia* 15, 1993; key 17 spp. Norway), Vitikainen (*Acta Bot. Fenn.* 152: 1, 1994; key 29 spp. Eur.), Eriksson & Strand (*SA* 14: 33, 1995; DNA), Goward *et al.* (*CJB* 73: 91, 1995; key 28 N. Am. spp.), Martínez & Burgaz (*Ann. bot. fenn.* 33: 223, 1996; anatomy), Goffinet & Bayer (*Fungal Genetics Biol.* 21: 228, 1997; DNA, species pairs), Martínez & Burgaz (*Clementeana* 3: 29, 1997; key), Martínez Moreno (*Ruizia* 15, 1999; Iberian spp.), Miadlikowska & Lutzoni (*Int. J. Pl. Sci.* 161: 925, 2000; phylogeny), Vitikainen (*Mitteilungen aus dem Institut für Allgemeine Botanik Hamburg* 30-32: 297, 2002; S America, Antarctica), Goffinet *et al.* (*Bryologist* 106: 349, 2003; phylogeny, morphospecies), Martínez *et al.* (*Lichenologist* 35: 301, 2003; biogeography), Miadlikowska *et al.* (*Mycol.* 95: 1181, 2003; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Peltigeraceae** Dumort. (1822), *Peltigerales* (L.). 2 gen. (+ 15 syn.), 101 spp.
Lit.: Hawksworth (*J. Linn. Soc. Bot.* 96: 3, 1988), Galloway (*Symbiosis* 11: 327, 1991), Czeuczuga & Upreti (*Bull. bot. Surv. India* 32: 80, 1990), Holtan-Hartwig (*Sommerfeltia* 15: 1, 1993), Smith & Øvstedal (*Lichenologist* 26: 209, 1994), Vitikainen (*Acta Bot. Fenn.* 152: 1, 1994), Eriksson & Strand (*SA* 14: 33, 1995), Goward *et al.* (*CJB* 73: 91, 1995), Goffinet & Bayer (*Fungal Genetics Biol.* 21: 228, 1997), Galloway (*Cryptog. Bryol.-Lichénol.* 19: 137, 1998), Miadlikowska & Lutzoni (*Int. J. Pl. Sci.* 161: 925, 2000), Miadlikowska *et al.* (*Mycol.* 95: 1181, 2003), Wiklund & Wedin (*Cladistics* 19: 419, 2003), Miadlikowska & Lutzoni (*Am. J. Bot.* 91: 449, 2004), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny), Vitikainen (*Nordic Lichen Flora* 3: Cyanolichens: 113, 2007).
- Peltigerales** Walt. Watson (1929), (L.). *Lecanoromycetidae*. 8 fam., 50 gen., 1208 spp. Thallus usually foliose, occ. crustose, fruticose or squamulose, corticate on the upper or both surfaces, the lower surface sometimes characteristically areolate. Ascomata apothecial, initially immersed, usually with a covering layer which splits to expose the hymenium at a late stage. Interascal tissue of simple paraphyses. Asci usually with a thickened apex (usually not capitate), a J+ apical ring, a well-developed ocular chamber and a J+ gelatinized outer coat. Ascospores hyaline or brown, often elongated, often multiseptate. Anamorphs pycnidial. Lichenized with green algae or cyanobacteria, if the former then often with cyanobacteria in cephalodia, widespr. esp. temp. Fams:
- (1) **Coccocarpiaceae**
 - (2) **Collemataceae**
 - (3) **Lobariaceae** (syn. *Stictaceae*)
 - (4) **Massalongiaceae**
 - (5) **Nephromataceae**
 - (6) **Pannariaceae**
 - (7) **Peltigeraceae** (syn. *Solorinaceae*)
 - (8) **Placynthiaceae** (syn. *Lecotheciaceae*)
- Two suborders have been recognized based on molecular data, the *Peltigerineae* (containing *Lobariaceae*, *Massalongiaceae*, *Nephromataceae* and *Peltigeraceae*) and *Collematineae* which contains the other 4 fams.
- Lit.*: Galloway (*Symbiosis* 11: 327, 1991; chemical evol.), Hawksworth (*J. Hattori bot. Lab.* 52: 323, 1982; evolutionary significance), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007), Honegger (*Lichenologist* 10: 47, 1978; asci), Letrouit-Galinou & Lallement (*Lichenologist* 5: 59, 1971; asci, ontogeny), Matsubara *et al.* (*Bryologist* 102: 196, 1999; chemistry), Miadlikowska & Lutzoni (*Am. J. Bot.* 91: 449, 2004), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006), Wiklund & Wedin (*Cladistics* 19: 419, 2003; phylogeny).
- Peltigeromyces** Möller (1901), *Helotiales*. 3, Africa. See Le Gal (*Bull. Jard. Bot. État* 29: 73, 1959).
- Peltigeromyces** E.A. Thomas ex Cif. & Tomas. (1953) = *Peltigera*.
- Peltigeropsis** V. Marciano & A. Morales (1994) nom. inval., *Peltigerales* (L.). 1, Europe. See Marciano *et al.* (*Libro de Resúmenes, Sesiones Técnicas, VI Congreso Latinoamericano de Botánica* Mar del Plata,

- Argentina, 2 al 8 de Octubre de 1994: 192, 1994), Eriksson & Hawksworth (*SA* 15: 139, 1997).
- Peltiphylla** M. Choisy (1950) = *Psora* Hoffm. (1796) fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Peltistroma** Henn. (1904), anamorphic *Pezizomycotina*, Cpt.0eP.?. 1, Brazil.
- Peltistromella** Höhn. (1907), anamorphic *Pezizomycotina*, Cpt.≡ eP.?. 2, Brazil; Sri Lanka.
- Peltophora** Clem. (1909) = *Peltigera*.
- Peltophoromyces** Clem. (1909) = *Peltigeromyces* A. Möller.
- Peltopsis** Bat. (1960) = *Muyocopron* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Peltosoma** Syd. (1925), anamorphic *Pezizomycotina*, Cpt.≡ eP.?. 1, Philippines. See Sutton & Pascoe (*MR* 92: 210, 1989; re-evaluation).
- Peltosphaeria** Berl. (1888) = *Julella* fide Mayrhofer (*Biblthca Lichenol.* 26, 1987).
- Peltostromellina** Bat. & A.F. Vital (1959), anamorphic *Pezizomycotina*, Cpd.0eH.?. 1, Sri Lanka. See Batista & Vital (*Revista Soc. Brazil agron.* 13: 79, 1959).
- Peltostromopsis** Bat. & A.F. Vital (1959), anamorphic *Pezizomycotina*, Cpt.1eP.?. 1, Sri Lanka. See Batista & Vital (*Revista Soc. Brazil agron.* 13: 77, 1959).
- Peltula** Nyl. (1853), *Peltulaceae* (L.). 31, widespread (esp. temperate). See Wetmore (*Ann. Mo. Bot. Gdn* 57: 158, 1970; N. Am.), Swinscow & Krog (*Norw. J. Bot.* 26: 213, 1979; key 10 E. Afr. spp.), Büdel & Henssen (*Int. J. Mycol. Lichenol.* 2: 235, 1986), Filson (*Muelleria* 6: 495, 1988; 10 Australian spp.), Egea (*Biblthca Lichenol.* 31, 1989; W. Eur. & N. Afr.), Büdel & Elix (*Biblthca Lichenol.* 67: 3, 1997), Schultz *et al.* (*Pl. Biol.* 3: 116, 2001), Büdel & Schultz (*Biblthca Lichenol.* 86: 225, 2003; drought resistance), Schultz & Büdel (*Lichenologist* 35: 151, 2003), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Peltulaceae** Büdel (1986), *Lichinales* (L.). 3 gen., 35 spp.
Lit.: Büdel (*Biblthca Lichenol.* 25: 209, 1987; ontogeny), Filson (*Muelleria* 6: 495, 1988), Büdel (*Biblthca Lichenol.* 38: 47, 1990), Upreti & Büdel (*J. Hattori bot. Lab.* 68: 279, 1990), Büdel (*Mycotaxon* 54: 137, 1995), Reeb *et al.* (*Mol. Phylogen. Evol.* 32: 1036, 2004), Jørgensen (*Nordic Lichen Flora* 3: Cyanolichens: 132, 2007).
- Peltularia** R. Sant. (1944), *Coccocarpiaceae* (L.). 2, S. America; Australia. See Jørgensen & Galloway (*Lichenologist* 16: 189, 1984), Henssen & Jørgensen (*Biblthca Lichenol.* 78: 85, 2001; S America).
- Pemphidium** Mont. (1840), *Xylariales*. 6 (monocots), S. America (tropical). See Petrak (*Sydowia* 7: 354, 1953), Hyde (*Sydowia* 45: 204, 1993; posn), Hyde (*Sydowia* 48: 122, 1996).
- Penardia** Cash (1904), *Cercozoa*. q.v.
- penatin** (corylophillin, notatin, penicillin B), an antibiotic from *Penicillium notatum* and *P. chrysogenum*; antibacterial (Kocholary, *J. Bact.* 44: 143, 1942).
- pendant** (1) (of a fruticose lichen), one hanging downwards; (2) (in an ascus) see ascus.
- Pendulispora** M.B. Ellis (1961), anamorphic *Tubeufia*, Hso.#eP.10. 1, Venezuela. See Ellis (*Mycol. Pap.* 82: 41, 1961).
- penicidin**, see patulin.
- Penicillaria** Chevall. (1826) [non *Penicillaria* Willd. 1809, *Gramineae*] = *Pterula* fide Corner (*Ann. Bot. Mem.* [A monograph of *Clavaria* and allied genera] 1, 1950).
- penicillate**, like a little brush.
- penicillic acid**, a tetronic acid from *Penicillium pu-berulum*, *P. cyclopium*, etc. and antibacterial (Birkinshaw *et al.*, *Biochem. J.* 30: 394, 1936).
- Penicillifer** Emden (1968), anamorphic *Viridispora*, Hso.≡ eP.32/33. 7, widespread. See Samuels (*Mycol.* 81: 347, 1989; key), Polishook *et al.* (*Mycol.* 83: 797, 1991).
- penicillin**, one of a group of antibiotic substances (q.v.) produced by *Penicillium chrysogenum* (syn. *P. notatum*), active against Gram+ bacteria and of low toxicity to humans. Discovered by Fleming (*Br. J. exp. Path.* 10: 226, 1929). See Hare (*The birth of penicillin*, 1970), *Penicillin 1929-43* [*Br. med. Bull.* 2, 1944], Fleming (Ed.) (*Penicillin; its practical application*, 1946), Waksman (*Microbial antagonisms and anti-bacterial substances*, edn 2, 1947), Knox (*Nature* 192: 492, 1961; survey of new penicillins).
- penicillin B**, **B**, see penatin; **F**, see flavicin; **dihydro-F**, see gigantic acid; **N**, see cephalosporin **N**. See Knox (1961) under penicillin.
- penicillinase**, a bacterial enzyme which inhibits the action of penicillin.
- Penicilliopsis** Solms (1887), *Trichocomaceae*. Anamorphs *Stilbodendron*, *Sarophorum*, *Pseudocordyceps*. 3, widespread (tropical). See Udagawa & Takada (*Bull. natn. Sci. Mus. Tokyo*, B 14: 501, 1971), Samson & Seifert in Samson & Pitt (Eds) (*Advances in Penicillium and Aspergillus systematics* 102: 397, 1985), Kuraishi *et al.* (*MR* 95: 705, 1991; ubiquinones), Pitt *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 9, 2000; nomenclator), Hsieh & Ju (*Mycol.* 94: 539, 2002).
- Penicillites** Mesch. (1892), *Fossil Fungi*. 1 (Oligocene), Europe.
- Penicillium** Fr. (1832) ? = *Botrytis* fide Hawksworth *et al.* (*Taxon* 25: 665, 1976).
- Penicillium** Link (1809), anamorphic *Eupenicillium*, *Talaromyces*, Hso.0eP.15. 304, widespread. Common moulds, many first named on cultural, biochemical, or pathogenic characters. See Fig. 30. *P. expansum* (blue mould of apples), *P. digitatum* and *P. italicum* (green and blue moulds of citrus fruits), *P. gladioli* (storage rot of *Gladiolus*). See Pitt (*CJB* 52: 2231, 1974; sclerotial spp.), Pitt (*The genus Penicillium and its teleomorphic states Eupenicillium and Talaromyces*, 1979; revision), Frisvad & Filtenborg (*Appl. Environm. Microbiol.* 46: 1301, 1983; secondary metabolites and classification), Frisvad (*Toxigenic Fungi: their toxins and health hazard*: 98, 1984; chemistry and taxonomy), Pitt (*Toxigenic Fungi: their toxins and health hazard*: 107, 1984; physiology and taxonomy), Bridge (*J. gen. Microbiol.* 131: 1887, 1985; characterization methods), Hawksworth (*Advances in Penicillium and Aspergillus Systematics* 102: 3, 1985; typification), Peberdy (*Biology of Industrial Microorganisms*: 407, 1985; biology), Pitt (*Laboratory Guide to common Penicillium species*, 1985), Pitt & Hocking (*Fungi and Food Spoilage*, 1985), Anné (*Advances in Penicillium and Aspergillus Systematics* 102: 337, 1985; protoplast hybridization), Bridge *et al.* (*Advances in Penicillium and Aspergillus Systematics* 102: 281, 1985; polyphasic systematics), Bridge *et al.* (*TBMS* 87: 389, 1986; intra-strain variation), Deng *et al.* (*J. Med. Vet. Mycol.* 24: 383, 1986; clinical sp.), Fassatióvá

- (*Moulds and Filamentous Fungi in Technical Microbiology* Progress in industrial microbiology **22**, 1986), Fassatová (*Advances in Penicillium and Aspergillus Systematics* **102**: 105, 1985; media and morphology), Frisvad (*Advances in Penicillium and Aspergillus Systematics* **102**: 311, 1985; chemistry), Ho & Smith (*J. gen. Microbiol.* **132**: 3479, 1986; effect of CO₂ on morphology), Minter *et al.* (*Advances in Penicillium and Aspergillus Systematics* **102**: 71, 1985; terminology), Pitt (*Advances in Penicillium and Aspergillus Systematics* **102**: 93, 1985; diagnostic methods), Pitt *et al.* (*Food Microbiology* **3**: 363, 1986; white cheese moulds), Polonelli *et al.* (*Advances in Penicillium and Aspergillus Systematics* **102**: 267, 1985; serological diagnosis), Ramírez (*Advances in Penicillium and Aspergillus Systematics* **102**: 445, 1985; recombination), Ramírez (*Cryptog. Mycol.* **7**: 181, 1986; morphological species concept), Seifert & Samson (*Advances in Penicillium and Aspergillus Systematics* **102**: 143, 1985; synnematus spp.), Stolk & Samson (*Advances in Penicillium and Aspergillus Systematics* **102**: 163, 1985; classification), Wicklow (*Advances in Penicillium and Aspergillus Systematics* **102**: 255, 1985; ecology), Williams & Pitt (*Advances in Penicillium and Aspergillus Systematics* **102**: 129, 1985; key), Bridge *et al.* (*J. gen. Microbiol.* **133**: 995, 1987; phenotype, DNA content), Cruickshank & Pitt (*Microbiological Sciences* **4**: 14, 1987; isoenzymes), Cruickshank & Pitt (*Mycol.* **79**: 614, 1987; enzyme electrophoresis), El-Banna *et al.* (*Syst. Appl. Microbiol.* **10**: 42, 1987; mycotoxin production), Frisvad *et al.* (*CJB* **65**: 765, 1987; from rodent seed caches), Peberdy (*Penicillium and Acremonium* [Biotechnology Handbooks] **1**, 1987), Pitt (*Appl. Environm. Microbiol.* **53**: 266, 1987; ochratoxin-producing spp.), Polonelli *et al.* (*Appl. Environm. Microbiol.* **53**: 872, 1987; serological diagnosis, cheese-associated spp.), Drouhet *et al.* (*Bulletin de la Société Française de Mycologie Médicale* **17**: 77, 1988; clinical sp.), Petruccioli *et al.* (*Mycol.* **80**: 726, 1988; extracellular enzymes), Bridge & Hudson (*J. Linn. Soc. Bot.* **99**: 11, 1989; DNA content), Bridge *et al.* (*J. gen. Microbiol.* **135**: 2967, 1989; polyphasic systematics), Bridge *et al.* (*J. gen. Microbiol.* **135**: 2941, 1989; polyphasic systematics), Fuhrmann *et al.* (*Can. J. Microbiol.* **35**: 1043, 1989; immunology), Head *et al.* (*Exp. Mycol.* **13**: 203, 1989; ultrastr.), Kozakiewicz (*J. Linn. Soc. Bot.* **99**: 273, 1989; conidial ornamentation), Mills *et al.* (*Can. J. Pl. Path.* **11**: 357, 1989; mycotoxins from wheat), Paterson *et al.* (*J. gen. Microbiol.* **135**: 2979, 1989; polyphasic systematics), Pitt (*Journal of Applied Bacteriology* Symposium Supplement Series no. 18 **67**: 37S, 1989; review), Ström *et al.* (*Journal of Applied Bacteriology* **66**: 461, 1989; chemosystematics), Berny & Hennebert (*Modern Concepts in Penicillium and Aspergillus Classification* [NATO ASI Series A: Life Sciences] **185**: 49, 1990; *P. expansum*), Bridge (*Modern Concepts in Penicillium and Aspergillus Classification* [NATO ASI Series A: Life Sciences] **185**: 283, 1990; physiology), Fassatová & Kubatová (*Modern Concepts in Penicillium and Aspergillus Classification* [NATO ASI Series A: Life Sciences] **185**: 149, 1990; section *Divaricatum*), Filtenborg & Frisvad (*Modern Concepts in Penicillium and Aspergillus Classification* [NATO ASI Series A: Life Sciences] **185**: 27, 1990; identification of mixed cultures), Frisvad & Filtenborg (*Mycol.* **81**: 837, 1989; chemotaxonomy), Frisvad & Filtenborg (*Modern Concepts in Penicillium and Aspergillus Classification* [NATO ASI Series A: Life Sciences] **185**: 373, 1990; synoptic key), Frisvad & Filtenborg (*Modern Concepts in Penicillium and Aspergillus Classification* [NATO ASI Series A: Life Sciences] **185**: 159, 1990; sect. *Furcatum*), Hawksworth (*Modern Concepts in Penicillium and Aspergillus Classification* [NATO ASI Series A: Life Sciences] **185**: 75, 1990; nomencl.), Paterson & Kemmelmeier (*Journal of Chromatography* **511**: 195, 1990; chemistry), Pitt (*PENNAME A Computer Key to Penicillium Species*, 1990; computer key), Pitt & Samson (*Stud. Mycol.* **32**: 77, 1990; review), Pitt *et al.* (*Syst. Appl. Microbiol.* **13**: 304, 1990; monoverticillate spp.), Reenen-Hoekstra *et al.* (*Modern Concepts in Penicillium and Aspergillus Classification* [NATO ASI Series A: Life Sciences] **185**: 173, 1990; *P. funiculosum* complex), Samson & Pitt (*Modern Concepts in Penicillium and Aspergillus Classification* [NATO ASI Series A: Life Sciences], 1990), Stolk *et al.* (*Modern Concepts in Penicillium and Aspergillus Classification* [NATO ASI Series A: Life Sciences] **185**: 121, 1990; terverticillate spp.), Andersen (*Antonie van Leeuwenhoek* **60**: 115, 1991; *P. brevicompactum*, chemistry), Kuraishi *et al.* (*MR* **95**: 705, 1991; ubiquinones), Pitt (*Jap. J. Med. Mycol.* **32** Suppl.: 31, 1991; chemotaxonomy), Pitt *et al.* (*Phytopathology* **81**: 1108, 1991; on apples), Schubert & Kriesel (*Persoonia* **14**: 341, 1991; ubiquinones), Bridge *et al.* (*Mycol. Pap.* **165**, 1992; computer key), Drouhet (*J. Mycol. Médic.* **3**: 195, 1993; penicilliosis), LoBuglio *et al.* (*Mycol.* **85**: 592, 1993; phylogeny, sexuality), Pitt (*Journal of Applied Bacteriology* **75**: 559, 1993; media, species differentiation), Pitt (*The Fungal Holomorph: Mitotic, Meiotic and Pleomorphic Speciation in Fungal Systematics*: 107, 1993; speciation), Pitt & Samson (*Regnum veg.* **128**: 13, 1993; list of accepted names), Christensen *et al.* (*MR* **98**: 635, 1994; colour standards), Holmes *et al.* (*Phytopathology* **84**: 719, 1994; on citrus), LoBuglio *et al.* (*MR* **98**: 250, 1994; phylogeny, synnematus spp.), Lund & Frisvad (*MR* **98**: 481, 1994; *P. aurantiogriseum*, chemistry), Okuda (*Mycol.* **86**: 259, 1994; morphology in culture), Tzean *et al.* (*Mycol. Monogr.* **9**, 1994; Taiwan), Berbee *et al.* (*Mycol.* **87**: 210, 1995; phylogeny), Larsen & Frisvad (*MR* **99**: 1167, 1995; volatile metabolites), LoBuglio & Taylor (*J. Clin. Microbiol.* **33**: 85, 1995; *P. marneffei* diagnostics), Mills *et al.* (*Mycopathologia* **130**: 23, 1995; toxigenic spp., Canada), Pitt (*CJB* **73** Suppl. 1: S768, 1995; morphology), Boysen *et al.* (*Microbiology Reading* **142**: 541, 1996; *P. roqueforti* agg.), Banke *et al.* (*MR* **101**: 617, 1997; isoenzymes), Mekha *et al.* (*Mycoscience* **38**: 97, 1997; RAPDs), Smedsgaard & Frisvad (*Biochemical Systematics and Ecology* **25**: 51, 1997; mass spectroscopy), Cao *et al.* (*J. Clin. Microbiol.* **36**: 3028, 1998; serological diagnosis), Lopes da Silva *et al.* (*FEMS Microbiol. Lett.* **164**: 303, 1998; fatty acid profiles), Vanittanakom *et al.* (*Medical Mycology* **36**: 169, 1998; PCR diagnosis), Ahmad & Malloch (*Mycol.* **91**: 1031, 1999; physiology), Christensen *et al.* (*MR* **103**: 527, 1999; *P. miczynskii* group), Skouboe *et al.* (*MR* **103**: 873, 1999; phylogeny), Banke & Rosendahl (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 199, 2000; genetic markers), Boysen *et al.* (*Appl. Environm. Microbiol.* **66**:

- 1523, 2000; *P. roqueforti* group), Dörge *et al.* (*J. Microbiol. Meth.* **41**: 121, 2000; image analysis), Frisvad *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 113, 2000; conidiophore ornamentation), Peterson (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 163, 2000; phylogeny), Pitt & Samson (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 51, 2000; typification), Pitt *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 9, 2000; accepted names), Scott *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 225, 2000; DNA fingerprinting), Seifert & Giuseppin (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 259, 2000; cycloheximide tolerance), Seifert & Louis-Seize (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 189, 2000; phylogeny), Seifert *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 239, 2000; physiology), Tuthill *et al.* (*Mycol.* **93**: 298, 2001; *P. simplicissimum*), Vossler (*Clinical Microbiology Newsletter* **23**: 25, 2001; clinical diagnostics), Castella *et al.* (*Syst. Appl. Microbiol.* **25**: 74, 2002; ochratoxigenic spp.), Yuen *et al.* (*Archs Microbiol.* **179**: 339, 2003; *P. marneffei* genome), Fisher *et al.* (*J. Clin. Microbiol.* **42**: 5065, 2004; *P. marneffei* population structure), Frisvad & Samson (*Stud. Mycol.* **49**: 1, 2004; polyphasic systematics), Frisvad *et al.* (*Stud. Mycol.* **49**: 201, 2004; mycotoxins), Haugland *et al.* (*Syst. Appl. Microbiol.* **27**: 198, 2004; quantitative PCR), La Guerche *et al.* (*Curr. Microbiol.* **48**: 405, 2004; from grapes), Peterson (*MR* **108**: 434, 2004; phylogeny), Samson & Frisvad (*Stud. Mycol.* **49**, 2004; revision of subgen. *Penicillium*), Samson *et al.* (*Introduction to Food- and Airborne Fungi* edn 7, 2004; identification of common spp.), Samson *et al.* (*Stud. Mycol.* **49**: 175, 2004; phylogeny), Smedsgaard *et al.* (*Stud. Mycol.* **49**: 243, 2004; mass spectroscopy), Frisvad *et al.* (*Journal of Applied Microbiology* **98**: 684, 2005; ochratoxigenic sp.), Peterson *et al.* (*Mycol.* **97**: 659, 2005; on coffee), Dupont *et al.* (*Rev. Iberoam. Micol.* **23**: 145, 2006; RFLP diagnostics), Geiser *et al.* (*Mycol.* **98**: 1053, 2006; phylogeny), Peterson (*Rev. Iberoam. Micol.* **23**: 134, 2006; phylogeny), Vega *et al.* (*Mycol.* **98**: 31, 2006; endophytic spp., ochratoxins), Seifert *et al.* (*Proc. natn Acad. Sci. U.S.A.* **104**: 3901, 2007; phylogenetic barcodes), Horn & Peterson (*Mycol.* **100**: 12, 2008; on *Aspergillus* heads).
- penicillus**, the brush-like conidiogenous apparatus of *Penicillium* and related genera composed of a stipe bearing a tuft of conidiogenous cells and other elements formerly on the rami and metulae (Fig. 30).
- Penidiella** Crous & U. Braun (2007), anamorphic *Teratospaeriaceae*. 7, widespread. See Crous *et al.* (*Stud. Mycol.* **58**: 1, 2007), Mafia *et al.* (*Mycol. Progr.* **7**: 49, 2007).
- Peniophora** Cooke (1879), *Peniophoraceae*. 62, widespread. See Eriksson (*Symb. bot. upsal.* **10** no. 5, 1950), Slysh (*Tech. Pub. Sta. Univ. Coll. Forestry, Syracuse* **83**, 1960; N.Y. State), Boidin (*Bull. Soc. linn. Lyon* **34**: 161, 1965), Boidin (*Bull. Soc. linn. Lyon* **34**: 213, 1965; key), Hayashi (*Bull. Govt For. Exp. Stn* **260**, 1974; Japan), Leger (*BSMF* **92**: 377, 1976; electrophoresis) Many authors use *Peniophora* s.s. for *Peniophora* sect. *Coloratae*; see, Leger & Poncet (*BSMF* **92**: 229, 1976; numerical tax.), Eriksson *et al.* (*Cortic. N. Europ.* **5**: 916, 1978; key 21 Eur. spp.) ? $\equiv$ *Corticium* Pers. (*Cortic.*), Wu (*Mycotaxon* **85**: 187, 2003; Taiwan).
- Peniophoraceae** Lotsy (1907), *Russulales*. 7 gen. (+ 6 syn.), 88 spp.
- Lit.*: Donk (*Reinwardtia* **1**, 1951; gen. names), Reid (*Beih. Nova Hedwigia* **18**: 484 pp., 1965; stipitate steroid spp.), Liberta (*Mycol.* **60**: 827, 1968; *Peniophora*), Ginns (*Mycol.* **60**: 1211, 1969; *Merulius*), Rattan (*Biblthca Mycol.* **60**, 1977; NW Himalayas), Jülich & Stalpers (*Verh. Kon. Ned. Akad. Wetensch., Afd. Natuurk.* sect. 2 **74**, 1980; temp. N. Hemisph.), Boidin *et al.* (*BSMF* **107**: 91, 1991; trop. spp.), Wu & Chen (*Bull. natn. Mus. Nat. Sci. Taiwan* **4**: 101, 1993), Hallenberg *et al.* (*MR* **100**: 179, 1996), Ginns (*Mycol.* **90**: 19, 1998), Yurchenko (*Mikol. Fitopatol.* **34**: 37, 2000), Larsson & Larsson (*Mycol.* **95**: 1037, 2003), Hjortstam & Ryvarden (*Syn. Fung.* **18**: 20, 2004), Larsson *et al.* (*MR* **108**: 983, 2004), Binder *et al.* (*Systematics and Biodiversity* **3**: 113, 2005), Küffer & Senn-Irlet (*Mycol. Progr.* **4**: 77, 2005).
- Peniophorella** P. Karst. (1889) nom. dub., *Agaricomycetes*. 35, widespread. *Hymenochaetales* or *Agaricales* (*Rickenella* clade). See Larsson (*MR* **111**, 2007).
- Peniophorina** Höhn. (1917) nom. dub., *Fungi*. See Donk (*Reinwardtia* **1**: 216, 1951).
- penitrem A**, a mycotoxin produced by some *Penicillium* spp., including *P. cyclopium*, which affects the nervous system, causing tremors; see neurotoxin, tremorgen.
- Pennella** Manier (1968), *Legeriomycetaceae*. 7 (in *Diptera*), widespread. See Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986; key), Williams & Lichtwardt (*CJB* **68**: 1045, 1990), Sato (*Mycoscience* **43**: 33, 2002; ultrastr. *Pennella angustispora*), Nelder *et al.* (*Fungal Diversity* **22**: 121, 2006; ecology and taxonomy), White (*MR* **110**: 1011, 2006; phylogeny).
- Penomyces** Giard ex Sacc. & Trotter (1913) nom. dub., anamorphic *Pezizomycotina*, Hso.???. 2, Europe. See Petch (*TBMS* **19**: 190, 1935).
- Pentagenella** Darb. (1897), *Roccellaceae* (L.). 3, Chile. See Follmann *et al.* (*J. Hattori bot. Lab.* **85**: 245, 1998), Tehler & Irestedt (*Cladistics* **23**: 432, 2007).
- Pentaposporium** Bat. (1957) ? = *Tripaspermum* fide Hughes (*Mycol.* **68**: 810, 1976).
- Pentasporium**, see *Pentaposporium*.
- Penzigia** Sacc. (1888) = *Xylaria* Hill ex Schrank fide Læssøe (*SA* **8**: 25, 1989), Læssøe (*SA* **13**: 43, 1994).
- Penzigina** Kuntze (1891) $\equiv$ *Eriosphaeria*.
- Penzigomyces** Subram. (1992), anamorphic *Pezizomycotina*, Hso. $\equiv$ eP.19. 13, widespread. See Subramanian (*Proc. Indian natn Sci. Acad. Part B. Biol. Sci.* **58**: 186, 1992), Mercado-Sierra *et al.* (*Mycol.* **96**: 424, 2004; Spain).
- Peplopus** (Quél.) Quél. ex Moug. & Ferry (1887) $\equiv$ *Suillus* Gray.
- per** (in author citations) (obsol.), see *Nomenclature*.
- percurrent** (1) extending throughout the entire length, as of the columella of a gasteromycete basidioma; (2) growing through in the direction of the long axis, as of a conidial germ tube emerging through the hilum or of a proliferation growing through the tip of the conidiogenous cell (Luttrell, 1963).

Perelegamyces R.F. Castañeda & W.B. Kendr. (1990), anamorphic *Pezizomycotina*, Hso.0eP.11. 1, Cuba. See Castañeda & Kendrick (*Univ. Waterloo Biol. Ser.* 32: 34, 1990).

perennial, living for a number of years.

Perenniporia Murrill (1942) nom. cons. prop., Polyporaceae. c. 60, widespread. See Donk (*Persoonia* 1: 266, 1960; nomencl. of *Poria*), Lowe (*Mycol.* 55: 453, 1963; key 162 trop. spp., as *Poria*), Wright (*Mycol.* 56: 694, 1964; dextrinoid reaction; as *Poria*), Lowe (*Tech. Pub. Sta. Univ. Coll. Forestry, Syracuse* 90, 1966; syns, key 133 N. Am. spp., as *Poria*), Ryvarden (*Polyp. N. Eur.* 2: 305, 1978; key Eur. spp.), Ryvarden & Johansen (*Prelim. Polyp. Fl. E. Afr.*: 463, 1980; key 10 Afr. spp.), Decock & Mossebo (*Systematics and Geography of Plants* 71: 607, 2002; African taxa), Decock & Mossebo (*Systematics and Geography of Plants* 73: 161, 2003; African taxa), Decock & Ryvarden (*MR* 107: 94, 2003; key Afr. spp.), Decock & Stalpers (*Taxon* 55: 227, 759, 2006; nomencl.).

Perenniporiaceae Jülich (1982) = Polyporaceae.

Perenniporiella Decock & Ryvarden (2003), Polyporaceae. 3, S. America. See Decock & Ryvarden (*MR* 107: 94, 2003).

Peresia H. Maia (1960) = *Colletotrichum* fide Sutton (*Mycol. Pap.* 141, 1977).

Peresiopsis Bat. (1960) = *Yamamotoa* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).

Perezia L. Léger & Duboscq (1909), Microsporidia. 9.

perfect state, see States of fungi.

Perforaria Müll. Arg. (1891) = *Coccotrema* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Perforariomyces Cif. & Tomas. (1953) = *Perforaria*.

perforation lysis, the process by which degradation of resistant fungus propagules in soil is initiated (Old & Wong, *Soil Biol. Biochem.* 8: 285, 1976; review).

perfume, see oak-moss, smell.

pergameneous (**pergamenous**, **pergamentaceous**), like paper.

Periamphispora J.C. Krug (1989), Lasiosphaeriaceae. 1, Spain. See Krug (*Mycol.* 81: 475, 1989), Huhndorf *et al.* (*Mycol.* 96: 368, 2004).

Periascomycetes. Class introduced for *Protascus*, *Protomyces*, *Ashbya*, and other 'primitive' ascomycetes (Moreau, 1953).

Periaster Theiss. & Syd. (1917) = *Erikssonina* fide Petrak (*Annls mycol.* 29: 390, 1931).

Peribotryon Fr. (1832) nom. rej. = *Chrysothrix* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Pericauda.

Perichlamys Clem. & Shear (1931) = *Kuntzeomyces*.

Pericladium Pass. (1875), ? Ustilaginaceae. 3 (forming galls on *Grewia*), Africa; Asia; Australia. See Mor-due (*Mycopathologia* 103: 173, 1988), Vánky (*Mycotaxon* 95: 1, 2006).

periclinal, curved in the direction of, or parallel to, the surface or the circumference; cf. anticlinal; -**thickening**, zone of increased material surrounding the protoplasmic channel at the apex of a 'phialide' (see Sutton, *The Coelomycetes*, 1980).

Pericoccis Clem. (1931) = *Leptogium* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).

Pericoelium Bonord. (1851) = *Ustilago* fide Saccardo (*Syll. fung.* 7: 1, 1888).

Periconia Tode (1791), anamorphic *Pleosporales*,

Hso.0eP.10. 36, widespread. See Mason & Ellis (*Mycol. Pap.* 56, 1953; Brit. spp., key), Bunning & Griffiths (*TBMS* 78: 147, 1984; ultrastr.), Carmarán & Novas (*Fungal Diversity* 14: 67, 2003; spp. described by Spegazzini).

Periconiella Sacc. (1885), anamorphic *Mycosphaerellaceae*, Hso.0eP/≡ eP.10. 50 (some fungicolous), widespread. See Ellis (*Mycol. Pap.* 111, 1967; key), McKenzie (*Mycotaxon* 39: 229, 1990), Priest (*MR* 95: 924, 1991; spp. on *Proteaceae*), Braun (*Feddes Repert.* 115: 50, 2004; on ferns), Kirschner & Piepenbring (*Mycol. Progr.* 7: 21, 2008; Panama, generic limits).

Pericystales = *Ascosphaerales*.

Pericystis Betts (1912) [non *Pericystis* J. Agardh 1847, *Algae*] = *Ascosphaera*.

Peridermium (Link) J.C. Schmidt & Kunze (1817) nom. cons., anamorphic *Cronartium*, *Chrysomyxa*, *Pucciniastrum*. c. 20 (on gymnosperms (I)), widespread. Anamorph name for (I). See Arthur & Kern (*Bull. Torrey bot. Club* 33: 403, 1906), Peterson (*Bull. Torrey bot. Club* 94: 511, 1967; pine stem rust), Laundon (*Taxon* 25: 186, 1976; taxonomy) Cf. *Endocronartium*.

peridermium, an aecium as in the form genus *Peridermium*.

peridiole (**peridiolum**) (esp. of *Nidulariaceae*), a division of the gleba having a separate wall, frequently acting as a unit for distribution.

Peridiomyces H. Karst. (1843) nom. dub., anamorphic *Pezizomycotina*.

Peridiopsora Kamat & Sathe (1969), anamorphic *Milesina*. 1 (on *Adelocaryum* (*Boraginaceae*)), India. Anamorph name for (II).

Peridiospora C.G. Wu & S.J. Lin (1997), Endogonaceae. 2, Brazil; Taiwan. See Wu & Lin (*Mycotaxon* 64: 180, 1997), Goto & Maia (*Mycotaxon* 96: 327, 2006; Brazil).

Peridiothelia D. Hawksw. (1985), Pleomassariaceae. 3, Europe. See Barr (*Mycotaxon* 43: 371, 1992; posn).

Peridipes Buriticá & J.F. Hennen (1994) nom. inval., Pucciniales. 2 (on *Arachis*, *Hymenaea*), S. America. Anamorph name for (II). See Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003; as syn. of *Milesia*).

peridium, the wall or limiting membrane of a sporangium or other fruit-body, an excipule; **peridial cells** (esp. of aecia), the cells of the peridium.

Peridoxylon Shear (1923) = *Camarops* fide Nannfeldt (*Svensk bot. Tidskr.* 66: 335, 1972), Dargan & Thind (*J. Indian bot. Soc.* 63: 177, 1984; India).

Peridoxylum Clem. & Shear (1931) = *Peridoxylon*.

perifulcrum, the wall of a pycnidium in a lichen thallus (obsol.).

Perigrapha Hafellner (1996), Roccellaceae (L). 1, Europe; Australasia. See Hafellner (*Nova Hedwigia* 63: 174, 1996), Grube (*Bryologist* 101: 377, 1998), Ertz *et al.* (*Bibliotheca Lichenol.* 91: 155 pp., 2005).

Periline Syd. (1939) = *Antennularia* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).

Perinidium Cromb. (1870) = *Pyrenidium*.

Periola Fr. (1822), anamorphic *Pezizomycotina*, Hsp.???. 1 or 2, Europe; America.

Periolopsis Maire (1913) = *Sarcopodium* fide Sutton (*TBMS* 76: 97, 1981).

Periperidium Darker (1963), anamorphic *Micraspis*, St.≡ eH.15. 1, Canada. See Darker (*CJB* 41: 1392, 1963).

Peripherostoma Gray (1821) nom. rej. $\equiv$ *Daldinia*.
periphysis (pl. **periphyses**), an upward pointing hypha inside, or near, the ostiole of a perithecium, pycnidium, or pycnium; see hamathecium.
periphysoid, see hamathecium.
periphyton, the 'assemblage of organisms growing upon free surfaces of submerged objects in water and covering them with a slimy coat.' Young (1945) fide Cooke (*Bot. Rev.* 22: 616, 1956).
periplasm (of *Peronosporales*), the outer, non-functional protoplasm of an oogonium or antheridium; cf. gonoplasm, ooplasm.
Perirhiza Karling (1946) = *Catenophlyctis* fide Karling (*Chytriomyc. Iconogr.*, 1977).
Perischizon Syd. & P. Syd. (1914), *Parmulariaceae*. 1, S. Africa.
Perisperma, see *Pyrisperma*.
Perisphaeria Roussel (1806) = *Hypoxylon* Bull. fide Læssøe (*SA* 13: 43, 1994).
perispore (**perisporium**), sheath outside the true spore wall. See Harmaja (*Karstenia* 14: 123, 1974; cyanophilic in *Pezizales*); ascospore, spore wall.
Perisporiacites Félix (1894), Fossil Fungi, *Ascomycota*. 2 (Cretaceous, Eocene), former USSR. See Sahni & Rao (*Proc. Indian natn Sci. Acad. Part B. Biol. Sci.* 13: 45, 1943).
perisporial sac, a perispore forming a loose envelope around the spore as in *Coprinus* sp.
Perisporiales = *Pleosporales*.
Perisporiella Henn. (1902) = *Hypocrella* fide Clements & Shear (*Gen. Fung.*, 1931).
Perisporina Henn. (1904) = *Perisporiopsis* Henn. fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
Perisporiopsella Bat., J.L. Bezerra, Castr. & Matta (1964) = *Pilgeriella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
Perisporiopsidaceae E. Müll. & Arx (1962) = *Parodiopsidaceae*.
Perisporiopsis F. Stevens (1917) $\equiv$ *Stevensea*.
Perisporiopsis Henn. (1904), *Parodiopsidaceae*. Anamorph *Septoidium*. c. 16, widespread (tropical).
Perisporites Pampal. (1902), Fossil Fungi. 2 (Miocene), Italy.
Perisporium Fr. (1821) nom. dub., *Pezizomycotina*. Sensus Corda (1842) = *Preussia*.
perisporium, see perispore.
Peristemma Syd. (1921) = *Miyagia* fide Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983).
peristome, an edging round an opening, esp. of basidiomata of certain gasteromycetes.
Peristomialis (W. Phillips) Boud. (1907) = *Ijuhya* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
Peristomium Lechmere (1912) = *Microascus* Zúkal fide von Arx (*Persoonia* 8: 191, 1975).
perithecium (pl. **perithecia**), a subglobose or flask-like ostiolate ascoma; sometimes limited to ascohymenial types formed from the development of an ascogonium (not of stromatic origin), but now widely used as a general term regardless of the ontogenetic type. See Cherepanova (*Vestn. Leningrad Univ. Biol.* 3: 39, 1986; types and evol. pathways).
Peritrichospora Linder (1944) = *Corollospora* fide Kohnmeyer (*Ber. dt. bot. Ges.* 75: 125, 1962).
peritrichous (**peritrichiate**), having hairs or flagella all over the surface.
Perizomatium Syd. (1927) = *Phaeofabraea* fide Pfister (*Occ. Pap. Farlow Herb. Crypt. Bot.* 11, 1977).

Perizomella Syd. (1927), anamorphic *Pezizomycotina*, *St.0eP.1.* 1, C. America.
Pernicivesicula E.K.C. Bylén & J.I.R. Larsson (1994), *Microsporidia*. 1. See Bylén & Larsson (*Eur. J. Protist.* 30: 139, 1994).
Perona Pers. (1825) = *Hemimycena* fide Kuyper (*in litt.*) *Perona* is a superfluous name change for *Helotium* Tode, nom. utique rej.
peronate, sheathed; having a boot or covering, esp. of the lower part of a stipe covered by a volva or veil.
Peroneutypa Berl. (1902), *Diatrypaceae*. 1, widespread. See Rappaz (*Mycol. Helv.* 2: 285, 1987), Carmarán *et al.* (*Fungal Diversity* 23: 67, 2006; morphology).
Peroneutypella Berl. (1902) $\equiv$ *Scoptria*.
Peronosporites W.G. Sm. (1877), Fossil Fungi. 3 (Carboniferous, Miocene), Italy; British Isles.
Peronosporoides E.W. Berry (1916), Fossil Fungi, *Peronosporales*. 1 (Oligocene), USA. See Berry (*Mycol.* 8: 76, 1916).
Peronosporoides J. Sm. Dalry (1896), Fossil Fungi (mycel.) Fungi. 1 (Carboniferous), British Isles. See Smith (*Trans. Geol. Soc. Glasgow* 10: 321, 1896).
Peroschaeta Bat. & A.F. Vital (1957), *Dothideomycetes*. 1, Philippines. See Batista & Vital (*An. Soc. Biol. Pernambuco* 15: 500, 1957).
peroxisome, one of the subcellular organelles which have indispensable functions in the metabolism of *n*-alkalenes, fatty acids, methanol, and several nitrogen-containing compounds in eukaryotic microorganisms. See Tanaka & Ueda (*MR* 97: 1025, 1993).
Perrotia Boud. (1901), *Hyaloscyphaceae*. c. 19, widespread. See Dennis (*Persoonia* 2: 182, 1962), Spooner (*Bibliotheca Mycol.* 116, 1987; 5 spp. Australasia), Cantrell & Hanlin (*Mycol.* 89: 745, 1997; DNA), Wang (*Mycotaxon* 72: 461, 1999), Zhuang & Hyde (*Mycol.* 93: 606, 2001; Hong Kong), Zhuang & Yu (*Nova Hedwigia* 73: 261, 2001; China), Verkley (*Mycotaxon* 89: 205, 2004; New Zealand).
Perrotiella Naumov (1916) = *Hydropisphaera* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
perrumpent, breaking through. Cf. *erumpent*.
Persiciospora P.F. Cannon & D. Hawksw. (1982), *Ceratostomataceae*. 4, widespread. See Horie *et al.* (*Mycotaxon* 25: 229, 1986), Krug (*Mycol.* 80: 414, 1988; key 3 spp.).
persistent (1) (of interascal tissues) still evident at maturity; (2) (of spores), non-deciduous; (3) (of teliospore pedicels), remaining firmly attached to the spore after liberation.
Persoon (Christiaan Hendrik; 1761-1836; South Africa, later Germany, France). Born in Cape Province; at school, Lingen-on-Ems, Germany (1775); student in Halle (1783), then Leiden (1786) and Göttingen and Erlangen (1799), moving to Paris (c. 1803), living there for the rest of his life. With E.M. Fries (q.v.) the founder of Mycology. There had been little development in the taxonomy of fungi from its low level at the time of Linnaeus till the work of Persoon began to appear in 1793. His early works, including *Observationes Mycologicae* (1795-1799) and the *Synopsis Methodica Fungorum* (1801) formed the framework on which Fries and all later systematists based their classifications. Names of fungi belonging in the *Pucciniales*, *Ustilaginales* and 'gasteromycetes' which appear in *Synopsis Methodica Fungorum* have sanctioned status (see Nomenclature). Persoon's working conditions in Paris were hard, and his later work was

- overshadowed by the simultaneous publication by E.M. Fries (q.v.) of the *Systema Mycologicum*. Persoon's collection, a very important one because it has nomenclatural types of a great number of common species, was taken over by the Dutch government before his death and is now in Leiden (L). *Publs. Observationes Mycologicae* (1795-1799); *Synopsis Methodica Fungorum* (1801) [reprint 1952; index by G.H. Lünemann, 1808]; *Mycologia Europaea* (1822-1828). *Biogs, obits etc.* Ainsworth (*Nature* 193: 22, 1962); Grumann (1974: 704); Lloyd (*Mycological Notes* 1: 158, 1903); Lloyd (*Mycological Notes* 7: 1301, 1924); Petersen (*Kew Bulletin* 31: 695, 1977); Stafleu & Cowan (*TL-2* 4: 178, 1983).
- Persooniana** Britzelm. (1897) = *Tyromyces* fide Donk (*Verh. K. ned. Akad. Wet.* tweede sect. 62: 1, 1974).
- Persooniella** Syd. (1922) = *Puccinia* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- Perspicinora** Riedl (1990) = *Koerberiella* fide Coppins (*SA* 10: 48, 1991).
- perthophyte** (**perthotroph**), a necrophyte on dead tissues of living hosts (Münch); cf. saprophyte.
- Pertusaria** DC. (1805) nom. cons., Pertusariaceae (L). 525, widespread. See Brodo (*CJB* 66: 1264, 1988), Takeshita *et al.* (*Pl. Syst. Evol.* 165: 49, 1989; phyco-bionts), Kantvilas (*Lichenologist* 22: 289, 1990; Tasmania), Archer (*Telopea* 4: 165, 1991; 28 spp., Australia), Archer (*Mycotaxon* 41: 223, 1991; key 63 Australian spp.), Niebel-Lohmann & Feuerer (*Mitteilungen aus dem Institut für Allgemeine Botanik Hamburg* 24: 199, 1992; Germany), Archer (*Biblthca Lichenol.* 53: 1, 1993; subgen.), Archer & Elix (*N.Z. J. Bot.* 31: 111, 1993; Australasia), Awasthi & Srivastava (*Bryologist* 96: 210, 1993; India), Archer *et al.* (*Mycotaxon* 56: 387, 1995; Papua New Guinea), Elix *et al.* (*Flechten Follmann Contributions to Lichenology in Honour of Gerhard Follmann*: 15, 1995; chemistry), Elix *et al.* (*Mycotaxon* 53: 273, 1995), Archer (*Biblthca Lichenol.* 69, 1997; monogr. Australian spp.), Elix *et al.* (*Mycotaxon* 64: 17, 1997; Australasia), Archer & Messuti (*Nova Hedwigia* 67: 403, 1998; Argentina), Ladd & Wilhelm (*Lichenogr. Thomsoniana North American Lichenology in Honor of John W. Thomson*: 89, 1998; USA), Lumbsch *et al.* (*Bryologist* 102: 215, 1999; N America), Messuti & Archer (*Bryologist* 102: 208, 1999; Falkland Is), Lumbsch & Schmitt (*Lichenologist* 33: 161, 2001; phylogeny), Lumbsch & Schmitt (*Lichenology* 1: 37, 2002; phylogeny), Boqueras & Llimona (*Mycotaxon* 88: 471, 2003; Iberian peninsula), Schmitt & Lumbsch (*Mol. Phylogen. Evol.* 33: 43, 2004; phylogeny, chemistry), Zhao *et al.* (*Bryologist* 107: 531, 2004; key, China), Lumbsch *et al.* (*Biol. J. Linn. Soc.* 89: 615, 2006; micromorphology, chemistry), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Schmitt *et al.* (*J. Hattori bot. Lab.* 100: 753, 2006; phylogeny, fam. placement), Messuti *et al.* (*Lichenologist* 39: 227, 2007; Zimbabwe).
- Pertusariaceae** Körb. ex Körb. (1855), Pertusariales (L). 2 gen. (+ 24 syn.), 526 spp.
Lit.: Letrouit-Galinou (*Revue bryol. lichén.* 34: 413, 1966; ontogeny), Dibben (*Milwaukee Public Mus., Publs Biol. Geol.* 5, 1980; N. Am.), Dibben (*J. Hattori bot. Lab.* 52: 343, 1982; evol. trends), Honegger (*Lichenologist* 14: 205, 1982; asci), Oshio (*J. Sci. Hiroshima Univ.* B(2): 76, 1991), Lumbsch *et al.* (*Biblthca Lichenol.* 57: 355, 1995), Archer (*Biblthca Lichenol.* 69: 249 pp., 1997), Lumbsch *et al.* (*Bryologist* 102: 215, 1999), Lumbsch & Schmitt (*Lichenologist* 33: 161, 2001), Schmitt *et al.* (*Biblthca Lichenol.* 86: 147, 2003), Lumbsch *et al.* (*Mol. Phylogen. Evol.* 31: 822, 2004), Schmitt & Lumbsch (*Mol. Phylogen. Evol.* 33: 43, 2004), Wedin *et al.* (*MR* 109: 159, 2005), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Schmitt *et al.* (*J. Hattori bot. Lab.* 100: 753, 2006), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny), Lumbsch *et al.* (*MR* 111: 257, 2007; phylogeny).
- Pertusariales** M. Choisy ex D. Hawksw. & O.E. Erikss. (1986), (L). Ostropomycetidae. 5 fam., 15 gen., 901 spp. Thallus crustose, rarely lobate or minutely foliose. Ascomata apothecial, often deeply cupulate, usually initially immersed, opening widely or with a poroid aperture and appearing perithecial, usually with a well-developed thalline margin. Interascal tissue of basal paraphyses, sometimes also with apical paraphyses in the poroid taxa. Asci short, widely cylindrical, with a thick multilayered usually J+ wall, the apex often more strongly thickened, releasing spores through a $\pm$ vertical apical split, often less than 8-spored. Ascospores very large, hyaline, aseptate, with a very thick multilayered wall. Anamorphs pycnidial. Lichenized with green algae, cosmop. Fams:
- (1) **Coccotremataceae**
 - (2) **Icmadophilaceae**
 - (3) **Megasporaceae**
 - (4) **Ochrolechiaceae**
 - (5) **Pertusariaceae**
- Many spp. reproduce mainly by soredia or isidia, forming 'species-pairs' with their meiotic counterparts. *Lit.*: Lumbsch *et al.* (*MR* 111: 257, 2007; phylogeny).
- Pertusariomyces** E.A. Thomas ex Cif. & Tomas. (1953) $\equiv$ *Pertusaria*.
- pervious** (of lichenized scyphi), open or perforate basally.
- Pesavis** Elsik & Janson. (1974), Fossil Fungi, anamorphic *Pezizomycotina*. 2 (Paleogene), widespread. See Smith & Crane (*J. Linn. Soc. Bot.* 79: 243, 1979).
- Pesotum** J.L. Crane & Schokn. (1973), anamorphic *Ophiostoma*, Hsy.0eH.10. 16, widespread. See Wingfield *et al.* (*MR* 95: 1328, 1991; conidial ontogeny), Okada *et al.* (*CJB* 76: 1495, 1998; phylogeny), Hausner *et al.* (*CJB* 78: 903, 2000; phylogeny), Geldenhuis *et al.* (*Fungal Diversity* 15: 137, 2004), Yamaoka *et al.* (*Mycoscience* 45: 277, 2004; Japan).
- pest control**, in reference collections of specimens, see Hall (*Taxon* 37: 885, 1988).
- Pestalopezia** Seaver (1942), Helotiaceae. 3, N. America.
- Pestalospaeria** M.E. Barr (1975), Amphisphaeriaceae. Anamorph *Pestalotiopsis*. 11, widespread. See Nag Raj (*Mycotaxon* 22: 52, 1985; key), Zhu *et al.* (*Acta Agric. Univ. Zhejiang* 16: 163, 1990; key 7 spp.), Kang *et al.* (*Fungal Diversity* 1: 147, 1998; DNA), Kang *et al.* (*MR* 103: 53, 1999), Kobayashi *et al.* (*Mycoscience* 42: 211, 2001), Jeewon *et al.* (*MR* 107: 1392, 2003; phylogeny).
- Pestalotia** De Not. (1841), anamorphic *Broomella*, Ccu. $\equiv$ eP.19. 1, Italy. See Steyaert (*Bull. Jard. bot. Brux.* 19: 285, 1949; s.str. monotypic), Guba (*Monograph of Monochaetia and Pestalotia*, 1961; 222 spp. accepted, key), Sutton (*CJB* 47: 2083, 1969), Jeewon *et al.* (*MR* 107: 1392, 2003).

- Pestalotiopsis** Steyaert (1949), anamorphic *Pestalotia*, Cac.≡ eP.19. 162, widespread. *P. theae* (grey blight of tea; *CMI Descr.* 318, 1971). See Steyaert (*TBMS* 36: 181, 1953), Sutton (*Mycol. Pap.* 80, 1961; conidium development), Zhu *et al.* (*Acta Agr. Univ. Zhejiangensis* 16: 173, 1990; soluble protein patterns), Zhu *et al.* (*Mycotaxon* 40: 129, 1991; teleomorphs in China), Zhu *et al.* (*Acta Mycol. Sin.* 10: 273, 1991; China), Suto & Kobayashi (*TMSJ* 34: 323, 1993; Japan), Nag Raj & Mel'nik (*Mycotaxon* 50: 435, 1994), Keller (*Atlas des Basidiomycetes Vus aux Microscopes Électroniques*, 1997; taxol production), Morgan *et al.* (*MR* 102: 975, 1998; neural networks), Watanabe *et al.* (*Mycoscience* 39: 71, 1998; conidiomatal ontogeny), Hopkins & McQuilken (*Eur. J. Pl. Path.* 106: 77, 2000; UK), Murugan & Muthumary (*Mycotaxon* 79: 455, 2001; ultrastr.), Jeewon *et al.* (*Mol. Phylogen. Evol.* 25: 378, 2002; phylogeny), Jeewon *et al.* (*MR* 107: 1392, 2003; phylogeny), Jeewon *et al.* (*Mol. Phylogen. Evol.* 27: 372, 2003; phylogeny, morphology), Ebenezer *et al.* (*Journal of Mycology and Plant Pathology* 34: 794, 2004; fatty acid profiles), Jeewon *et al.* (*Fungal Diversity* 17: 39, 2004; phylogeny, host specificity), Sergeeva *et al.* (*Australas. Pl. Path.* 34: 255, 2005; on *Vitis*), Keith *et al.* (*Pl. Dis.* 90: 16, 2006; on guava), Lee *et al.* (*Stud. Mycol.* 55: 175, 2006; on *Restionaceae*), Hu *et al.* (*Fungal Diversity* 24: 1, 2007; phylogeny).
- Pestalozzia**, see *Pestalotia*.
- Pestalozziella** Sacc. & Ellis ex Sacc. (1882), anamorphic *Pezizomycotina*, Cpd.0eH.10. 4, widespread (temperate). See Nag Raj & Kendrick (*CJB* 50: 607, 1972).
- Pestalozzina** (Sacc.) Sacc. (1895) ≡ *Zetiasplozna* fide Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993).
- Pestalozzina** P. Karst. & Roum. (1890) ? = *Bartalinia* fide Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993).
- Pestalozzites** E.W. Berry (1917), Fossil Fungi. 2 (Oligocene, Miocene), USA.
- Petaloides** Lloyd ex Torrend (1920) = *Polyporus* P. Micheli ex Adans. fide Donk (*Persoonia* 1: 173, 1960).
- Petalosporus** G.R. Ghosh, G.F. Orr & Kuehn (1963) = *Arachniotus* fide von Arx (*Persoonia* 9: 393, 1977).
- Petasodes** Clem. (1909) = *Phomopsis* (Sacc.) Bubák. fide Sutton (*Mycol. Pap.* 141, 1977).
- Petasospora** Boidin & Abadie (1955) = *Pichia* fide Yamada *et al.* (*Biosc., Biotechn., Biochem.* 60: 818, 1996), Kurtzman in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 273, 1998).
- Petch** (Thomas; 1870-1948; England, later Sri Lanka). Schoolmaster, Hull and King's Lynn (1890s); mycologist, Royal Botanic Gardens, Peradeniya (1905-1924); founder and first Director, Tea Research Institute (1925-1928). A leading student of tropical mycology (many works published in *Annals of the Royal Botanic Gardens, Peradeniya*, 1906-1926), entomogenous fungi (q.v.) and plant pathology; married a daughter of Charles Plowright and on retirement lived in Plowright's old house at North Wootton, near King's Lynn. His specimens are in the fungal reference collections of the Royal Botanic Gardens, Kew (K) and Peradeniya; slides in the British Museum (Natural History), London (BM). *Publs. Diseases and Pests of the Rubber Tree* (1921); *Diseases and Pests of the Tea Bush* (1923); *British Hypocreales*. *TBMS* 21, 25, 27 (1938-1945). *Biogs, obits etc.* Ainsworth (*TBMS* 67: 179, 1976) [portrait]; Stafleu & Cowan (*TL-2* 4: 168, 1983).
- Petchiomyces** E. Fisch. & Mattir. (1938), *Pyronemataceae*. 2, N. America; Sri Lanka. See Eckblad (*Nytt Mag. Bot.* 15: 1, 1968), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Petelotia** Pat. (1924) = *Acanthonitschkea* fide Nannfeldt (*Svensk bot. Tidskr.* 66: 49, 1975).
- Peterjamesia** D. Hawksw. (2006), *Roccellaceae*. 2, widespread. See Hawksworth (*Lichenologist* 38: 187, 2006).
- Petersonia** Cummins & Y. Hirats. (2003) nom. inval., anamorphic *Mikronegeria*. 1 (on *Araucaria*), Chile. Anamorph name for (I).
- Petractis** Fr. (1845), *Ostropales* (L.). 5, widespread. See Vězda (*Preslia* 37: 127, 1965), Kauff & Lutzoni (*Mol. Phylogen. Evol.* 25: 138, 2002; phylogeny), Kauff & Büdel (*Bryologist* 108: 272, 2005; ontogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Petrak** (Franz; 1886-1973; Austria). Born in Mährisch-Weisskirchen [now Hranice, Czech Republic]; student, Vienna (1906-1913); school teacher (1913-1916); Austrian army (1916-1918); private scientist, living by selling exsiccata (1918-1938); contract employee, Natural History Museum, Vienna (1938-1951). Eminent and prolific taxonomist (especially ascomycetes and anamorphic fungi), bibliographer and indexer (see Literature); collector, distributing thousands of exsiccata specimens; contributor to the mycotas of many parts of the world; founded *Sydowia* (1947) to replace *Annales Mycologici*. *Publs. Petrak's Lists* (1930-1950) [these volumes are freely available on-line; see Internet: catalogues & thesauri]; see also full bibliography in Samuels. *Biogs, obits etc.* Arx (*Persoonia* 9: 95, 1976); Grumann (1974: 938); Lohwag (*Beihefte zur Sydowia* 1: IV, 1957) [portrait]; Riedl (*Sydowia* 26: xxix, 1974); Samuels (*An Annotated Index to the Mycological Writings of Franz Petrak* 1-5 A-O, 1981-1986) [bibliography and biography in vol. 1]; Stafleu & Cowan *TL-2* 4: 204, 1983).
- Petrakia** Syd. & P. Syd. (1913), anamorphic *Pezizomycotina*, Hsp.#eP.1. 3, Europe; Asia. See van der Aa (*Acta Bot. Neerl.* 171: 221, 1968), Carmichael *et al.* (*Genera of Hyphomycetes*, 1980; synonymy with *Echinosprium*), Wong *et al.* (*Cryptog. Mycol.* 23: 195, 2002).
- Petrakiella** Syd. (1924), ? *Sordariomycetes*. 1 (from bark), Brazil. Affinities uncertain, no recent research is available.
- Petrakina** Cif. (1932), ? *Asterinaceae*. 2, C. America. See Farr & Palm (*Mycotaxon* 24: 275, 1985).
- Petrakiopeltis** Bat., A.F. Vital & Cif. (1957), ? *Microthyriaceae*. 1, Guyana. See Batista *et al.* (*Publções Inst. Micol. Recife* 90: 10, 1957).
- Petrakiopsis** Subram. & K.R.C. Reddy (1968), anamorphic *Pezizomycotina*, Hsp.1bH.1. 1, India. See Subramanian & Reddy (*Sydowia* 20: 340, 1966).
- Petrakomyces** Subram. & K. Ramakr. (1953) = *Ciliochora* fide Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993).
- Petriella** Curzi (1930), *Microascaceae*. Anamorphs *Graphium*, *Scopulariopsis*, *Scedosporium*. 5, Europe; N. America. See Barron *et al.* (*CJB* 39: 837, 1961; key), Corlett (*CJB* 44: 79, 1966; ontogeny), Val-

- maseda *et al.* (*CJB* 65: 1802, 1987; concept), von Arx *et al.* (*Beih. Nova Hedwigia* 94, 1988), Issakainen *et al.* (*J. Med. Vet. Mycol.* 35: 389, 1997; DNA), Issakainen *et al.* (*MR* 103: 1179, 1999), Lee & Hanlin (*Mycol.* 91: 434, 1999; DNA), Okada *et al.* (*CJB* 76: 1495, 1999), Issakainen *et al.* (*Medical Mycology* 41: 31, 2003; phylogeny), Kwasna *et al.* (*Acta Mycologica Warszawa* 40: 267, 2005; morphology, phylogeny), Rainer & Hoog (*MR* 110: 151, 2006; phylogeny), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Petriellidium** Malloch (1970) = *Pseudallescheria* fide McGinnis *et al.* (*Mycotaxon* 14: 94, 1982).
- Petriellopsis** Gilgado, Cano, Guarro & Gené (2007), Microascaceae. 1, Argentina. See Gilgado *et al.* (*Int. J. Syst. Evol. Microbiol.* 57: 2171, 2007).
- Petromyces** Malloch & Cain (1973), Trichocomaceae. Anamorph *Aspergillus*. 2, widespread. See Kuraishi *et al.* (*NATO ASI Series A: Life Sciences* 185: 407, 1990; ubiquinones), Udagawa *et al.* (*Mycotaxon* 52: 207, 1994), Samson (*Contributions to Microbiology* 2: 5, 1999; review), Frisvad & Samson (*Stud. Mycol.* 45: 201, 2000), Varga *et al.* (*Antonie van Leeuwenhoek* 77: 83, 2000), McAlpin & Wicklow (*Can. J. Microbiol.* 51: 765, 2005; physiology, ontogeny), McAlpin & Wicklow (*Can. J. Microbiol.* 51: 1039, 2005; genetic diversity).
- Petrona** Adans. (1763) ? = *Schizophyllum* fide Donk (*Beih. Nova Hedwigia* 5: 220, 1962).
- petrophilous**, see saxicolous.
- Petrosphaeria** Stopes & H. Fujii (1910), Fossil Fungi (mycel.) Fungi. 1 (Cretaceous), Japan.
- Peyerimhoffiella** Maire (1916), Laboulbeniaceae. 1, N. Africa. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- Peylia** Opiz (1857) = *Botryosporium* Corda fide Saccardo & Trotter (*Syll. fung.* 22: 1252, 1913).
- Peyritschella** Thaxt. (1890), Laboulbeniaceae. 47, widespread. See De Kesel (*Belg. J. Bot.* 131: 176, 1998; Belgium).
- Peyritschellaceae** Thaxt. (1908) = Laboulbeniaceae.
- Peyronelia** Cif. & Gonz. Frag. (1927), anamorphic *Glyphium*, Hso.#eP.4. 4, America; Europe.
- Peyronelina** G. Arnaud (1952) nom. inval., anamorphic *Pezizomycotina*.
- Peyronelina** P.J. Fisher, J. Webster & D.F. Kane (1976), anamorphic *Pezizomycotina*, Hso.#bH.1. 1 (aquatic), British Isles. See Fisher *et al.* (*TBMS* 67: 351, 1976), Nakagiri & Ito (*Res. Commun. Inst. Ferm., Osaka* 18: 57, 1995; conidial ontogeny).
- Peyronellaea** Goid. (1952) = *Phoma* Sacc. fide Boerema *et al.* (*Persoonia* 4: 47, 1965), Boerema (*Persoonia* 15: 197, 1993).
- Peyronellula** Malan (1952) = *Emericellopsis* fide Stolk (*TBMS* 38: 419, 1955).
- Pezicula** Paulet (1791) nom. rej. = *Craterellus* fide Cannon & Hawksworth (*Taxon* 32: 477, 1983).
- Pezicula** Tul. & C. Tul. (1865) nom. cons., Dermateaceae. Anamorph *Cryptosporiopsis*. c. 37, widespread (esp. temperate). See Groves (*Can. J. Res. C* 17: 125, 1939), Dennis (*Kew Bull.* 29: 158, 1974; key Brit. spp.), Verkley (*Stud. Mycol.* 44: 180 pp., 1999; monogr., key 26 spp., phylogeny), Abeln (*Mycol.* 92: 685, 2000; phylogeny), Vrålstad *et al.* (*New Phytol.* 155: 131, 2002; phylogeny), Pärtel & Raitviir (*Mycol. Progr.* 4: 149, 2005; ultrastr.), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Peziotrichum** (Sacc.) J. Lindau (1900), anamorphic *Podonectria*, Hsy.0eP.?. 1 (entomogenous), Australia to Sri Lanka. See Petch (*TBMS* 12: 44, 1927), Downing (*Mycol.* 45: 938, 1953).
- Peziza** Dill. ex Fr. (1822), Pezizaceae. Anamorphs *Chromelosporium*, *Oedocephalum*. 104, widespread. Apparently highly polyphyletic with two main clades broadly corresponding to species with *Chromelosporium* and *Oedocephalum* anamorphs. See Donadini (*Bull. Soc. linn. Provence* 31: 9, 1978), Donadini (*Docums Mycol.* 9 no. 36: 1, 1979; key), Donadini (*Docums Mycol.* 11 no. 41: 25, 1980), Donadini (*Docums Mycol.* 14 no. 56: 39, 1980), Donadini (*BSMF* 96: 239, 1980), Donadini (*BSMF* 96: 247, 1980; key *nivalis* group), Donadini (*Docums Mycol.* 11 no. 53: 57, 1984), Donadini (*Bull. Soc. linn. Provence* 36: 153, 1985; spores 74 spp.), Moravec (*Agarica* 6: 56, 1985), Dyby & Kimbrough (*Bot. Gaz.* 148: 283, 1987; ascospore ontogeny), Moravec & Spooner (*TBMS* 90: 43, 1988; brown-spored spp.), Turnau (*TBMS* 91: 338, 1988; asci), Pfister (*Mycotaxon* 41: 505, 1991; tropical spp.), Pfister (*Mycotaxon* 43: 171, 1992; on snow banks), Pant (*Journal of Mycopathological Research* 31: 21, 1993; India), Pant & Tewari (*Journal of Mycopathological Research* 33: 37, 1995; India, key), Yao *et al.* (*SA* 14: 17, 1995; nomencl.), Wang (*Bull. natn. Mus. Nat. Sci. Taiwan* 8: 57, 1996; Taiwan), Landvik *et al.* (*Nordic J. Bot.* 17: 403, 1997; phylogeny), Norman & Egger (*Mycol.* 88: 986, 1996; phylogeny), Norman & Egger (*Mycol.* 91: 820, 1999; phylogeny), Hansen *et al.* (*Mycol.* 93: 958, 2001; phylogeny), Hansen *et al.* (*MR* 106: 879, 2002; phylogeny), Hansen *et al.* (*Mol. Phylogen. Evol.* 36: 1, 2005; phylogeny), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Peziza** Fuckel (1870) = *Aleuria* Fuckel fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Peziza** L. (1753) = *Cyathus* fide Dennis (*Kew Bull.* 37: 643, 1983).
- Pezizaceae** Dumort. (1829), Pezizales. 31 gen. (+ 40 syn.), 230 spp.
- Lit.*: Curry & Kimbrough (*Mycol.* 75: 781, 1983; septal ultrastr.), Moravec (*Mycotaxon* 30: 473, 1987), Kimbrough (*Mem. N. Y. bot. Gdn* 49: 326, 1989; delimitation), Kimbrough *et al.* (*Bot. Gaz.* 152: 408, 1991), Maia *et al.* (*Mycotaxon* 57: 371, 1996), Landvik *et al.* (*Nordic J. Bot.* 17: 403, 1997; DNA), Norman & Egger (*Mycol.* 88: 986, 1996), Harrington *et al.* (*Mycol.* 91: 41, 1999; phylogeny), Norman & Egger (*Mycol.* 91: 820, 1999; phylogeny), Doveri *et al.* (*Docums Mycol.* 30: 3, 2000), Bougher & Lebel (*Aust. Syst. Bot.* 14: 439, 2001), Hansen *et al.* (*Mycol.* 93: 958, 2001), Hansen *et al.* (*MR* 106: 879, 2002), Tehler *et al.* (*MR* 107: 901, 2003), Hansen *et al.* (*Mol. Phylogen. Evol.* 36: 1, 2005), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Pezizales** J. Schröt. (1894). Pezizomycetidae. 16 fam., 199 gen., 1683 spp. Operculate discomycetes; cup-fungi. Stroma absent. Ascomata apothecial or cleistothecial, rarely absent, often large, discoid, cupulate or ± globose, sometimes stalked, often brightly coloured; excipulum usually thick-walled, fleshy or membranous, composed of thin-walled pseudoparenchymatous cells. Interascal tissue of simple or moniliform paraphyses, often pigmented and swollen at the apices, absent in some cleistothecial taxa. Asci elongated, persistent, thin-walled, usually without

obvious apical thickening, opening by a circular pore (operculum) or vertical split, the wall sometimes blueing in iodine, the asci cylindrical to $\pm$ globose and usually indehiscent in cleistothecial taxa. Ascospores usually ellipsoidal, aseptate, hyaline to strongly pigmented, often ornamented, usually without a sheath. Anamorphs hyphomycetous where known, usually with sympodial proliferation. Saprobes on soil and very rotten wood, some coprophilous, mycorrhizal, some hypogeous (and then mycorrhizal); esp. temp. Fams:

- (1) **Ascobolaceae**
- (2) **Ascodesmidaceae**
- (3) **Caloscyphaceae**
- (4) **Carbomycetaceae**
- (5) **Chorioactidaceae**
- (6) **Discinaceae**
- (7) **Glaziellaceae**
- (8) **Helvellaceae**
- (9) **Karstenellaceae**
- (10) **Morchellaceae**
- (11) **Pezizaceae**
- (12) **Pyronemataceae** (syn. *Aleuriaceae*, *Humariaceae*, *Otideaceae*)
- (13) **Rhizinaceae**
- (14) **Sarcoscyphaceae**
- (15) **Sarcosomataceae**
- (16) **Tuberaceae**

Lit.: van Brummelen (*Persoonia* 10: 113, 1978; in Reynolds, 1981; ascus ultrastr., in Hawksworth (Ed.), 1994: 303), Cabello (*Boln. Soc. Argent. Bot.* 25: 394, 1988; *Sarcoscyphineae*), Eckblad (*Nytt. Mag. Bot.* 15: 1, 1968; nomencl. gen., fam., etc.), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Harmaja (*Karstenia* 14: 109, 123, 1974; tetranucleate spored, cyanophilic perispored spp.), Harrington *et al.* (*Mycol.* 91: 41, 1999; phylogeny), Hennebert & Bellemère (1979; anamorphs), Korf (*Mycol.* 64: 937, 1972; synoptic key, gen. names, in Ainsworth *et al.* (Eds), *The Fungi* 4A: 249, 1973; gen. keys, lit.), Landvik *et al.* (*Nordic J. Bot.* 17: 403, 1997; DNA), Norman & Egger (*Mycol.* 91: 820, 1999; phylogeny), Pegler *et al.* (*British truffles*, 1993), Percudani *et al.* (*Mol. Phylog. Evol.* 13: 169, 1999; DNA), Pfister (*Mycol.* 65: 326, 1973; psilopezoid gen.), Pfister & Kimbrough (in McLaughlin *et al.* (Eds), *The Mycota* 7A: 257, 2001), Schumacher & Jenssen, *Arctic Alp. Fungi* 4, 1992; montane spp.); Svrček (*Česká Myk.* 30: 129, 135, 1976; *Sborník narod. Muz. Praha* 32B: 115, 1976; Velenovský spp.), Thind & Kaushal (in Subramanian (Ed.), *Taxonomy of fungi* 1: 283, 1978; tissue types), Trappe (*Mycotaxon* 9: 297, 1979; hypogeous taxa); Weber (*Bibl. Mycol.* 140, 1992; reprod. system).

Regional: **Australasia**: Rifai (*Verh. K. ned. Akad. wet. ser. 2* 57(3), 1968). **Caribbean**: Pfister (*J. Agric. Univ. Puerto Rico* 58: 358, 1974). **Denmark**: Petersen (*Op. Bot.* 77, 1985; ecology). **N. America**: Larsen & Denison (*Mycotaxon* 7: 68, 1978; checklist). **Scandinavia**: Dissing (in Hanse & Knudsen (eds), *Nordic Macromycetes* 1, 2000). **Tierra del Fuego**: Gamundí (*Fl. cript. Tierra del Fuego* 10 (3), 1975). **Ukraine**: Smits'ka (*Petsitsovi gribi Ukraini*, 1975).

See also under *Ascomycota*, *Discomycetes*, *Macrofungi*, *truffle*.

Pezizasporites T.C. Huang (1981), *Fossil Fungi*. 1 (Miocene), Taiwan.

Pezizella Fuckel (1870) = *Calycina* fide Hawksworth *et*

al. (*Dictionary of the Fungi* edn 8, 1995).

Pezizella P. Karst. (1872) = *Pezizula*.

Pezizellaceae Velen. (1934) = *Hyaloscyphaceae*.

Pezizellaster Höhn. (1917) = *Lachnum* fide Dennis (*Mycol. Pap.* 32, 1949).

Pezizites Göpp. & Berendt (1845), *Fossil Fungi*. 3 (Tertiary), Europe.

Pezizomycetes O.E. Erikss. & Winka (1997), *Pezizomycotina*. 1 ord., 16 fam., 200 gen., 1684 spp. Ord.:

Pezizales

For *Lit.* see ord. and fam.

Pezizomycetidae Locq. (1974), see *Pezizomycetes*.

Pezizomycotina O.E. Erikss. & Winka (1997), see *Pezizomycetes*.

Pezizula P. Karst. (1871) = *Thelebolus* fide Kimbrough & Korf (*Am. J. Bot.* 54: 9, 1967).

Pezolepis Syd. (1925), *Helotiales*. 2, widespread (tropical).

Pezoloma Clem. (1909), *Leotiaceae*. 13, widespread (temperate). See Korf (*Phytologia* 21: 201, 1971), Gamundí & Romero (*Fl. criptog. Tierra del Fuego* 10, 1998), Lizoñ *et al.* (*Mycotaxon* 67: 73, 1998; posn), Korf (*Mycotaxon* 73: 493, 1999; subgen. *Phaeopezoloma*).

Pezomela Syd. (1928), ? *Helotiales*. 1, Chile.

PFGE, see pulsed field gel-electrophoresis.

Pfistera Korf & W.Y. Zhuang (1991) = *Peziza* Fr. fide Brummelen (*Cryptog. Bryol.-Lichénol.* 19: 257, 1998).

pH, see Hydrogen-ion concentration.

Phacellium Bonord. (1860), anamorphic *Mycosphaerella*, Hsy. = eP.10. 22, widespread. See Braun (*Nova Hedwigia* 50: 499, 1990), Braun (*Monogr. Cercospora*, *Ramularia Allied Genera (Phytopath. Hyphom.)* 2: 316, 1998; key).

Phacellula Syd. (1927), *Exobasidiales*. 1, C. America; Greece. See Seifert & Bandoni (*Sydowia* 53: 156, 2001).

Phacidiaaceae Fr. (1849), *Helotiales*. 7 gen. (+ 7 syn.), 148 spp.

Lit.: Di Cosmo *et al.* (*Mycotaxon* 21: 1, 1984), Di Cosmo *et al.* (*Mycotaxon* 21: 1, 1984), Kramer (*Stud. Mycol.* 30: 151, 1987), Roll-Hansen (*Eur. J. For. Path.* 17: 311, 1987), Roll-Hansen (*Eur. J. For. Path.* 19: 237, 1989), Gernandt *et al.* (*Mycol.* 93: 915, 2001).

Phacidiales = *Helotiales*.

Phacidiella P. Karst. (1884), anamorphic *Pyrenopeziza*, St.0eH.40. 5, widespread.

Phacidiella Potebnia (1912) = *Potebniamyces*.

Phacidina Höhn. (1917), ? *Leptopeltidaceae*. 1, Europe. See Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).

Phacidiopsis Geyl. (1887), *Fossil Fungi*. 1 (Tertiary), Indonesia. = *Phacidites* fide Meschinelli (1892).

Phacidiopsis Hazsl. (1873) = *Triblidium* fide Saccardo (*Syll. fung.* 8: 804, 1889).

Phacidiopycnis Potebnia (1912), anamorphic *Potebniamyces*, St.0eH.15. 4, widespread. *P. pseudotsugae* (syn. *Phomopsis pseudotsugae*), canker of *Pseudotsuga* and other conifers. See Rupprecht (*Sydowia* 13: 10, 1959), Sutton (*The Coelomycetes*, 1980).

Phacidrostoma Höhn. (1917) = *Phacidium* fide Sherwood (*in litt.*).

Phacidrostromella Höhn. (1917) nom. dub., ? *Dothideomycetes*.

Phacidites Mesch. (1892), *Fossil Fungi*. 19 (Tertiary), Europe.

- Phacidium** Fr. (1815) nom. cons., Phacidiaceae. Anamorphs *Apostrasseria*, *Ceuthospora*. 27, widespread (temperate). *P. infestans* (snow blight of conifers). See DiCosmo *et al.* (*Mycotaxon* 21: 1, 1984; 26 spp.), Roll-Hansen (*Eur. J. For. Path.* 17: 311, 1987), Roll-Hansen (*Eur. J. For. Path.* 19: 237, 1989; review).
- Phacobolus** Fr. (1849) = *Stictis* fide Eriksson & Hawksworth (*SA* 5: 150, 1986).
- Phacodothis**, see *Placodothis*.
- Phacopeltis** Petch (1919) = *Vizella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Phacopsis** Tul. (1852), Parmeliaceae. 21 (on lichens), widespread. See Hafellner (*Herzogia* 7: 343, 1987), Triebel *et al.* (*Bryologist* 98: 71, 1995; key), Peršoh & Rambold (*Mycol. Progr.* 1: 43, 2002; phylogeny).
- Phacorhiza** Pers. (1822) = *Typhula* fide Corner (*Ann. Bot. Mem.* [A monograph of *Clavaria* and allied genera] 1, 1950).
- Phacostroma** Petr. (1955), anamorphic *Pezizomycotina*, Cac.0eH.15. 1, former Czechoslovakia. See Petrak (*Sydowia* 9: 527, 1955).
- Phacostromella** Petr. (1955), anamorphic *Pezizomycotina*, St.0eH.15. 1, Germany. See Petrak (*Sydowia* 9: 480, 1955).
- Phacothecium** Trevis. (1857) = *Arthonia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Phacotiella** Vain. (1927) = *Sphinctrina* fide Tibell (*Beih. Nova Hedwigia* 79: 597, 1984).
- Phacotium** (Ach.) Trevis. (1821) = *Phacotrum*.
- Phacotrum** Gray (1821) = *Calicium* fide Tibell (*Beih. Nova Hedwigia* 79: 597, 1984).
- Phaeangella** (Sacc.) Masee (1895) ? = *Phibalis* fide Korf & Kohn (*Mem. N. Y. bot. Gdn* 28: 109, 1976).
- Phaeangellina** Dennis (1955), Helotiaceae. 1, Europe. See Dennis (*Kew Bull.* 1955: 360, 1955).
- Phaeangium** (Sacc.) Sacc. (1902) [non *Phaeangium* Pat. 1894] = *Pezicula* Tul. & C. Tul. fide Verkley (*Stud. Mycol.* 44: 180 pp., 1999).
- Phaeangium** Pat. (1894), Pyronemataceae. 1, N. Africa; Arabian peninsula. See Alsheikh & Trappe (*CJB* 61: 1923, 1983), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Phaeaspis** Clem. & Shear (1931) = *Vizella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Phaeaspis** Kirschst. (1939) = *Phomatospora* fide Francis (*Mycol. Pap.* 139, 1975).
- Phaedropezia** Le Gal (1953) = *Acervus* fide Pfister (*Occ. Pap. Farlow Herb. Crypt. Bot.* 8, 1975).
- Phaeidium** Clem. (1931) = *Laaseomyces*.
- phaeo-** (prefix), dark-coloured or swarthy, esp. of spores; cf. Anamorphic fungi.
- Phaeocremonium** W. Gams, Crous & M.J. Wingf. (1996), anamorphic *Togninia*, Hso.?.?. 14, widespread. See Crous *et al.* (*Mycol.* 88: 789, 1996).
- Phaeoannellomyces** McGinnis & Schell (1985), anamorphic *Chaetothyriales*, Hso.0eH.19. 2 (from humans), widespread. See McGinnis & Schell (*Sabouraudia* 23: 182, 1985).
- Phaeoantenariella** Cavalc. (1969) nom. dub., anamorphic *Pezizomycotina*. Based on mycelium fide Hawksworth (*Bull. Br. Mus. nat. Hist., Bot.* 9: 78, 1981).
- Phaeoaphelaria** Corner (1953), Aphelariaceae. 1, Australia. See Corner (*Ann. Bot. Mem.* [A monograph of *Clavaria* and allied genera, addenda] 17: 357, 1953).
- Phaeoapiospora** (Sacc. & P. Syd.) Theiss. & Syd. (1915) = *Anisomyces* Theiss. & Syd. fide Petrak (*Sydowia* 1: 35, 1947).
- Phaeobarlaea** Henn. (1903) nom. nud. = *Plicaria* fide Eckblad (*Nytt Mag. Bot.* 15: 1, 1968).
- Phaeoblastophora** Partr. & Morgan-Jones (2002), anamorphic *Pezizomycotina*, H?..?. 2. See Partridge & Morgan-Jones (*Mycotaxon* 83: 339, 2002), Crous *et al.* (*MR* 110: 264, 2006; key).
- Phaeobotryon** Theiss. & Syd. (1915), Botryosphaeriaceae. 4. See Phillips *et al.* (*Persoonia* 21: in press, 2008).
- Phaeobotryosphaeria** Speg. (1908), Botryosphaeriaceae. 1. See Phillips *et al.* (*Persoonia* 21: in press, 2008).
- Phaeobotrys** M. Caldach, Gené & Guarro (2002), anamorphic *Pezizomycotina*, H?..?. 1, Africa; Peru. See Caldach *et al.* (*Mycol.* 94: 127, 2002).
- Phaeobulgaria** Seaver (1932) = *Bulgaria* fide Korf (*Mycol.* 49: 102, 1957).
- Phaeocalicium** Alb. Schmidt (1970), Mycocaliciaceae. c. 10, widespread (temperate). See Tibell (*Beih. Nova Hedwigia* 79: 597, 1984), Titov (*Bot. Zh. SSSR* 71: 384, 1986; key 4 spp.), Hutchison (*Mycol.* 79: 786, 1987; N America), Tibell (*Symb. bot. upsal.* 27 no. 1: 279 pp., 1987; Australasia), Tibell (*Ann. bot. fenn.* 33: 205, 1996; N Europe), Tibell (*Biblthca Lichenol.* 71: 107 pp., 1998; S America), Titov *et al.* (*Botanicheskii Zhurnal* 87: 60, 2002), Tibell & Thor (*J. Hattori bot. Lab.* 94: 205, 2003; Japan), Berglund *et al.* (*Symb. bot. upsal.* 34 no. 1: 49, 2004; Scandinavia).
- Phaeocandelabrum** R.F. Castañeda, Heredia, Saikawa (2007), anamorphic *Pezizomycotina*. 3, widespread.
- Phaeocapnias** Cif. & Bat. (1963) = *Euantennaria* fide Hughes (*Mycol.* 68: 693, 1976).
- Phaeocapnodinula** Clem. & Shear (1931) = *Phaeocapnodinula* Speg.
- Phaeocapnodinula** Speg. (1924) = *Phaeostigme* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Phaeocarpus** Pat. (1887) [non *Phaeocarpus* Mart. & Zucc. 1824, *Sapindaceae*] = *Chromocyphella*.
- Phaeochaetia** Bat. & Cif. (1962) = *Aithaloderma*.
- Phaeochora** Höhn. (1909), Phaeochoraceae. 5 (on *Palmae*), widespread (tropical to subtropical). See Müller (*Sydowia* 86: 1, 1965), Carrai-Giovanni d'Aghiano (*Sperimentazione Applicata* 4: 4, 1992; col. pls), Cannon (*SA* 11: 181, 1993), Hyde *et al.* (*SA* 15: 117, 1997), Hyde & Cannon (*Mycol. Pap.* 175: 114, 1999; gen. delim.).
- Phaeochoraceae** K.D. Hyde, P.F. Cannon & M.E. Barr (1997), ? Phyllachorales. 4 gen., 19 spp.
Lit.: Barr *et al.* (*Mycol.* 81: 47, 1989), Carrai & D'Aghiano (*Inftore fitopatol.* 42: 17, 1992), Hyde *et al.* (*SA* 15: 117, 1997), Hyde *et al.* (*SA* 15: 117, 1997), Hyde & Cannon (*Mycol. Pap.* 175: 114 pp., 1999; spp. on palms).
- Phaeochorella** Theiss. & Syd. (1915), Phyllachoraceae. 6 (from living leaves), S. Africa; Philippines. See Hyde (*TMSJ* 32: 265, 1991).
- Phaeochoropsis** K.D. Hyde & P.F. Cannon (1999), Phaeochoraceae. 4 (on *Palmae*), N. & S. America. See Hyde & Cannon (*Mycol. Pap.* 175, 1999).
- Phaeociboria** Höhn. (1918) = *Lambertella* fide Dumont (*Mem. N. Y. bot. Gdn* 33, 1971).
- Phaeociliospora** Bat. & Peres (1967) = *Ciliochorella* fide Sutton (*Mycol. Pap.* 141, 1977).
- Phaeoclavulina** Brinkmann (1897) = *Ramaria* Fr. ex Bonord. fide Corner (*Ann. Bot. Mem.* [A monograph of *Clavaria* and allied genera] 1, 1950).

- Phaeococcomyces** de Hoog (1979), anamorphic *Herpotrichiellaceae*, Hso.0eH/1eP.3. 4, widespread. See de Hoog (*Taxon* 28: 348, 1979), McGinnis *et al.* (*Sabouraudia* 23: 179, 1985), Sugiyama *et al.* (*J. gen. appl. Microbiol.* Tokyo 33: 197, 1987; ubiquinones), Butler *et al.* (*Can. J. Microbiol.* 35: 728, 1989), Hoog *et al.* (*Antonie van Leeuwenhoek* 68: 43, 1995; physiology), Rogers *et al.* (*Stud. Mycol.* 43: 122, 1999; phylogeny), Untereiner & Naveau (*Mycol.* 91: 67, 1999; phylogeny).
- Phaeococcomycetaceae** McGinnis & Schell (1985) = *Herpotrichiellaceae*.
- Phaeococcus** de Hoog (1977) [non *Phaeococcus* Borzí 1892, *Algae*] = *Phaeococcomyces*.
- Phaeocollybia** R. Heim (1931) nom. cons., *Cortinariaceae*. c. 50, widespread (esp. temperate). See Singer (*Fl. Neotrop.* 4: 3, 1970; monogr. neotrop. spp.), Smith & Trappe (*Mycol.* 64: 1141, 1972; key N. Am. spp.), Horak (*Sydowia* 29: 28, 1978), Singer (*Mycol. Helv.* 2: 247, 1987; key Costa Rica spp.), Norvell (*MR* 102: 615, 1998; ecology), Norvell (*Mycotaxon* 90: 241, 2004; western North America spp.).
- Phaeoconis** Clem. (1909) = *Nigrospora*.
- Phaeocoriolellus** Kotl. & Pouzar (1957) = *Gloeophyllum* fide David (*BSMF* 84: 119, 1968).
- Phaeocrella** Réblová, L. Mostert, W. Gams & Crous (2004), anamorphic *Togniniella*. 1, New Zealand. See Réblová *et al.* (*Stud. Mycol.* 50: 545, 2004), Mostert *et al.* (*Stud. Mycol.* 54: 115 pp., 2006; phylogeny).
- Phaeocreopsis** Sacc. & P. Syd. ex Lindau (1900) = *Valsaria* fide Ju *et al.* (*Mycotaxon* 58: 419, 1996).
- Phaeocryptopus** Naumov (1915), *Dothideales*. Anamorph *Rhizosphaera*. 5 or 6 (on conifers), Europe; N. America. *P. gaeumannii* (Swiss needle cast of *Pseudotsuga taxifolia* in Eur.), now not considered congeneric. See Butin (*Phytopath. Z.* 68: 269, 1970), Stone & Carroll (*Sydowia* 38: 317, 1985; ontogeny *P. gaeumannii*), Hambleton *et al.* (*Mycol.* 95: 959, 2003; phylogeny), Winton *et al.* (*Mycol.* 99: 240, 2007; phylogeny).
- Phaeocyphella** Pat. (1900) = *Chromocyphella*.
- Phaeocyphella** Speg. (1909) = *Chromocyphella* fide Singer (*Agaric. mod. Tax.* edn 3, 1975).
- Phaeocyphellopsis** W.B. Cooke (1961) = *Merismodes* fide Reid (*Persoonia* 3: 97, 1964).
- Phaeocyrtidula** Vain. (1921), ? *Dothideomycetes*. 2, Europe.
- Phaeocyrtis** Vain. (1921) = *Merismatium* fide Triebel (*Bibliotheca Lichenol.* 35, 1989).
- Phaeocytospora** G.L. Stout (1930) = *Phaeocytostroma* fide Petrak (*Annls mycol.* 39: 252, 1941).
- Phaeocytostroma** Petr. (1921), anamorphic *Pezizomycotina*, St.0eP.15. 4, widespread. See Sutton (*The Coelomycetes*, 1980), Levič & Petrovič (*Mycopathologia* 140: 149, 1997; α -conidia & β -conidia).
- Phaeodactylella** Udaiyan (1992), anamorphic *Pezizomycotina*, Hso. = eP.10. 1 (from water cooling tower), India. See Udaiyan (*J. Econ. Taxon. Bot.* 15: 629, 1991).
- Phaeodactylium** Agnihothr. (1968), anamorphic *Pezizomycotina*, Hso.0eH/ = eH.10. 2, paleotropical. See Agnihothrudu (*Proc. Indian Acad. Sci. series B* 68: 206, 1968), Caldusch *et al.* (*Mycol.* 94: 127, 2002).
- Phaeodaedalea** M. Fidalgo (1962) = *Daedalea* fide Reid (*Mem. N. Y. bot. Gdn* 28: 183, 1976).
- Phaeodepas** D.A. Reid (1961), *Marasmiaceae*. 2, Venezuela. See Reid (*Kew Bull.* 15: 273, 1961).
- Phaeoderris** (Sacc.) Höhn. (1907) = *Leptosphaeria* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Phaeodiaportha** Petr. (1920) = *Prosthecium* fide Barr (*Mycol. Mem.* 7, 1978).
- Phaeodictyon** M. Choisy (1929) = *Anthracotheceum* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Phaeodimeriella** Speg. (1908), *Pseudoperisporiaceae*. Anamorph *Cicinnobella*. c. 13 (on *Asterinaceae*, *Meliolaceae*), widespread (tropical). See Hansford (*Mycol. Pap.* 15, 1946), Barr (*Mycotaxon* 64: 149, 1997), Ahn & Crane (*CJB* 82: 1625, 2004).
- Phaeodimeriella** Theiss. (1912) = *Phaeodimeriella* Speg. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Phaeodimeris** Clem. & Shear (1931) = *Phaeodimeriella* Speg.
- Phaeodiscula** Cub. (1891), anamorphic *Pezizomycotina*. 1, Europe. See Petch (*Ann. Bot. Lond.* 22: 389, 1908).
- Phaeodiscus** L.R. Batra (1968) = *Lambertella* fide Dumont (*Mem. N. Y. bot. Gdn* 33, 1971).
- Phaeodochium** M.L. Farr (1968) ? = *Hymenopsis* fide Sutton (*in litt.*).
- Phaeodomus** Höhn. (1909), anamorphic *Pezizomycotina*, St.0eP.19. 3, Cuba; S. America.
- Phaeodon** J. Schröt. (1888) = *Hydnellum* P. Karst. (1879) fide Donk (*Taxon* 5: 69, 1956).
- Phaeodothis** Theiss. & Syd. (1914) nom. dub., *Pezizomycotina*. 3, widespread (tropical). See Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Phaeodothiora** Petr. (1948) = *Sacothecium* fide Eriksson & Hawksworth (*in litt.*), von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Phaeodothis** Syd. & P. Syd. (1904), *Montagnulaceae*. 5, widespread. See Aptroot (*Nova Hedwigia* 60: 325, 1995; key), Liew *et al.* (*Mol. Phylogen. Evol.* 16: 392, 2000; phylogeny), Câmara *et al.* (*MR* 107: 516, 2003; phylogeny), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Phaeofabraea** Rehm (1909), *Helotiaceae*. 2, S. America; Taiwan. See Pfister (*Occ. Pap. Farlow Herb. Crypt. Bot.* 11, 1977; key).
- Phaeogalera** Kühner (1973) = *Galerina* fide Singer (*Nova Hedwigia* 26: 436, 1975).
- Phaeoglabrotricha** W.B. Cooke (1961) = *Pellidiscus* fide Reid (*Persoonia* 3: 97, 1964).
- Phaeoglaena** Clem. (1909) nom. dub., ? *Dothideomycetes* (?L). No spp. included. See Mayrhofer & Poelt (*Herzogia* 7: 13, 1985).
- Phaeoglossum** Petch (1922), *Geoglossaceae*. 1, Sri Lanka. No recent research is available.
- Phaeographidomyces** Cif. & Tomas. (1953) = *Phaeographis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Phaeographina** Müll. Arg. (1882) nom. illegit., *Graphidaceae*. c. 117. The correct name for most of the species appears to be *Thecographa* A. Massal. See Wirth & Hale (*Contr. US natn Herb.* 36: 63, 1963; C. Am.), Nakanishi (*J. Sci. Hiroshima Univ. B(2)* 11: 51, 1966; Japan), Awasthi & Singh (*Kavaka* 1: 87, 1974; India), Archer & Elix (*Mycotaxon* 72: 91, 1999; chemistry), Archer (*Telopea* 8: 461, 2000; Australia), Archer (*Telopea* 9: 329, 2001; Australia), Archer (*Mycotaxon* 83: 361, 2002; Guadalcanal), Nakanishi *et al.* (*Bull. natn. Sci. Mus. Tokyo*, B 28: 107, 2002; Vanuatu), Staiger (*Bibliotheca Lichenol.* 85, 2002; monogr.), Archer (*Systematics & Biodiversity* 5: 9, 2007; Solomon Is), Lücking *et al.* (*Taxon* 56:

- 1296, 2007; nomencl.; = *Pliariona*).
- Phaeographinomyces** Cif. & Tomas. (1953) = *Phaeographina* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Phaeographis** Müll. Arg. (1882) nom. cons. prop., Graphidaceae (L). c. 226, widespread (esp. tropical). See Wirth & Hale (*Contr. US natn Herb.* 36: 63, 1963; C. Am.), Nakanishi (*J. Sci. Hiroshima Univ.* B(2) 11: 51, 1966; Japan), Singh & Awasthi (*Bull. Bot. Surv. India* 21: 97, 1981; key 28 Indian spp.), Ernst & Hauck (*Herzogia* 10: 39, 1994; Germany), Archer & Elix (*Mycotaxon* 72: 91, 1999; chemistry), Archer (*Telopea* 8: 461, 2000; Australia), Archer (*Telopea* 9: 663, 2001; Australia), Staiger (*Biblthca Lichenol.* 85, 2002; revision), López de Silanes & Álvarez (*Nova Hedwigia* 77: 147, 2003; Iberian peninsula), Archer (*Biblthca Lichenol.* 94, 2006; Australia), Staiger *et al.* (*MR* 110: 765, 2006; phylogeny), Archer (*Systematics & Biodiversity* 5: 9, 2007; Solomon Is), Lücking *et al.* (*Taxon* 56: 1296, 2007; nomencl.).
- Phaeographopsis** Sipman (1997), Graphidaceae (L). 3, pantropical. See Aptroot *et al.* (*Biblthca Lichenol.* 64: 129, 1997), Kalb (*Biblthca Lichenol.* 88: 301, 2004), Flakus & Wilk (*J. Hattori bot. Lab.* 99: 307, 2006).
- Phaeogyroporus** Singer (1944) = *Phlebopus* fide Kuyper (*in litt.*).
- Phaeoharziella** Loubière (1924) ? = *Arthrimum* fide Sutton (*in litt.*).
- Phaeohelotium** Kanouse (1935), Helotiaceae. c. 16, widespread (north temperate). See Dennis (*Kew Bull.* 25: 335, 1971; key Brit. spp.), Baral & Krieglsteiner (*Beih. Sydowia* 6, 1985), Huhtinen (*Karstenia* 29: 45, 1990), Svrček (*Česká Mykol.* 46: 149, 1993), Gamundí & Messuti (*MR* 110: 493, 2006; key S hemisphere spp.).
- Phaeohendersonia** Höhn. (1918) nom. dub., *Pezizomycotina*. = 'Hendersonia *sensu* Sacc.' (Ascomycetes, inc. sed.) fide Sutton (*in litt.*).
- Phaeohiratsukaea** Udagawa & Iwatsu (1990), anamorphic *Pezizomycotina*, Hso.0eP.15. 1 (from a stained closet), Japan. See Udagawa & Iwatsu (*Rep. Tottori Mycol. Inst.* 28: 151, 1990).
- Phaeohydnochaete** Lloyd (1916), Hymenochaetaceae. 1, N. America.
- Phaeohygrocybe** Henn. (1901) = *Russula* fide Pegler (*in litt.*).
- Phaeohymenula** Petr. (1954), anamorphic *Pezizomycotina*, Hsp.0eH.?. 1, Australia. See Petrak (*Sydowia* 8: 77, 1954).
- phaeohyphomycosis**, a mycotic infection in humans or other animals caused by a dematiaceous fungus (Ajello *et al.*, *Mycol.* 66: 490, 1974); cf. *hyalohyphomycosis*.
- Phaeoidiomyces** Dorn.-Silva & Dianese (2004), anamorphic *Pezizomycotina*. 1, Brazil. See Dornelo-Silva & Dianese (*Mycol.* 96: 881, 2004).
- Phaeoisaria** Höhn. (1909), anamorphic *Pezizomycotina*, Hsy.0eH.10. 15, widespread. Anamorph links with *Scoptria* require confirmation. See de Hoog & Papendorf (*Persoonia* 8: 407, 1976; key), Müller & Samuels (*Sydowia* 35: 143, 1982; teleomorph), Mercado Sierra *et al.* (*Mycotaxon* 63: 369, 1997; Cuba), Siboe *et al.* (*Mycotaxon* 73: 283, 1999; Kenya), Guarro *et al.* (*J. Clin. Microbiol.* 38: 2434, 2000; keratomycosis), Castaneda Ruiz *et al.* (*Cryptog. Mycol.* 23: 9, 2002; Cuba).
- Phaeoisariopsis** Ferraris (1909) = *Pseudocercospora* fide Ellis (*MDH*, 1976), Deighton (*MR* 94: 1096, 1990; redispotion spp. from *Cercospora*), Walker & White (*MR* 95: 1005, 1991; on *Wikstroemia*), Busogoro *et al.* (*Eur. J. For. Path.* 105: 559, 1999; mol. biol.), Crous *et al.* (*Mycol.* 93: 1081, 2001; phylogeny), Mahuku *et al.* (*Pl. Path.* 51: 594, 2002; genetic diversity, C America), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003; reassignment of names), Sartorato (*J. Phytopath.* 152: 385, 2004; genetic diversity, Brazil), Wagara *et al.* (*J. Phytopath.* 152: 235, 2004; genetic diversity, Kenya), Crous *et al.* (*Stud. Mycol.* 55: 173, 2006; phylogeny, synonymy with *Pseudocercospora*).
- Phaeolabrella** Speg. (1912), anamorphic *Pezizomycotina*, Cac.0eH.1. 1, S. America. See Petrak & Sydow (*Annls mycol.* 33: 157, 1935).
- Phaeolaceae** Jülich (1982) = Polyporaceae.
- Phaeolepiota** Maire ex Konrad & Maubl. (1928), Agaricaceae. 1, widespread (north temperate). Probably a separate family is justified. See Stijve & Andrey (*Australasian Mycologist* 21: 24, 2002).
- Phaeolimacium** Henn. (1899) = *Oudemansiella*.
- Phaeolopsis** Murrill (1905) = *Phylloporia* fide Ryvarden (*Syn. Fung.* 5, 1991).
- Phaeolus** (Pat.) Pat. (1900), Fomitopsidaceae. 2, widespread. See Pegler (*The polypores [Bull. BMS Suppl.]*, 1973), Simpson & May (*Australas. Pl. Path.* 31: 99, 2002; Australia).
- Phaeomacropus** Henn. (1899) = *Helvella* fide Eckblad (*Nytt Mag. Bot.* 15: 1, 1968).
- Phaeomarasmius** Scherff. (1897), Inocybaceae. c. 20, widespread. See Singer (*Schweiz. Z. Pilzk.* 34: 44, 1956; monogr.), Singer (*Schweiz. Z. Pilzk.* 34: 53, 1956; monogr.), Horak (*Sydowia* 32: 167, 1979; key 8 Papua New Guinea spp.).
- Phaeomarsonia** (orthographic variant), see *Phaeomarssonia* Speg.
- Phaeomarssonia** Bubák (1915) = *Didymosporina* fide Sutton (*Mycol. Pap.* 141, 1977).
- Phaeomarssonia** Speg. (1908) nom. dub., anamorphic *Pezizomycotina*. See Petrak & Sydow (*Annls mycol.* 34: 32, 1936).
- Phaeomassaria** Speg. (1880) ? = *Massaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Phaeomeris** Clem. (1909) = *Speiconisca* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Phaeomoniella** Crous & W. Gams (2000), anamorphic *Herpotrichiellaceae*. 1, widespread. See Crous & Gams (*Phytopath. Mediterr.* 39: 113, 2000), Gams (*Stud. Mycol.* 45: 187, 2000; morphology), Groenewald *et al.* (*S. Afr. J. Sci.* 96: 43, 2000; PCR diagnostics), Groenewald *et al.* (*MR* 105: 651, 2001; phylogeny), Whiting *et al.* (*Mycotaxon* 92: 351, 2005; culture, phylogeny), Lee *et al.* (*Mycol.* 98: 598, 2006; pine endophytes), Mostert *et al.* (*Australas. Pl. Path.* 35: 453, 2006; genetic diversity), Mostert *et al.* (*Stud. Mycol.* 54: 115 pp., 2006).
- Phaeomonilia** R.F. Castañeda, Heredia & R.M. Arias (2007), anamorphic *Pezizomycotina*. 2, Cuba; Mexico. See Castañeda Ruiz *et al.* (*Mycotaxon* 100: 327, 2007).
- Phaeomonostichella** Keissl. ex Petr. (1941), anamorphic *Pezizomycotina*, Cpd/Cac.0eP.?. 1, China. See Sutton (*Mycol. Pap.* 141, 1977).
- Phaeomycena** R. Heim ex Singer & Digilio (1966), Tricholomataceae. 5, Africa; Asia. See Singer & Digilio (*Lilloa* 25: 175, 1966).
- Phaeomyces** E. Horak (2005), Inocybaceae. 2, Europe.

- See Horak (*Röhrlinge und Blätterpilze in Europa*, 2005).
- phaeomycosis**, see phaeohyphomycoses.
- Phaeonaevia** L. Holm & K. Holm (1977), Helotiales. 1 (on *Rubus*), widespread (northern Europe). See Holm & Holm (*Kew Bull.* 31: 576, 1977).
- Phaeonectria** (Sacc.) Sacc. & Trotter (1913) = *Calostilbe* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Phaeonectriella** R.A. Eaton & E.B.G. Jones (1971), Halosphaeriaceae. 1 (submerged wood), widespread. See Lowen (*SA* 5: 150, 1986; posn), Chen *et al.* (*Mycol.* 91: 84, 1999; phylogeny), Hyde *et al.* (*Mycoscience* 40: 165, 1999), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Campbell *et al.* (*Mycol.* 95: 530, 2003; phylogeny).
- Phaeonema** Kütz. (1843) nom. dub., ? Fungi.
- Phaeonematoloma** (Singer) Bon (1994) = *Pholiota* fide Kuyper (*in litt.*).
- Phaeopeltis** Clem. (1909) = *Phaeosaccardinula*.
- Phaeopeltis** Petch (1919) = *Phaeaspis* Clem. & Shear.
- Phaeopeltium** Clem. & Shear (1931) = *Phaeopeltosphaeria*.
- Phaeopeltosphaeria** Berl. & Peglion (1892), Dothideomycetes. 2, widespread.
- Phaeopezia** (Vido) Sacc. (1884) = *Peziza* Fr. fide Eckblad (*Nytt Mag. Bot.* 15: 1, 1968).
- Phaeophacidium** Henn. & Lindau (1897), Rhytismatales. 1, America.
- Phaeophlebia** W.B. Cooke (1956) = *Punctularia* fide Talbot (*Bothalia* 7: 131, 1958).
- Phaeophleospora** Rangel (1916), anamorphic *Mycosphaerellaceae*. 18. See also *Kirramyces* for species on eucalypts. See Sutton (*Mycol. Pap.* 141, 1977), Crous *et al.* (*S. Afr. J. Bot.* 63: 111, 1997), Crous (*Mycol. Mem.* 21: 170 pp., 1998), Taylor & Crous (*Fungal Diversity* 3: 153, 1999; on *Proteaceae*), Crous *et al.* (*Stud. Mycol.* 45: 107, 2000; review), Crous *et al.* (*Mycol.* 93: 1081, 2001; phylogeny), Taylor *et al.* (*S. Afr. J. Bot.* 67: 39, 2001; on *Proteaceae*), Hunter *et al.* (*MR* 108: 672, 2004; S Africa), Hunter *et al.* (*Stud. Mycol.* 55: 147, 2006; phylogeny), Andjic *et al.* (*MR* 111: 1184, 2007; phylogeny).
- Phaeophloeospora** Crous & B. Sutton (1997), anamorphic *Pezizomycotina*, Cpd.?.?. 1, S. Africa. See Crous & Sutton (*S. Afr. J. Bot.* 63: 281, 1997).
- Phaeopholiota** Locq. & Sarwal (1983), Agaricaceae. 1, Sikkim. See Locquin & Sarwal (*Compt. Rend. Congr. Natl. Soc. Savantes Sec. Sci.*, 1983: 193, 1983).
- Phaeophomatospora** Speg. (1909) = *Anthostomella* fide Petrak & Sydow (*Annls mycol.* 23: 209, 1925), Francis (*Mycol. Pap.* 139, 1975), Lu & Hyde (*Fungal Diversity Res. Ser.* 4, 2000).
- Phaeophomopsis** Höhn. (1917), anamorphic *Pezizomycotina*, St.0eP.?. 1, France. See Sutton (*Mycol. Pap.* 141, 1977).
- Phaeophragmeriella** Hansf. (1944) = *Leptomeliola* fide Hughes (*Mycol. Pap.* 166, 1993).
- Phaeophragmocaula** F. Stevens (1931) = *Dermatodothis* fide Müller (*Sydowia* 28: 149, 1976).
- Phaeophycopsis** Bat. & Peres (1967) = *Seuratia* fide Meeker (*CJB* 53: 2462, 1975).
- Phaeophyscia** Moberg (1977), Physciaceae (L). 28, widespread. See Esslinger (*Mycotaxon* 7: 283, 1978; N. Am.), Hafellner *et al.* (*Herzogia* 5: 39, 1979), Hale (*Lichenologist* 15: 157, 1983), Moberg (*Nordic Jl Bot.* 3: 509, 1983; E. Africa), Kashiwadani (*Bull. natn. Sci. Mus. Tokyo*, B 10: 127, 1984; Japan), Moberg (*Op. Bot.* 121: 281, 1993; S. Am.), Moberg (*Nordic Jl Bot.* 15: 319, 1995; Far East), Lohtander *et al.* (*Mycol.* 92: 728, 2000; Scandinavia, phylogeny), Dahlkild *et al.* (*Bryologist* 104: 527, 2001; photobionts), Grube & Arup (*Lichenologist* 33: 63, 2001; phylogeny), Helms *et al.* (*Mycol.* 95: 1078, 2003; phylogeny), Simon *et al.* (*J. Mol. Evol.* 60: 434, 2005; introns), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Phaeopolynema** Speg. (1912) = *Hymenopsis* fide Sutton (*Mycol. Pap.* 141, 1977).
- Phaeopolystomella** Bat. & H. Maia (1960) = *Microdothella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Phaeoporothelium** (W.B. Cooke) W.B. Cooke (1961), Cyphellaceae. 2, Cuba; Argentina. See Cooke (*Beih. Sydowia* 4: 129, 1961).
- Phaeoporus** Bataille (1908) = *Tylopilus* fide Kuyper (*in litt.*).
- Phaeoporus** J. Schröt. (1888) ? = *Inonotus* fide Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974).
- Phaeopterula** (Henn.) Sacc. & D. Sacc. (1905) = *Pterula* fide Corner (*Ann. Bot. Mem.* [A monograph of *Clavaria* and allied genera] 1, 1950).
- Phaeopyxis** Rambold & Triebel (1990), Helotiales. 4 (mainly on lichens), widespread (north temperate). See Rambold & Triebel (*Notes R. bot. Gdn Edinb.* 46: 375, 1990).
- Phaeoradulum** Pat. (1900), Boletales. 1, West Indies.
- Phaeoramularia** Munt.-Cvetk. (1960) = *Passalora* fide Ellis (*More Dematiaceous Hyphomycetes*, 1976), Deighton (*Mycol. Pap.* 144: 26, 1979), Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 2: 382, 1998; key), Braun (*Schlechtendalia* 2: 1, 1998), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003).
- Phaeorhizisma** Henn. (1899) ? = *Criella* fide Müller (*Sydowia* 12: 160, 1959; non-sporulating).
- Phaeorobillarda** Bat. & J.L. Bezerra (1961) = *Robillarda* Sacc. fide Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993).
- Phaeorrhiza** H. Mayrhofer & Poelt (1979), Physciaceae (L). 2, widespread. See Mayrhofer & Poelt (*Nova Hedwigia* 30: 783, 1979), Elvebakk & Moberg (*Lichenologist* 34: 311, 2002; Chile), Helms *et al.* (*Mycol.* 95: 1078, 2003; phylogeny), Golubkova (*Nov. sist. Niz. Rast.* 37: 200, 2004; Russia).
- Phaeosaccardinula** Henn. (1905), Chaetothyriaceae. 14, widespread (tropical). See Eriksson & Yue (*Mycotaxon* 22: 269, 1985).
- Phaeoschiffnerula** Theiss. (1914) = *Schiffnerula*. fide Petrak [not traced]. fide Petrak (*Annls mycol.* 25: 193, 1927).
- Phaeoschizophyllum** W.B. Cooke (1962) = *Schizophyllum* fide Donk (*Persoonia* 3: 199, 1964).
- Phaeosclera** Sigler, Tsuneda & J.W. Carmich. (1981), anamorphic *Dothideomycetes*, Hso.#eP.1. 1, Canada. See Sigler *et al.* (*Mycotaxon* 12: 461, 1981), Hambleton *et al.* (*Mycol.* 95: 959, 2003; phylogeny).
- Phaeosclerotinia** Hori (1916), Sclerotiniaceae. Anamorph *Monilia*. 1, Japan.
- Phaeoscopulariopsis** M. Ota (1928) nom. provis. = *Scopulariopsis* fide Morton & Smith (*Mycol. Pap.* 86, 1963).
- Phaeoscutella** Henn. (1904) nom. dub., Fungi.
- Phaeoscypha** Spooner (1984), Hyaloscyphaceae. Anamorph *Chalara*-like. 1, British Isles. See Spooner

- (*Kew Bull.* 38: 574, 1984).
- Phaeoseptoria** Speg. (1908), anamorphic *Phaeosphaeria*, Cpd.≡ fP.?. 19, widespread. See Petrak (*Annls mycol.* 39: 292, 1941), Punithalingam (*Nova Hedwigia* 32: 585, 1980; key), Knipscheer *et al.* (*S. Afr. For. J.* 154: 56, 1990; *P. eucalypti* in *S. Afr.*), Walker *et al.* (*MR* 96: 911, 1992; redisp. of *P. eucalypti*, redescr. of *P. papayae*), Punithalingam & Spooner (*MR* 101: 292, 1997; on lichens), Câmara *et al.* (*Mycol.* 94: 630, 2002; phylogeny).
- Phaeosiphonia** Kütz. (1849) nom. dub., ? Fungi.
- Phaeosolenia** Speg. (1902), ? Inocybaceae. 8, S. America. See Cooke (*Sydowia* Beih. 4, 1961), Siepe & Kasperek (*Z. Mykol.* 68: 153, 2002; *Phaeosolenia densa* from Germany).
- Phaeosperma** (Sacc.) Traverso (1906) = *Valsaria* fide Shear (*Mycol.* 30: 589, 1938).
- Phaeosperma** Nitschke ex Fuckel (1870), ? Dothideomycetes. 1 (on *Alnus*), Switzerland.
- Phaeosperma** Nitschke ex G.H. Otth (1869) [non *Phaiosperma* Raf. 1883] = *Camarops* fide Nannfeldt (*Svensk bot. Tidskr.* 66: 335, 1972).
- Phaeosphaera** Bat. & Cif. (1963), anamorphic *Pezizomycotina*, Cpd.0eP.?. 2, Philippines; USA. See Batista & Ciferri (*Quaderno Ist. Bot. Univ. Pavia* 31: 142, 1963).
- Phaeosphaerella** P. Karst. (1888) = *Venturia* Sacc. fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Phaeosphaeria** I. Miyake (1909), *Phaeosphaeriaceae*. Anamorphs *Phaeoseptoria*, *Stagonospora*. c. 81 (esp. on *Poaceae*), widespread. See Holm (*Symb. bot. upsal.* 14 no. 3: 1, 1957), Eriksson (*Ark. Bot. ser. 2* 6: 339, 1967), Koponen & Mäkelä (*Ann. bot. fenn.* 12: 141, 1975; Finland), Otani (*Bull. natn. Sci. Mus. Tokyo*, B 2: 87, 1976; Japan), Leuchtmann (*Sydowia* 37: 75, 1984; key 45 spp.), Leuchtmann in Laursen *et al.* (Eds) (*Arctic and Alpine Mycology* 2: 153, 1987; key arctic alpine 16 spp.), Shoemaker & Babcock (*CJB* 67: 1500, 1989; monogr., keys), Khashnobish & Shearer (*MR* 100: 1355, 1996; phylogeny), Halama in Lucaset *et al.* (Eds) (*Septoria on Cereals*: 70, 1999), Silva-Hanlin & Hanlin (*MR* 103: 153, 1999), Czembor & Arseniuk (*MR* 104: 919, 2000; recombination), Câmara *et al.* (*Mycol.* 94: 630, 2002; phylogeny), Fukuhara (*Mycoscience* 43: 375, 2002; on *Phragmites*), Eriksson & Hawksworth (*Mycol.* 95: 426, 2003; phylogeny), Ueng *et al.* (*Curr. Genet.* 43: 121, 2003; mating type genes), Ueng *et al.* (*Plant Pathology Bulletin Taichung* 12: 255, 2003; on cereals), Solomon *et al.* (*Eur. J. Pl. Path.* 110: 763, 2004; mating types), Stoykov (*Mycol. Balcanica* 1: 125, 2004; Bulgaria), Tanaka (*Mycoscience* 45: 377, 2004; Japan), Verkley *et al.* (*Mycol.* 96: 558, 2004), Malkus *et al.* (*FEMS Microbiol. Lett.* 249: 49, 2005; on cereals), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny), Adhikari *et al.* (*Phytopathology* 98: 101, 2008; population biology, USA).
- Phaeosphaeriaceae** M.E. Barr (1979), *Pleosporales*. 19 gen. (+ 28 syn.), 394 spp.
Lit.: Leuchtmann (*Sydowia* 37: 75, 1984), Shoemaker (*CJB* 62: 2730, 1984), Shoemaker & Babcock (*CJB* 63: 1284, 1985), Boise (*Mem. N. Y. bot. Gdn* 49: 308, 1989), Shoemaker & Babcock (*CJB* 67: 1500, 1989), Barr (*Mycotaxon* 43: 371, 1992; keys 14 N. Am. gen.), Khashnobish & Shearer (*MR* 100: 1355, 1996), Ramaley (*Mycotaxon* 61: 351, 1997), Caten (*Septoria on Cereals A Study of Pathosystems*: 26, 1999), Cunfer & Ueng (*Ann. Rev. Phytopath.* 37: 267, 1999), Silva-Hanlin & Hanlin (*MR* 103: 153, 1999), Liew *et al.* (*Mol. Phylogen. Evol.* 16: 392, 2000), Câmara *et al.* (*MR* 105: 41, 2001), Câmara *et al.* (*Mycol.* 94: 630, 2002), Câmara *et al.* (*MR* 107: 516, 2003), Kodsueb *et al.* (*Mycol.* 98: 571, 2006), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Phaeosphaeriopsis** M.P.S. Câmara, M.E. Palm & A.W. Ramaley (2003), *Pleosporales*. Anamorph *Phaeostagonospora*. 6, widespread. See Câmara *et al.* (*MR* 107: 519, 2003).
- Phaeospora** Hepp ex Stein (1879), ? *Verrucariaceae*. 15 (on lichens), widespread.
- Phaeosporella** Keissl. (1922) = *Phaeosphaerella*.
- Phaeosporis** Clem. (1909), ? *Sordariales*. 2, France. See Hawksworth (*SA* 6: 145, 1987), Krug *et al.* (*Mycol.* 86: 581, 1994).
- Phaeosporobolus** D. Hawksw. & Hafellner (1986), anamorphic *Pezizomycotina*, St.0eP.3. 1 (on lichens), Europe; USA. See Hawksworth & Hafellner (*Nova Hedwigia* 43: 525, 1986).
- Phaeostagonospora** A.W. Ramaley (1997), anamorphic *Phaeosphaeriopsis*, Cpd.?.?. 1, USA. See Ramaley (*Mycotaxon* 61: 351, 1997).
- Phaeostagonosporopsis** Woron. (1925) = *Stenocarpella* fide Sutton (*Mycol. Pap.* 141, 1977).
- Phaeostalagmus** W. Gams (1976), anamorphic *Chaetosphaeria*, Hso.0eH.15. 7, widespread. See Sutton & Mel'nik (*MR* 96: 908, 1992), Réblová (*Stud. Mycol.* 50: 171, 2004), Fernández & Huhndorf (*Fungal Diversity* 18: 15, 2005; teleomorph).
- Phaeosticta** Trevis. (1869) nom. rej. = *Pseudocyphellaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Phaeostigme** Syd. & P. Syd. (1917), *Pseudoperisporiaceae*. c. 20, widespread (tropical). See Hughes (*Mycol. Pap.* 166, 1993).
- Phaeostilbella** Höhn. (1919) = *Myrothecium* fide Tulloch (*Mycol. Pap.* 130, 1972).
- Phaeostoma** Arx & E. Müll. (1954) [non *Phaeostoma* Spach 1835, *Onagraceae*] = *Arxiomyces*.
- Phaeostomiopeltis** Bat. & Cavalc. (1963) = *Haplopelthea* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Phaeotellus** Kühner & Lamoure (1972) = *Omphalina* fide Kuyper (*in litt.*).
- Phaeotheca** Sigler, Tsuneda & J.W. Carmich. (1981), anamorphic *Capnodiales*, Hsp.0eP.endoconidia. 2, widespread. See DesRochers & Ouellette (*CJB* 72: 808, 1994; sp. inhibiting *Ophiostoma ulmi*), Hoog *et al.* (*Antonie van Leeuwenhoek* 71: 289, 1997; from humidifier), Hoog *et al.* (*Stud. Mycol.* 43: 31, 1999; phylogeny), Zalar *et al.* (*Stud. Mycol.* 43: 49, 1999; revision), Tsuneda *et al.* (*Mycol.* 96: 1136, 2004; endoconidiogenesis).
- Phaeothecium**, see *Phacothecium*.
- Phaeothecoidea** Crous (2007), anamorphic *Mycosphaerellaceae*. 1, Australia. See Crous *et al.* (*Stud. Mycol.* 58: 1, 2007), Crous *et al.* (*Fungal Diversity* 26: 1, 2007).
- Phaeothrombis** Clem. (1909) = *Thrombium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Phaeothyriolum** Syd. (1938), *Microthyriaceae*. 1 (on *Eucalyptus*), Australia. See Swart (*TBMS* 87: 81, 1986).
- Phaeothyrium** Petr. (1947), anamorphic *Pezizomycotina*, Cpt.0eP.?. 1, China.
- Phaeotomasellia** Katum. (1981), *Dothideomycetes*. 1,

- Uganda. See Katumoto (*J. Jap. Bot.* **56**: 389, 1981).
- Phaeotrabutia** Orejuela (1941) = *Phyllachora* Nitschke ex Fuckel (1870) fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* **11** no. 1, 1954).
- Phaeotrabutiella** Theiss. & Syd. (1915) = *Phyllachora* Nitschke ex Fuckel (1870) fide Hyde & Cannon (*Mycol. Pap.* **175**, 1999).
- Phaeotrametaceae** O.F. Popoff ex Piątek (2005) = Polyporaceae.
- Phaeotrametes** Lloyd ex J.E. Wright (1966), Polyporaceae. 1, southern hemisphere. See Wright (*Mycol.* **58**: 529, 1966), Piątek & Cabala (*Mycotaxon* **91**: 173, 2005; Poland).
- Phaeotrema** Müll. Arg. (1887), ? Dothideomycetes. 14. See Salisbury (*Nova Hedw.* **29**: 405, 1978), Matsumoto & Deguchi (*Bryologist* **102**: 86, 1999; anamorphs), Matsumoto (*J. Hattori bot. Lab.* **88**: 1, 2000).
- Phaeotremella** Rea (1912) = *Tremella* Pers. fide Donk (*Taxon* **7**: 238, 1958).
- Phaeotrichaceae** Cain (1956), Pleosporales. 3 gen., 7 spp.
Lit.: Cain (*CJB* **34**: 675, 1956), Ebersohn & Eicker (*S. Afr. J. Bot.* **58**: 145, 1992), Khan & Krug (*Proceedings of the Thirteenth Plenary Meeting of AET-FAT Zomba, Malawi, 2-11 April 1991, Vol. 1*: 755, 1994), Lumbsch & Lindemuth (*MR* **105**: 901, 2001), Kruys *et al.* (*MR* **110**: 527, 2006).
- Phaeotrichoconis** Subram. (1956), anamorphic *Pezizomycotina*, Hso.≡ eP.26. 2, widespread. See Subramanian (*Proc. Indian Acad. Sci. series B* **44**: 2, 1956).
- Phaeotrichosphaeria** Sivan. (1983), ? Xylariales. Anamorph *Endophragmiella*. 4 (from wood etc.), India; British Isles; New Zealand. Perhaps related to *Iodosphaeria*. See Barr (*Mycotaxon* **39**: 43, 1990; posn), Réblová (*Mycotaxon* **71**: 13, 1999; posn), Romero & Carmarán (*Persoonia* **18**: 253, 2003).
- Phaeotrichum** Cain & M.E. Barr (1956), Phaeotrichaceae. 2, widespread. See Cain (*CJB* **34**: 675, 1956), Barr (*Mycotaxon* **76**: 105, 2000), Kruys *et al.* (*MR* **110**: 527, 2006; phylogeny), Schoch *et al.* (*Mycol.* **98**: 1041, 2006; phylogeny).
- Phaeotrombis**, see *Phaeothrombis*.
- Phaeotrype** Sacc. (1920) = *Diatrype* fide Petrak (*Annl. mycol.* **23**: 46, 1925).
- Phaeoxyphiella** Bat. & Cif. (1963), anamorphic *Capnodium*, Cpd.≡ eP.?. 7, widespread. See Hughes (*Mycol.* **68**: 693, 1976).
- Phaeoxyphium** Bat. & Cif. (1963) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* **141**, 1977).
- Phaeoxyphium** Bat. & J.L. Bezerra (1960) ≡ *Phaeoxyphium* Bat. & Cif.
- Phaffia** M.W. Mill., Yoney. & Soneda (1976), anamorphic *Xanthophyllomyces*, Hso.0eH.3/19. 1, Japan; USA. See Nagy *et al.* (*FEMS Microbiol. Lett.* **123**: 315, 1994; PGFE), Adrio *et al.* (*Curr. Genet.* **27**: 447, 1995; PFGE), Johnson & Schroeder (*Stud. Mycol.* **38**: 81, 1995; production astaxanthin), Varga *et al.* (*Int. J. Syst. Bacteriol.* **45**: 173, 1995; isozymes, RAPD, RFLP), Kucsera *et al.* (*Antonie van Leeuwenhoek* **73**: 163, 1998; life cycle), Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* **50**: 1351, 2000; mol. phylogeny), Fell *et al.* (*The Mycota, A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research* **7 B**: 3, 2001).
- Phaffomyces** Y. Yamada (1997), Phaffomycetaceae. 3 (on cacti), widespread. See Yamada *et al.* (*Biosc., Biotechn., Biochem.* **63**: 827, 1999), Suh *et al.* (*Mycol.* **98**: 1006, 2006; phylogeny).
- Phaffomycetaceae** Y. Yamada, H. Kawas., Nagats., Mikata & T. Seki (1999), Saccharomycetales. 3 gen., 7 spp.
Lit.: Yamada *et al.* (*Bull. Fac. Agric. Shizuoka Univ.* **47**: 23, 1997), Yamada *et al.* (*Biosc., Biotechn., Biochem.* **63**: 827, 1999).
- Phagodinium** Kristiansen (1993) nom. dub., ? Fungi. 1. See Kristiansen (*Arch. Protistenk.* **143**: 213, 1993).
- phagosome**, a membrane surrounding an endosymbiont to form a distinctive structure, as *Nostoc*-containing vesicles of *Geosiphon*.
- phagotrophic**, feeding by ingestion, engulfing food.
- Phakopsora** Dietel (1895), Phakopsoraceae. c. 110 (on dicots esp. (> 30 families)), widespread (tropical). *P. pachyrhizi* (soybean rust), *P. euvtis* (vine (*Vitis*) rust); *P. gossypii* (cotton rust). See Thirumalachar & Kern (*Mycol.* **41**: 283, 1949), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983), Ono *et al.* (*MR* **96**: 825, 1992), Ono (*Mycol.* **92**: 154, 2000), Frederick *et al.* (*Phytopathology* **92**: 217, 2002; PCR soybean rust detection), Berndt (*Mycol. Progr.* **4**: 339, 2005; Tanzania), Aime (*Mycoscience* **47**: 112, 2006; family relationships).
- Phakopsoraceae** Cummins & Hirats. f. (1983), Pucciniales. 18 gen. (+ 8 syn.), 205 spp.
Lit.: Gjerum *et al.* (*Lidia* **5**: 13, 2000), Ono (*Mycol.* **92**: 154, 2000), Frederick *et al.* (*Phytopathology* **92**: 217, 2002), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003), Hüseyin & Selçuk (*Pakist. J. Bot.* **36**: 203, 2004), Tessmann *et al.* (*Fitopatol. Brasil* **29**: 338, 2004), Wingfield *et al.* (*Australas. Pl. Path.* **33**: 327, 2004), Aime (*Mycoscience* **47**: 112, 2006).
- Phalacrichomyces** R.K. Benj. (1992), Laboulbeniaceae. 2, Venezuela. See Benjamin (*Aliso* **13**: 428, 1992), Santamaria (*MR* **99**: 1071, 1995).
- phalacrogenous**, of conidiogenous cells arising at the same level from single hyphae to form a turf-like layer; velvety. See Gams (*Cephalosporium-artige Schimmelpilze*, 1971).
- Phalangispora** Nawawi & J. Webster (1982), anamorphic *Pezizomycotina*, Hsp.1bH.10. 2, pantropical. See Kuthubutheen (*TBMS* **89**: 414, 1987), Keshava Prasad & Bhat (*Mycotaxon* **83**: 405, 2002).
- Phallaceae** Corda (1842), Phallales. 21 gen. (+ 46 syn.), 77 spp.
Lit.: Boedijn (*Bull. Jard. bot. Buitenz. ser. 3* **12**: 71, 1932; Indonesia), Calonge (*Boln Soc. Micol. Castell.* **10**: 59, 1985), Beaton & Malajczuk (*TBMS* **86**: 478, 1986), Boa (*Mycologist* **2**: 107, 1988), Fan *et al.* (*Beih. Nova Hedwigia* **108**: 72 pp., 1994), Marren (*British Wildlife* **6**: 366, 1995), Kreisel (*Czech Mycol.* **48**: 273, 1996), Stijve (*Australas. Mycol. Newsl.* **16**: 11, 1997), Pine *et al.* (*Mycol.* **91**: 944, 1999), Bougher & Lebel (*Aust. Syst. Bot.* **14**: 439, 2001), Humpert *et al.* (*Mycol.* **93**: 465, 2001), Baseia *et al.* (*Mycotaxon* **85**: 77, 2003).
- Phallales** E. Fisch. (1898). Phallomycetidae. 2 fam., 26 gen., 88 spp. There may be some justification in recognizing *Gomphales* and *Phallales* as previously circumscribed at sub-ordinal level. Fams:
- (1) **Claustulaceae**
 - (2) **Phallaceae**
- For *Lit.* see fam.; see also under gasteromycetes.
- Phallobata** G. Cunn. (1926), Trappeaceae. 1, Australia.

Phalloboletus Adans. (1763) = *Morchella*.

Phallogaster Morgan (1893), Phallogastraceae. 1, widespread (north temperate; ? introd.).

Phallogastraceae Locq. (1974) nom. inval., Hysterangiales. 2 gen. (+ 1 syn.), 14 spp.

phalloid, one of the *Phallales*.

Phalloidastrum Battarra (1755) nom. inval. = *Phallus* fide Stalpers (*in litt.*).

phallolysin, a protein of *Amanita phalloides*, has cytolytic effects *in vitro*, and is toxic to animals (Odenthal *et al.*, *Naunyn-Schmiedberg's Arch. Pharmacol.* 290: 133, 1975).

Phallomyces Bat. & Valle (1961) = *Echinoplaca* fide Lücking *et al.* (*Lichenologist* 30: 121, 1998).

Phallomycetidae K. Hosaka, Castellano & Spatafora (2007), Agaricomycotina. Ords:

(1) **Geastrales**

(2) **Gomphales**

(3) **Hysterangiales**

(4) **Phallales**

For *Lit.* see ord. and fam.

phallotoxins, cyclic heptapeptides (phallicidin, phalloidin, phallicin, phallicidin, phallin B) toxic to humans from *Amanita phalloides* etc., see Wieland (*Science* 159: 950, 1968; *Peptides of Amanita mushrooms*, 1986). Cf. amatoxins.

Phallus Junius ex L. (1753), Phallaceae. 18, widespread. See Baseia *et al.* (*Mycotaxon* 85: 77, 2003; Brazil).

Phalodictyum Clem. (1909) = *Rhizocarpon* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Phalomia Nieuwl. (1916) = *Omphalia* (Fr.) Staude.

Phalostauris Clem. (1909) = *Willeya*.

Phalothrix Clem. (1909) = *Unguicularia* fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).

Phaneroascus Baudyš (1919) = *Cookella* fide von Arx (*Persoonia* 2: 421, 1963).

Phanerochaetaceae Jülich (1982), Polyporales. 19 gen. (+ 9 syn.), 249 spp.

Phanerochaete P. Karst. (1889), Phanerochaetaceae. Anamorph *Necator*. c. 65, widespread. See Donk (*Persoonia* 2: 223, 1962), Eriksson *et al.* (*Taxon* 27: 299, 1978; nomencl.), Eriksson *et al.* (*Cortic. N. Europ.* 5: 987, 1978; key 12 Eur. spp.), Burdsall (*Mycol. Mem.* 10: 165, 1985; key 46 spp.), Wu (*Acta Bot. Fenn.* 142: 37, 1990; key Taiwan spp.), Martinez *et al.* (*Nature Biotechnology* 22: 695, 2004; *Phanerochaete chrysosporium* genome), Martínez & Nakasone (*Sydowia* 57: 94, 2005; Uruguay).

Phanerococcus Cif. (1954), anamorphic *Koordersiella*, Cpd. = eH.?. 1, Santo Domingo. See Ciferri (*Sydowia* 8: 265, 1954).

Phanerococcus Theiss. & Syd. (1918) ? = *Koordersiella* fide Hansford (*Mycol. Pap.* 15, 1946).

Phanerocorynella Höhn. (1923) = *Exosporiella*.

Phanerocoryneum Höhn. (1923) = *Clasterosporium* fide Sutton (*Mycol. Pap.* 141, 1977).

Phaneromyces Speg. & Hara (1889), Phaneromycetaceae. 1, S. America. See Gamundí & Spinedi (*Sydowia* 38: 106, 1986), Kutorga & Hawksworth (*SA* 15: 1, 1997).

Phaneromycetaceae Gamundí & Spinedi (1985), Pezizomycotina (inc. sed.). 1 gen., 1 spp.

Lit.: Gamundí & Spinedi (*Sydowia* 38: 106, 1985), Kutorga & Hawksworth (*SA* 15: 1, 1997).

phaneroplasmodium, see plasmodium.

Phanosticta Clem. (1909) = *Pseudocyphellaria* fide

Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Phanotylum Clem. (1909) = *Tremotylum* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Pharcidia Körb. (1865) = *Stigmidium* fide Santesson (*Svensk bot. Tidskr.* 54: 499, 1960), Roux & Triebel (*Bull. Soc. linn. Provence* 45: 451, 1994).

Pharcidiella (Sacc.) Clem. & Shear (1931) = *Phaeospora* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Pharcidiopsis Sacc. (1905) = *Stigmidium* fide Keissler (*Rabenh. Krypt.-Fl.* 8, 1930).

pharmaceutical prospecting, see Bioprospecting, Biotechnology, Screening.

Pharus Petch (1919) [non *Pharus* P. Browne 1756, *Gramineae*] = *Mycopharus*.

Phascolomyces Boedijn ex Benny & R.K. Benj. (1976), Syncephalastraceae. 1, widespread. See Benny & Benjamin (*Aliso* 8: 391, 1976), Jeffries & Young (*CJB* 56: 747, 1978; sporangium ultrastr.), Jeffries & Young (*CJB* 56: 2449, 1978; response to mycoparasitism), Balasubramanian & Manocha (*CJB* 64: 2441, 1986; biochemistry), Benny *et al.* in McLaughlin *et al.* (Eds) (*The Mycota A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research* 7A: 113, 2001), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny).

phaseolin, a phytoalexin (q.v.) from bean (*Phaseolus vulgaris*).

Phasya Syd. (1934) = *Venturia* Sacc. fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).

Phaulomyces Thaxt. (1931), Laboulbeniaceae. 14, widespread. See De Kesel (*Mycotaxon* 50: 191, 1994), Majewski (*Acta Mycologica Warszawa* 34: 7, 1999; Poland), Santamaría & Rossi (*Pl. Biosystems* 133: 163, 1999; Mediterranean).

Phellinaceae Jülich (1982) = *Hymenochaetaceae*.

Phellinidium (Kotl.) Fiasson & Niemelä (1984), Hymenochaetaceae. 3, Europe. See Fiasson & Niemelä (*Karstenia* 24: 25, 1984), Wagner & Fischer (*MR* 105: 773, 2001), Wagner & Fischer (*Mycol.* 94: 998, 2002; phylogeny).

Phellinites Singer & S. Archang. (1958), Fossil Fungi, Basidiomycota. 1 (Jurassic), Argentina.

Phellinus Qué. (1886), Hymenochaetaceae. c. 180, widespread. s. str. c. 30 species. See Ryvarden & Johansen (*Prelim. Polyp. Fl. E. Afr.*: 129, 1980; key 62 Afr. spp.), Wright & Blumenfeld (*Mycotaxon* 21: 413, 1984; key 26 spp. Argentina), Larsen & Coldopoulle (*Syn. Fung.* 3, 1990; world key), Wagner & Fischer (*MR* 105: 773, 2001), Wagner & Fischer (*Mycol.* 94: 998, 2002; phylogeny), Ryvarden (*Syn. Fung.* 19: 229 pp., 2004).

Phellodon P. Karst. (1881), Bankeraceae. 16, Europe; N. America. See Stalpers (*Stud. Mycol.* 35: 168 pp., 1993; key), Arnolds (*Coolia* 46 3, Suppl.: 96 pp., 2003; Netherlands and Belgium), Parfitt *et al.* (*MR* 111: 761, 2007; molec. phylog. British spp.).

Phellomyces A.B. Frank (1898) = *Colletotrichum* fide Husz (*Z. Pflanzenkr. Pflanzensch.* 44: 186, 1934).

Phellomycetes Renault (1896), Fossil Fungi (mycel.) Fungi. 1 (Carboniferous), France.

Phellomycites Mesch. (1896) = *Phellomycetes*.

phellophagy, ability to attack cork cells (Speer, *Mycotaxon* 21: 235, 1984).

Phellopilus Niemelä, T. Wagner & M. Fisch. (2001), Hymenochaetaceae. 1, widespread. See Niemelä *et al.* (*Ann. bot. fenn.* 38: 53, 2001).

- Phellorinia** Berk. (1843), Phelloriniaceae. 1, widespread (subtropical dry areas). See Malençon (*Annals Cryptog. Exot.* 8: 5, 1935), Long (*Lloydia* 9: 132, 1946), Kreisel (*Česká Mykol.* 15: 195, 1961), Martin *et al.* (*Cryptogamie, Mycologie* 21: 3, 2000; phylogeny), Sarasini (*Rivista di Micologia* 46: 7, 2003; mediterranean sp.), Fan & Liu (*Mycosystema* 23: 306, 2004; China), Sarasini (*Gasteromiceti Epigei*: 406 pp., 2005).
- Phelloriniaceae** Ulbr. (1951), Agaricales. 2 gen. (+ 5 syn.), 2 spp.
Lit.: Wright *et al.* (*Cryptog. Mycol.* 14: 77, 1993), Coetzee *et al.* (*Bothalia* 27: 117, 1997), Moreno *et al.* (*Mycotaxon* 64: 393, 1997), Calonge (*Fl. Mycol. Iberica* 3: 271 pp., 1998), Martín *et al.* (*Cryptog. Mycol.* 21: 3, 2000), Dios *et al.* (*Mycotaxon* 84: 265, 2002).
- Phellostroma** Syd. & P. Syd. (1914), Pezizomycotina. 1, Philippines.
- Phelonites** Fresen. (1861), Fossil Fungi. 1 (Miocene), Germany.
- Phelonitis** Chevall. (1826) nom. dub., ? Dothideomycetes.
- Phenacopodium** Debey (1849) = *Melanospora* Corda fide Mussat (*Syll. fung.* 15: 279, 1901).
- Pherima** Raf. (1819) = *Phorima*.
- pheromone**, a substance secreted to the outside by an individual and received by a second individual of the same species, in which it induces a specific reaction, e.g. a definite behaviour or developmental process (Karlson & Luscher, *Nature* 183: 55, 1959).
- Phiala** Raf. (1815) nom. dub., Fungi. No spp. included.
- Phialastrum** Sunhede (1989), Geastraceae. 1, Africa (tropical). See Sunhede (*Syn. Fung.* 1: 66, 1989).
- Phialea** (Fr.) Gillet (1879) nom. dub., Pezizomycotina. See Dumont & Korf (*Taxon* 26: 598, 1977).
- Phialemonium** W. Gams & McGinnis (1983), anamorphic *Cephalothecaceae*, Hso.0eH.15. 3, widespread. See King *et al.* (*J. Clin. Microbiol.* 31: 1804, 1993; re-evaluation), Guarro *et al.* (*J. Clin. Microbiol.* 37: 2493, 1999; clinical cases), Gavin *et al.* (*J. Clin. Microbiol.* 40: 2207, 2002; endocarditis), Mostert *et al.* (*Stud. Mycol.* 54: 115 pp., 2006; key), Weinberger *et al.* (*Medical Mycology* 44: 253, 2006; endophthalmitis), Yaguchi *et al.* (*Mycotaxon* 96: 309, 2006; phylogeny).
- Phialetea** Bat. & Nascim. (1960) = *Grallomyces* fide Deighton & Pirozynski (*Mycol. Pap.* 105, 1966).
- Phialicorona** Subram. (1993) nom. inval. = *Kionochaeta* fide Sutton (*in litt.*).
- phialide** (after Vuillemin), a cell which develops one or more (the **polyphialide** of Hughes, *Mycol. Pap.* 45, 1951) open ended conidiogenous loci from which a basipetal succession of conidia, **phialospores**, develops without an increase in length of the phialide itself (Hughes, *loc. cit.*); cf. annellophore; sterigma. In some fungi, e.g. *Acremonium*, the phialide may be the conidiophore; more frequently the phialide is either an end cell of a conidiophore or attached to a conidiophore (or **phialophore**). See Roquebert (*Rev. Myc.* 40: 417, 1976; review), terminus phialospore, and Minter *et al.* (*TBMS* 81: 109, 1983; history).
- phialidic** (of conidiogenesis, obsol.), the sort of conidiogenesis in which each conidium (**phialoconidium**, phialidic conidium, phialospore) originates by the laying down of new wall material not from existing walls or layers of the wall of the conidiogenous cell (**phialide**). A *basipetal* succession of conidia is formed from a *fixed* conidiogenous locus (cf. *tretic*). **mono-**, **poly-**, (of phialides), producing conidia through a single opening or a sympodial irregular or synchronous succession of openings, respectively, in the conidiogenous cell wall.
- Phialina** Höhn. (1926), Hyaloscyphaceae. 13, widespread (north temperate). See Huhtinen (*Karstenia* 29: 545, 1990; key), Baral (*Z. Mykol.* 59: 3, 1993; ? synonymy with *Calycellina*), Huhtinen & Scheuer (*Öst. Z. Pilzk.* 4: 1, 1995), Raitviir & Schneller (*Sydowia* 55: 306, 2003), Raitviir (*Scripta Mycol.* 20, 2004).
- Phialisphaera** Dumort. (1822) nom. dub., Pezizomycotina.
- Phialoarthrobotryum** Matsush. (1975), anamorphic *Pezizomycotina*, Hsy. = eP.15. 1, Japan. See Matsushima (*Icon. microfung. Matsush. lect.*: 111, 1975), Okada & Tubaki (*Sydowia* 39: 148, 1986).
- Phialoascus** Redhead & Malloch (1977), ? Endomycetaceae. 1, Canada. Has been linked to *Cephaloascus*, but similarities are probably superficial. See Malloch & Hoog in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 197, 1998), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Phialocephala** W.B. Kendr. (1961), anamorphic *Vibrissaceae*, Hso.0eP.15. 20, widespread. See Wingfield *et al.* (*TBMS* 89: 509, 1987; classification), Currah & Tsuneda (*TMSJ* 34: 345, 1993; sporulation *P. fortinii* in culture), Onofri *et al.* (*MR* 98: 745, 1994; key), Kowalski & Kehr (*CJB* 73: 26, 1995; n.spp.), Kirschner & Oberwinkler (*Sydowia* 50: 205, 1998; n.sp.), Vujanovic *et al.* (*Mycol.* 92: 571, 2000; on orchids), Jacobs *et al.* (*CJB* 79: 110, 2001), Grünig *et al.* (*CJB* 80: 1239, 2002; phylogeny), Vrålstad *et al.* (*New Phytol.* 155: 131, 2002; phylogeny), Grünig *et al.* (*MR* 107: 1332, 2003; population biology), Jacobs *et al.* (*Mycol.* 95: 637, 2003; phylogeny), Grünig *et al.* (*Fungal Genetics Biol.* 41: 676, 2004; cryptic species), Piercey *et al.* (*MR* 108: 955, 2004; genetic diversity, Canada), Grünig *et al.* (*Fungal Genetics Biol.* 43: 410, 2006; population genetics, Sweden), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Grünig *et al.* (*Mycol.* 100: 47, 2008; cryptic speciation).
- Phialocladus** Kreisel (1972) nom. inval. = *Escovopsis*.
- Phialoconidiophora** M. Moore & F.P. Almeida (1937) = *Fonsecaea* fide de Hoog (*Stud. Mycol.* 15, 1977), Hoog *et al.* (*Medical Mycology* 42: 405, 2004).
- Phialocorona** Subram. (1995) = *Kionochaeta* fide Sutton (*in litt.*).
- Phialocybe** P. Karst. (1879) ? = *Crepidotus* fide Singer (*Agaric. mod. Tax.*, 1951).
- Phialogangliospora** Udaiyan & V.S. Hosag. (1992), anamorphic *Pezizomycotina*, Hso.0eH.40+15. 1 (from cooling tower), India. See Udaiyan & Hosagoudar (*J. Econ. Taxon. Bot.* 15: 654, 1991).
- Phialogeniculata** Matsush. (1971), anamorphic *Chaetosphaeriaceae*, Hso. = eH.15. 1, Guadaloupe. See Kuthubutheen & Nawawi (*MR* 95: 1220, 1991; synonymy with *Dictyochaeta*).
- Phialographium** H.P. Upadhyay & W.B. Kendr. (1974), anamorphic *Ophiostoma*. See Wingfield *et al.* (*MR* 95: 1328, 1991), Harrington *et al.* (*Mycol.* 93: 111, 2001; morphology, phylogeny), Zhou *et al.* (*Mycol.* 96: 1306, 2004).
- Phialomyces** P.C. Misra & P.H.B. Talbot (1964), anamorphic *Pezizomycotina*, Hso.0eH/1eP.32/33. 2, widespread. See Misra & Talbot (*CJB* 42: 1287,

- 1964), Castañeda Ruiz & Gams (*Mycotaxon* 42: 239, 1991), Delgado Rodriguez & Decock (*Mycol.* 95: 896, 2003).
- Phialophaeoisaria** Matsush. (1995), anamorphic *Pezizomycotina*, Hsy.0eH.16. 1, Japan. See Matsushima (*Matsush. Mycol. Mem.* 8: 29, 1995).
- Phialophora** Medlar (1915), anamorphic *Herpotrichiellaceae*, Hso.0eH/1eP.15. 2, widespread. *P. verrucosa* (a cause of chromoblastomycosis (q.v.) in humans). The genus in its traditional circumscription is grossly polyphyletic; see segregates including especially *Cadophora*, *Harpophora*, *Lecythophora* and *Phaeoacremonium*. See Cain (*CJB* 30: 338, 1952), Schol-Schwarz (*Persoonia* 6: 63, 1970; key), Gams & Holubová-Jechová (*Stud. Mycol.* 13, 1976), Yamamoto *et al.* (*Ann. phytopath. Soc. Japan* 56: 584, 1990; isozyme polymorphism in *P. gregata*), Kobayashi *et al.* (*Ann. phytopath. Soc. Japan* 57: 225, 1991; f.spp. in *P. gregata*), Yamamoto *et al.* (*TMSJ* 34: 465, 1993; RFLPs in *P. gregata*), Yan *et al.* (*Mycol.* 87: 72, 1995; rDNA supports morphol. spp. separation), de Hoog *et al.* (*Stud. Mycol.* 43: 107, 1999; *P. verrucosa* complex), Untereiner & Naveau (*Mycol.* 91: 67, 1999), Gams (*Stud. Mycol.* 45: 187, 2000; review, polyphyly), Hoog *et al.* (*Mycoses* 43: 409, 2000; in humans).
- phialophore**, see phialide.
- Phialophorophoma** Linder (1944), anamorphic *Pezizomycotina*, Cpd.0eH.15. 1 (marine), Europe; USA. See Hyde (*Beih. Sydowia* 43: 31, 1991).
- Phialophoropsis** L.R. Batra (1968) ? = *Ambrosiella* fide Sutton & Brady (*TBMS* 72: 337, 1979), Gebhardt *et al.* (*MR* 109: 687, 2005).
- Phialopsis** Körb. (1855) = *Gyalecta* Ach. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Phialoscypha** Raitv. (1977) = *Phialina* fide Huhtinen (*Karstenia* 29: 545, 1990).
- Phialoselanospora** Udaiyan (1992), anamorphic *Pezizomycotina*, Hso.0eH.15. 1 (from water cooling tower), India. See Udaiyan (*J. Econ. Taxon. Bot.* 15: 627, 1991).
- Phialospora** Raf. (1832) ≡ *Cucurbitaria*.
- phialospore**, see phialide.
- Phialosporostilbe** Mercado & J. Mena (1985), anamorphic *Pezizomycotina*, Hsy.0eH.15. 1, pantropical. See Mercado & Mena (*Revta Jardín bot. Nac. Univ. Habana* 6: 57, 1985), Shirouzu & Harada (*Mycoscience* 45: 390, 2004).
- Phialostele** Deighton (1969), anamorphic *Pezizomycotina*, Hsy/Hsp.0eH.15. 1, Africa. See Deighton (*Mycol. Pap.* 117: 11, 1969).
- Phialotubus** R.Y. Roy & Leelav. (1966), anamorphic *Pezizomycotina*, Hso.0eH.32/33. 1, India. See Roy & Leelavathy (*TBMS* 49: 495, 1966).
- Phibalis** Wallr. (1833) nom. rej. = *Encoelia* fide Korf & Kohn (*Mem. N. Y. bot. Gdn* 28: 109, 1976).
- Philately**. More than 1400 postage stamps, of over 100 countries, illustrating 575 spp. fungi issued up to 1996 are catalogued by McKenzie (*Collect fungi on stamps*, 1997). Macromycetes predominate but some medically important fungi, lichens and mycorrhizas are covered. See also Ing (*Bull. BMS* 10: 32, 1976), Moss & Dunkley (*Bull. BMS* 15: 61, 1981), Moss (*Mycologist* 6: 68, 1992, 7: 28, 1993), Coetzee (*Mycologist* 7: 29, 1993).
- Phillippiregis** Cif. & Tomas. (1953) ≡ *Polyblastidea*.
- Phillipsia** Berk. (1881) nom. cons., *Sarcoscyphaceae*. Anamorph *Molliardiomyces*. c. 17, widespread (subtropical; tropical). See Denison (*Mycol.* 61: 289, 1969; key C. Am. spp.), Paden (*CJB* 55: 2685, 1977), Paden (*Mycotaxon* 25: 165, 1986; anamorph), Romero & Gamundí (*Darwiniana* 27: 43, 1986; key 4 spp. Argentina, SEM), Li & Kimbrough (*CJB* 74: 10, 1996; ontogeny), Hansen *et al.* (*Mycol.* 91: 299, 1999; phylogeny, SEM), Weinstein *et al.* (*Mycol.* 94: 673, 2002; phylogeny), Prasad & Pant (*Journal of Mycopathological Research* 41: 99, 2003), Zhuang (*Mycotaxon* 86: 291, 2003; China), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Phillipsiella** Cooke (1878), *Phillipsiellaceae*. 7, America. See Rossman *et al.* (*Sydowia* 46: 66, 1994).
- Phillipsiellaceae** Höhn. (1909), ? *Dothideomycetes* (inc. sed.). 1 gen. (+ 2 syn.), 7 spp.
Lit.: Rossman *et al.* (*Sydowia* 46: 66, 1994) suggest a possible relationship with the *Schizothyriaceae*.
Lit.: Kohlmeyer *et al.* (*CJB* 76: 470, 1998).
- Phylliscidiopsis**, see *Phylliscidiopsis*.
- Philobryon** Döbbeler (1988), *Dothideomycetes*. 1 (on *Bryophyta*), Papua New Guinea. See Döbbeler (*Pl. Syst. Evol.* 158: 335, 1988).
- Philocopra** Speg. (1880) = *Podospora* fide Lundqvist (*Symb. bot. upsal.* 20 no. 1, 1972).
- Philonectria** Hara (1914), *Dothideomycetes*. 3, Japan; Uganda. See Eriksson & Hawksworth (*SA* 6: 146, 1987).
- Philophora** Wallr. (1833) = *Rhizopus* fide Hesseltine (*Mycol.* 47: 344, 1955).
- Phlebia** Fr. (1821), *Meruliaceae*. c. 50, widespread. See Cooke (*Mycol.* 48: 386, 1956), Corner (*Gdms' Bull. Singapore* 25: 355, 1971; Malaysian spp.), Ginns (*CJB* 54: 100, 1976; disposition spp.), Nakasone & Burdsall (*Mycotaxon* 21: 241, 1984; synonymy with *Merulius*), Wu (*Acta Bot. Fenn.* 142: 25, 1990; key Taiwan spp.), Spirin & Zmitrovich (*Novosti Sistematiki Nizshikh Nov. sist. Niz. Rast.* 37: 166, 2004).
- Phlebiaceae** Jülich (1982) = *Meruliaceae*.
- Phlebiella** P. Karst. (1890), *Polyporales*. c. 20, widespread. See Stalpers (*in litt.*), Hjortstam *et al.* (*Cortic. N. Europ.* 8, 1988; key Eur. spp.) = *Xenasmatella* fide.
- Phlebiopsis** Jülich (1978), *Phanerochaetaceae*. 11, widespread. See Burdsall (*Mycol. Mem.* 10, 1985), Vainio & Hantula (*Mycol.* 92: 436, 2000; genetics *Phlebiopsis gigantea*), Hjortstam *et al.* (*Syn. Fung.* 20: 42, 2005; Venezuela) = *Phanerochaete* fide.
- Phlebogaster** Fogel (1980), *Claustulaceae*. 2, Canary Islands; Asia. See Fogel (*Contr. Univ. Mich. Herb.* 14: 79, 1980).
- Phlebomarasmus** R. Heim (1967) ? = *Xeromphalina* fide Singer (*Agaric. mod. Tax.* edn 3, 1975).
- Phlebomycena** R. Heim (1966) = *Mycena* fide Singer (*Agaric. mod. Tax.*, 1951).
- Phlebonema** R. Heim (1929), ? *Agaricaceae*. 1, Madagascar. See Heim (*Compte rendu hebdomadaire des Sciences de l'Academie des sciences Paris* 188: 1568, 1929).
- Phlebophora** Lév. (1841) nom. dub. = *Tricholoma* fide Boedijn (*Sydowia* 5: 211, 1951).
- Phlebophyllum** R. Heim (1969), ? *Agaricales*. 1, Gabon. See Heim (*Revue Mycol. Paris* 33: 38, 1968).
- Phlebopus** (R. Heim) Singer (1936), *Boletiniaceae*. 12 (saprotrophs, possibly ectomycorrhizal with exotic trees), widespread (pantropical). Saprotrophs, under exceptional conditions possibly ectomycorrhizal with exotic trees. See Groves (*Mycol.* 54: 319, 1962), Groves (*Fl. Illustr. Champ. Afr. centr.* 7: 128, 1980),

- Groves (*Mycotaxon* 15: 384, 1982), Thoen & Ducousso (*Agric., Ecosyst. Envir.* 28: 519, 1989; possibly ectomycorrhizal), Bruns *et al.* (*Mol. Ecol.* 7: 257, 1998; phylogeny), Deschamps & Moreno (*Mycotaxon* 72: 205, 1999; Argentina).
- Phleboscypus** Clem. (1903) = *Helvella* fide Eckblad (*Nytt Mag. Bot.* 15: 1, 1968).
- Phlebriella**, see *Phlebiella*.
- Phlegmacium** (Fr.) Wünsche (1877) = *Cortinarius* fide Kauffman (*N. Amer. Fl.* 10, 1932) but used by Moser (*Die Gattung Phlegmacium*, 1960).
- Phlegmatium** Fr. (1819) nom. dub., Agaricomycetes. 'basidiomycetes', inc. sed. See Horníček (*Mykol. Sborn.* 4: 121, 1984).
- Phlegmophiale** Zahlbr. (1926) = *Arthonia* fide Santeson (*Symb. bot. upsal.* 12 no. 1: 1, 1952).
- Phlegographa**, see *Flegographa*.
- Phleogena** Link (1833), Phleogenaceae. 1, widespread (north temperate). See Donk (*Persoonia* 4: 160, 1966), McNabb in Ainsworth *et al.* (Eds) (*The Fungi* 4B: 303, 1973), Holec (*Mykologické Listy* 84-85: 33, 2003; Czech Republic), Aime *et al.* (*Mycol.* 98: 896, 2006; phylogeny).
- Phleogenaceae** Gäum. (1926), Atractiellales. 6 gen. (+ 6 syn.), 30 spp.
Lit.: Oberwinkler & Bandoni (*CJB* 60: 1726, 1982), Oberwinkler & Bandoni (*Mycol.* 74: 634, 1982), Oberwinkler & Bauer (*Sydowia* 41: 224, 1989), Cook (*Mycologist* 8: 107, 1994), Hladun (*Clementeana* 4: 48, 1999), Kirschner *et al.* (*Mycol.* 91: 542, 1999), Bandoni & Inderbitzin (*Czech Mycol.* 53: 265, 2002), Bauer *et al.* (*Mycol.* 95: 756, 2003), Bauer *et al.* (*Mycol. Progr.* 5: 41, 2006).
- Phloeochora** Höhn. (1917) = *Phloeospora* fide Sutton (*Mycol. Pap.* 141, 1977).
- Phloeconis** Fr. (1849), anamorphic *Pezizomycotina*, Hso.?? 3, widespread (temperate).
- Phloeopannaria** Zahlbr. (1941) = *Psoroma* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Phloeopeccania** J. Steiner (1902), Lichinaceae (L). 1, Arabia; N. America. See Moreno & Egea (*Acta Bot. Barcinon.* 41: 1, 1992), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key), Schultz & Mies (*Nova Hedwigia* 77: 73, 2003; Socotra), Schultz & Büdel (*Bryologist* 108: 520, 2005; Mexico).
- Phloeopeccaniomyces** Cif. & Tomas. (1953) = *Phloeopeccania*.
- Phloeoscoria** Wallr. (1825) = *Polymorphum*.
- Phloeospora** Wallr. (1833), anamorphic *Mycosphaerella*, Cac. = eH.19. c. 160, widespread. See Sutton (*The Coelomycetes*, 1980), Evans *et al.* (*MR* 97: 59, 1993; biocontrol), Fatehi & Punithalingam (*Kew Bull.* 54: 571, 1999; on *Lens*), Verkley & Priest (*Stud. Mycol.* 45: 123, 2000; review), Verkley *et al.* (*Mycol.* 96: 558, 2004; phylogeny), Feau *et al.* (*Mol. Phylogen. Evol.* 40: 808, 2006; phylogeny).
- Phloeosporella** Höhn. (1924), anamorphic *Blumeriella*, Cac. = eH.10. 13, widespread. See Sutton (*The Coelomycetes*, 1980), Williamson & Bernard (*CJB* 66: 2048, 1988; teleomorph), Sutton *et al.* (*MR* 100: 979, 1996; N America), Yip (*Australas. Pl. Path.* 26: 26, 1997; on *Eucalyptus*), Taylor & Crous (*MR* 104: 618, 2000; on *Proteaceae*).
- Phloeosporina** Höhn. (1924), anamorphic *Pezizomycotina*, Cac. = eH.?. 2, Europe (eastern). See Sameva (*Mycol. Balcanica* 1: 55, 2004; Bulgaria).
- Phloepeccania** Henssen (1990), Lichinaceae (L). 1, Australasia. See Henssen (*Lichenes Cyanophili et Fungi Saxicolae Exsiccati Fascicle 2* (nos 1-25): [10], 1990).
- Phlogicylindrium** Crous, Summerb. & Summerell (2006), anamorphic *Amphisphaeriaceae*. 2, Australia. See Summerell *et al.* (*Fungal Diversity* 23: 340, 2006).
- Phlogiotis** Qué. (1886) = *Guepinia* Fr. fide Donk (*Persoonia* 4: 185, 1966).
- Phlyctaena**, see *Phlyctema*.
- Phlyctaeniella** Petr. (1922), anamorphic *Pezizomycotina*, St.0fH.15. 1 or 3, Europe; Australia.
- Phlyctella** Kremp. (1876) = *Phlyctis* fide Galloway & Guzmán Grimaldi (*Lichenologist* 20: 393, 1988).
- Phlyctellomyces** Cif. & Tomas. (1953) = *Phlyctella*.
- Phlyctema** Desm. (1847), anamorphic *Neofabraea*, St.0eH.15. c. 30, widespread. See Sutton (*The Coelomycetes*, 1980), Spiers & Hopcroft (*N.Z. J. Bot.* 28: 67, 1990; TEM *P. vagabunda*), Verkley (*Stud. Mycol.* 44: 180 pp., 1999; review), Abeln *et al.* (*Mycol.* 92: 685, 2000; phylogeny), Jong *et al.* (*MR* 105: 658, 2001; phylogeny), Gariépy *et al.* (*MR* 107: 528, 2003; phylogeny).
- Phlyctibasidium** Jülich (1974), Agaricomycetidae. 1, Europe. See Vězda (*Folia geobot. phytotax.* 21: 208, 215, 1986).
- Phlyctidaceae** Poelt ex J.C. David & D. Hawksw. (1991), Ostropales (L). 2 gen. (+ 9 syn.), 13 spp.
Lit.: Brusse (*Bothalia* 17: 182, 1987), Galloway & Guzmán Grimaldi (*Lichenologist* 20: 393, 1988), Wedin *et al.* (*MR* 109: 159, 2005), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Phlyctidia** Müll. Arg. (1895) = *Phlyctis* fide Galloway & Guzmán Grimaldi (*Lichenologist* 20: 393, 1988).
- Phlyctidiaceae** Sparrow (1942) = *Chytridiaceae*.
- Phlyctidium** (A. Braun) Rabenh. (1868) [non *Phlyctidium* Wallr. 1833] = *Rhizophydium* fide Longcore (*in litt.*).
- Phlyctidium** Müll. Arg. (1888) [non *Phlyctidium* Wallr. 1833] = *Calenia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Phlyctidium** Wallr. (1833) = *Spilocaea* fide Sutton (*Mycol. Pap.* 141, 1977).
- Phlyctidomyces** E.A. Thomas ex Cif. & Tomas. (1953) = *Phlyctis*.
- Phlyctis** (Wallr.) Flot. (1850) nom. cons., Phlyctidaceae (L). c. 12, widespread. See Erichsen (*Hedwigia* 70: 216, 1930), Galloway & Guzmán Grimaldi (*Lichenologist* 20: 393, 1988), Wedin *et al.* (*MR* 109: 159, 2005; phylogeny).
- Phlyctochytrium** J. Schröt. (1892), Chytridiaceae. c. 30, widespread (temperate). See Sparrow (*Aquatic Phycomycetes* Edn 2: 324, 1960; key), Barr (*CJB* 62: 1171, 1984), Letcher & Powell (*Nova Hedwigia* 80: 135, 2005).
- Phlyctomia** A. Massal. (1860) = *Phlyctis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Phlyctorhiza** A.M. Hanson (1946), Chytridiaceae. 1, America.
- Phlyctospora** Corda (1841) = *Scleroderma* fide Stalpers (*in litt.*).
- Phoebus** R.C. Harris & Ladd (2007), Roccellaceae (L). 1, USA. See Harris & Ladd (*Opuscula Philolichenum* 4: 57, 2007).
- phoenicoid fungi**, fungi growing amongst the ashes of former fires (Carpenter & Trappe, *Mycotaxon* 23: 203, 1985); see Pyrophilous fungi.
- Phoenicostroma** Syd. (1925) = *Coccostromopsis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8,

- 1995), Hyde & Cannon (*Mycol. Pap.* 175, 1999).
- Pholidotopsis** Earle (1909) = *Galerina* fide Singer (*Agaric. mod. Tax.*, 1951).
- Pholiota** (Fr.) P. Kumm. (1871) nom. cons., Strophariaceae. c. 150 (lignicolous causing heartwood rot), widespread (esp. temperate). See Smith & Hesler (*The North American species of Pholiota*, 1968; 205 taxa, keys), Jacobsson (*Mycotaxon* 36: 95, 1989; culture), Klán *et al.* (*Mycotaxon* 36: 249, 1989; culture), Jacobsson (*Windahlia* 19: 1, 1990; key Eur. spp.), Holec (*Libri Botanici* 20: 220 pp., 2001), Bon & Roux (*Docums Mycol.* 33: 3, 2003; key), Chang *et al.* (*Australasian Mycologist* 24: 53, 2006; Tasmania) See nameko.
- Pholiotella** Speg. (1889) nom. rej. = *Conocybe* fide Kuyper (*in litt.*).
- Pholiotina** Fayod (1889), Bolbitiaceae. ca, cosmopolitan. See Singer (*Agaric. mod. Tax.* edn 2, 1962; 16 spp.).
- Phoma** Fr. (1821) nom. rej. = *Plagiostoma* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Phoma** Sacc. (1880) nom. cons., anamorphic *Didymella*, Cpd.0-1eH.15. c. 140, widespread. See Boerema (*Persoonia* 3: 9, 1963; typification), Dorenbosch (*Persoonia* 6: 1, 1970; soil spp.), Boerema & Dorenbosch (*Stud. Mycol.* 3, 1973; fruit rotting spp.), Boerema & Bollen (*Persoonia* 8: 111, 1975; sep. from *Ascochyta*), Boerema (*TBMS* 67: 289, 1976; spp. studied by Dennis), Sutton (*The Coelomycetes*, 1980; key 27 spp.), Hawksworth (*Bull. Br. Mus. nat. hist. Bot.* 9: 49, 1981; lichenicolous spp.), Morgan-Jones *et al.* (*Mycotaxon* 16: 403, 1983; studies on *Phoma*), Rajak & Rai (*J. Econ. Taxon. Bot.* 7: 588, 1986; key to spp. in culture), Monte & Garcia-Acha (*TBMS* 91: 133, 1988; germination of *P. betae*), Monte & Garcia-Acha (*TBMS* 90: 659, 1988; ultrastr. conidiogenesis *P. betae*), Pons (*Fitopat. Venez.* 3: 34, 1990; spp. on *Saccharum*), Upadhyay *et al.* (*CJB* 68: 2059, 1990; *P. cyperi* phytotoxin production), van der Aa *et al.* (*Stud. Mycol.* 32: 1, 1990; sect. classn), Monte *et al.* (*Mycopathologia* 115: 89, 1991; integrated systematics), de Gruyter & Nordeloos (*Persoonia* 15: 71, 1992; sect. *Phoma*), Schäfer & Wöstemeyer (*J. Phytopath.* 136: 124, 1992; aggressive and non-aggressive strains of *P. lingam* separated by PCR), Boerema (*Persoonia* 15: 197, 1993; sect. *Peyronellaea*), de Gruyter *et al.* (*Persoonia* 15: 369, 1993; sect. *Phoma*, taxa with small conidia), Nordeloos *et al.* (*MR* 97: 1343, 1993; dendritic crystals and taxonomy), Boerema *et al.* (*Persoonia* 15: 431, 1994; sect. *Plenodomus*), Boerema (*Mycotaxon* 64: 321, 1997; infrageneric names), de Gruyter *et al.* (*Persoonia* 16: 471, 1998), Voigt *et al.* (*J. Phytopath.* 146: 567, 1998; population study), Boerema & Gruyter (*Persoonia* 17: 273, 1999), Boerema *et al.* (*Persoonia* 17: 281, 1999), Miric *et al.* (*Aust. J. agric. Res.* 50: 325, 1999; on *Helianthus*), Aa *et al.* (*Persoonia* 17: 435, 2000), Pedras & Biesenthal (*Can. J. Microbiol.* 46: 685, 2000; chemistry), Voigt *et al.* (*Microbiol. Res.* 156: 169, 2001; cryptic species), Abeln *et al.* (*MR* 106: 419, 2002; population genetics), Gruyter (*Persoonia* 18: 85, 2002), Gruyter & Boerema (*Persoonia* 17: 541, 2002), Gruyter *et al.* (*Persoonia* 18: 1, 2002), Hollingsworth *et al.* (*Mycotaxon* 81: 331, 2002; cultural plasticity), Larsen *et al.* (*Pl. Dis.* 86: 928, 2002; molecular detection), Boerema (*Persoonia* 18: 153, 2003), Mendes-Pereira *et al.* (*MR* 107: 1287, 2003; phylogeny), Arenal *et al.* (*Mycotaxon* 89: 465, 2004; *Epicoccum* synanamorph), Barrins *et al.* (*Australas. Pl. Path.* 33: 529, 2004; genetic diversity, Australia), Boerema *et al.* (*Phoma Identification Manual* Differentiation of Specific and Infra-Specific Taxa in Culture: 470 pp., 2004; monograph), Hawksworth & Cole (*Lichenologist* 36: 7, 2004; lichenicolous spp.), Pethybridge *et al.* (*Australas. Pl. Path.* 33: 173, 2004; on *Chrysanthemum*), Balmas *et al.* (*Eur. J. Pl. Path.* 111: 235, 2005; *P. tracheiphila*), Torres *et al.* (*Mycotaxon* 93: 333, 2005; separation from *Plenodomus*), Voigt *et al.* (*Mol. Phylogen. Evol.* 37: 541, 2005; phylogeny), Zhou *et al.* (*Mycol.* 97: 612, 2005; biocontrol), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Phomachora** Petr. & Syd. (1925), anamorphic *Pezizomycotina*, St.0eH.?. 2 or 3, America; Australia.
- Phomachorella** Petr. (1947), anamorphic *Pezizomycotina*, St.0eH.?. 1, S. Africa. See Swart (*TBMS* 48: 463, 1965).
- Phomatosphaeropsis** Ribaldi (1953) = *Sphaeropsis* Sacc. fide Sutton (*The Coelomycetes*, 1980).
- Phomatospora** Sacc. (1875), Xylariales. Anamorph *Sporothrix*-like. 37 (on dead stems etc., sometimes aquatic), widespread. See Rappaz (*Mycotaxon* 45: 323, 1992; anamorph), Barr (*Mycotaxon* 51: 191, 1994), Fallah & Shearer (*Mycol.* 90: 323, 1998), Jeewon *et al.* (*MR* 107: 1392, 2003; phylogeny).
- Phomatosporella** Tak. Kobay. & K. Sasaki (1982), anamorphic *Phomatospora*, St.0eH.?. 1, Japan. See Kobayashi & Sasaki (*TMSJ* 23: 254, 1982).
- Phomatosporeopsis** Petr. (1925) = *Phomatospora* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- phomin**, a cytostatic antibiotic from *Phoma* sp. (S 298) (Rothweiler & Tamm, *Experientia* 22: 750, 1966; cytochalasin B (q.v.)).
- Phomites** Fritel (1910), Fossil Fungi. 2 (Cretaceous, Paleocene), France; India.
- Phomopsella** Höhn. (1920) = *Phomopsis* (Sacc.) Bubák. fide Petrak (*Annl. mycol.* 23: 1, 1925).
- phomopsin**, see lupinosis.
- Phomopsina** Petr. (1922) = *Phoma* Sacc. fide Clements & Shear (*Gen. Fung.*, 1931).
- Phomopsioides** M.E.A. Costa & Sousa da Câmara (1954) = *Phomopsis* (Sacc.) Bubák. fide Sutton (*Mycol. Pap.* 141, 1977).
- Phomopsis** (Sacc.) Bubák (1905) nom. cons., anamorphic *Diaporthe*, St.0eH.15. c. 234, widespread. See Uecker (*Mycol. Mem.* 13, 1988; list sp. names), Tomaz *et al.* (*Publ. Lab. Patol. Veg. 'Ver. de Alm.'* Lisboa: 54, 1989; *P. mali* on almonds), Brayford (*MR* 94: 691 and 745, 1990; variation and vegetative incompatibility in spp. from *Ulmus*), Wechtl (*Linzer biol. Beitr.* 22: 161, 1990; spp. on *Compositae* and *Umbelliferae*), Shivas *et al.* (*MR* 95: 320, 1991; variation in *P. leptostromiformis* from lupin), Uecker & Johnson (*Mycol.* 83: 192, 1991; spp. on *Asparagus*), Rehner & Uecker (*CJB* 72: 1666, 1994; DNA and species concepts), Muntañola-Cvetković *et al.* (*J. Phytopath.* 144: 285, 1996; growth patterns and incompatibility), Zhou *et al.* (*Mycosystema* 17: 199, 1998; ontogeny), Farr *et al.* (*Mycol.* 91: 1008, 1999; on *Prunus*), Kanematsu *et al.* (*Ann. phytopath. Soc. Japan* 65: 264, 1999; Japan), Phillips (*Mycol.* 91: 1001, 1999; on *Vitis*), Sutton *et al.* (*J. Clin. Microbiol.* 37: 807, 1999; from human), Kajitani & Kanematsu (*Mycoscience* 41: 111, 2000; on *Vitis*, Japan), Kanematsu *et al.* (*J. Gen. Pl. Path.* 66: 191, 2000;

- phylogeny, on fruit trees), Scheper *et al.* (MR 104: 226, 2000; teleomorph, on *Vitis*), Mostert *et al.* (Sydowia 53: 227, 2001; on *Protea*), Mostert *et al.* (Mycol. 93: 146, 2001; on *Vitis*, S Africa), Roy *et al.* (Mycopathologia 150: 15, 2001; on *Glycine*), Farr *et al.* (Mycol. 94: 494, 2002; on *Vaccinium*, USA), Says-Lesage *et al.* (Phytopathology 92: 308, 2002; on *Helianthus*, France), Castlebury *et al.* (Mycoscience 44: 203, 2003; phylogeny, teleomorph), Phillips (Sydowia 55: 274, 2003; on *Foeniculum*), Rekab *et al.* (MR 108: 393, 2004; on *Helianthus*), Adams *et al.* (Stud. Mycol. 52: 146 pp., 2005), Schilder *et al.* (Pl. Dis. 89: 755, 2005; on *Vitis*, N America), Murali *et al.* (Can. J. Microbiol. 52: 673, 2006; endophytes).
- Phomopsis** Sacc. & Roum. (1884) nom. rej. prop., Pezizomycotina.
- Phomyces** Clem. (1931), anamorphic Pezizomycotina, Cpd.0eH.?. 1 (on *Meliola*), Brazil.
- Phorcys** Niessl (1876) = *Amphisphaeria* fide Hawksworth *et al.* (Dictionary of the Fungi edn 8, 1995).
- Phorima** Raf. (1830) nom. dub. = *Hexagonia* Fr. fide Cooke (Spec. Publ. Div. Myc. Dis. Surv. US Department of Agriculture 3, 1953).
- phorophyte**, the 'host' tree of an epiphyte.
- photo-** (prefix), pertaining to light.
- photobiont**, a photosynthetic symbiont in a lichen which may be a eukaryotic alga (phycobiont), see Gärtner (in Reisser (Ed.), *Algae and symbiosis*: 325, 1992; review systematics), or a cyanobacterium (bactobiont, cyanobiont) (Ahmadian, *Internat. Lich. Newsl.* 15 (2): 19, 1982), Büdel (in Reisser (Ed.), *Algae and symbiosis*: 301, 1992; review systematics).
- photomorph**, an organism whose form is determined by the nature of its photosynthesis (Laundon, *Taxon* 44: 387, 1995); see also Lichens, phycotype, phototype, photosymbiodeme, phycosymbiodeme.
- photophilous**, having a preference for well-illuminated habitats; cf. heliophilous, anhelophilous.
- photophobic**, having a preference for shaded habitats.
- photosporogenic**, requiring light for sporogenesis.
- photosymbiodeme**, a replacement term for phycosymbiodeme to allow for one biont being a cyanobacterium (Stocker-Wörgötter & Türk, *Crypt. Bot.* 4: 300, 1994); a photomorph. See Lichens.
- phototaxis**, movement (e.g. of zoospores) influenced by light.
- phototropism**, see tropism.
- Phragmaspidium** Bat. (1960), ? Microthyriaceae. 3, widespread. See Batista (*Publicações Inst. Micol. Recife* 260: 109, 1960).
- Phragmeriella** Hansf. (1946), Pseudoperisporiaceae. 1 (on *Meliolaceae*), Africa.
- Phragmidiaceae** Corda (1837), Pucciniales. 14 gen. (+ 13 syn.), 164 spp.
Lit.: Eriksson (*Mycotaxon* 15: 249, 1982), Wahyuno *et al.* (*Mycoscience* 42: 519, 2001), Ono (*Mycoscience* 43: 37, 2002), Wahyuno *et al.* (*Mycoscience* 43: 159, 2002), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003), Maier *et al.* (*CJB* 81: 12, 2003), Wingfield *et al.* (*Australas. Pl. Path.* 33: 327, 2004), Ritz *et al.* (MR 109: 603, 2005), Aime (*Mycoscience* 47: 112, 2006), Gomez *et al.* (MR 110: 423, 2006).
- Phragmidiella** Henn. (1905), Phakopsoraceae. c. 8 (on *Bignoniaceae*, *Meliaceae*), Africa; India; S. America. See Ramachar & Rao (*Mycol.* 73: 778, 1981).
- Phragmidiites** Babajan & Tasl. (1970), Fossil Fungi. 1 (Tertiary), former USSR.
- Phragmidiopsis** (G. Winter) Mussat (1901) = *Phragmidium* fide Berndt (*in litt.*).
- Phragmidium** Link (1816), Phragmidiaceae. Anamorph *Physonema*. c. 110 (on *Rosa*, *Rubus*, *Potentilla* (*Rosaceae*) autoecious), widespread (esp. temperate). *P. violaceum* (blackberry (*Rubus*) rust), *P. rubi-idaei* (raspberry rust) and *P. mucronatum* (rose (*Rubus*) rust). See Dietel (*Hedwigia* 44: 112, 1905), Dietel (*Hedwigia* 44: 330, 1905), Cummins (*Mycol.* 23: 433, 1931), Hiratsuka *et al.* (*Rep. Tottori Mycol. Inst.* 18: 53, 1980), Wei (*Mycosystema* 1: 179, 1988), Wahyuno *et al.* (*Mycoscience* 42: 519, 2001; morph. urediniosp. & telios.), Helfer (*Nova Hedwigia* 81: 325, 2005; Europ. spp.), Ritz *et al.* (MR 109: 603, 2005; evolut.).
- Phragmitensis** K.M. Wong, Poon & K.D. Hyde (1998), Hyponectriaceae. 1 (on dead stems of *Phragmites*), Hong Kong. See Wong *et al.* (*Bot. Mar.* 41: 379, 1998), Wong *et al.* (*Fungal Diversity* 2: 175, 1999).
- Phragmiticola** Sherwood (1987), ? Helotiales. 1, Europe. See Magnes (*Bibliotheca Mycol.* 165, 1997).
- Phragmobasidiomycetes** R.T. Moore (1980), see *Tremellomycetes*; now placed within the *Agaricomycotina*.
- Phragmobasidiomycetidae** Gäum. (1949), see *Tremellomycetes*; now placed within the *Agaricomycotina*.
- phragmobasidium**, see basidium.
- Phragmocalosphaeria** Petr. (1923), Calosphaeriaceae. 1, Czech Republic. See Wehmeyer (*Revision of Melanconis*, 1941).
- Phragmocapnias** Theiss. & Syd. (1918), Capnodiaceae. Anamorph *Conidiocarpus*. c. 2, widespread (tropical). See Reynolds (*Mycotaxon* 8: 917, 1979), Reynolds (*Mycotaxon* 27: 377, 1986), Reynolds & Gilbert (*Aust. Syst. Bot.* 18: 265, 2005; Australia), Reynolds & Gilbert (*Cryptog. Mycol.* 27: 249, 2006; Panamá).
- Phragmocarpella** Theiss. & Syd. (1915) = *Phyllachora* Nitschke ex Fuckel (1870) fide Petrak (*Annls mycol.* 29: 349, 1931).
- Phragmocauma** Theiss. & Syd. (1915) = *Phyllachora* Nitschke ex Fuckel (1870) fide Cannon (*SA* 7: 111, 1988).
- Phragmocephala** E.W. Mason & S. Hughes (1951), anamorphic Pezizomycotina, Hso/Hsy.≡ eP.1. 9, widespread. See Hughes (*N.Z. Jl Bot.* 17: 163, 1979), Holubová-Jechová (*Folia geobot. phytotax.* 21: 173, 1986; Czechoslovakia).
- Phragmodiaporthe** Wehm. (1941), Melanconidaceae. 2 or 4, N. America. See Barr (*Mycol. Mem.* 7, 1978).
- Phragmodimerium** Petr. & Cif. (1932) = *Philonectria* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Phragmodiscus** Hansf. (1947), Lasiosphaeriaceae. 1 or 2 (on bamboo), Africa (tropical). See Eriksson & Yue (*SA* 8: 17, 1989), Huhndorf *et al.* (*Mycol.* 96: 368, 2004).
- Phragmodochium** Höhn. (1924), anamorphic Pezizomycotina, Hsp.≡ eH.?. 1, Java.
- Phragmodothella** Theiss. & Syd. (1915) = *Discostroma* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Phragmodothidea** Dearn. & Barthol. (1926) = *Scirrha* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Phragmodothis** Theiss. & Syd. (1914) = *Dothidea* fide Barr (*Mycotaxon* 43: 371, 1992).

- Phragmogibbera** Samuels & Rogerson (1990), Venturiaceae. Anamorph *Stigmina*. 1, Venezuela. See Samuels & Rogerson (*Mem. N. Y. bot. Gdn* 64: 165, 1990).
- Phragmogloeum** Petr. (1954), anamorphic *Pezizomycotina*, Cpd.≡ eP.?. 1, Australia. See Petrak (*Sydowia* 8: 158, 1954).
- Phragmographium** E.F. Morris (1966) ≡ *Morrisographium*.
- Phragmographum** Henn. (1905) = *Opegrapha* Ach. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Phragmonaevia** Rehm (1896) nom. dub., Helotiales. See Sherwood (*Mycotaxon* 5: 1, 1977), Hawksworth & Santesson (*Bibliotheca Lichenol.* 38: 121, 1990; lichenicolous taxa excluded).
- Phragmopeltheca** L. Xavier (1976) = *Porina* Müll. Arg. fide Lücking *et al.* (*Lichenologist* 30: 121, 1998).
- Phragmopelthecaceae** L. Xavier (1976) = *Porinaceae*.
- Phragmopeltis** Henn. (1904), anamorphic *Pezizomycotina*, Cpt.1eP.?. 5, America (tropical).
- Phragmoportha** Petr. (1934), *Gnomoniaceae*. 1, Europe; N. America. See Barr (*Mycol. Mem.* 7, 1978), Monod (*Beih. Sydowia* 9: 1, 1983).
- Phragmopsora** Magnus (1875) = *Pucciniastrum* fide Sydow & Sydow (*Monographia Uredinearum seu Specierum Omnium ad hunc usque Diem Descriptio et Adumbratio Systematica* 3, 1915).
- Phragmopyxine** Clem. (1909) = *Pyxine* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Phragmopyxis** Dietel (1897), *Uropyxidaceae*. 4 (on *Leguminosae*, esp. *Faboideae*), America (tropical); Africa.
- Phragmoscutella** Woron. & Abramov (1926), *Dothideomycetes*. 1, former USSR.
- Phragmospathula** Subram. & N.G. Nair (1966), anamorphic *Pezizomycotina*, Hsp.≡ eP.19. 2, India; Cuba. See Subramanian & Nair (*Antonie van Leeuwenhoek Ned. Tijdschr. Hyg.* 32: 384, 1966), Mercado Sierra *et al.* (*Mycol.* 89: 304, 1997; revision).
- Phragmospathulella** J. Mena & Mercado (1986), anamorphic *Pezizomycotina*, Hso.≡ eP.28. 1, Cuba. See Mena & Mercado (*Revta Jardín bot. Nac. Univ. Habana* 7: 32, 1986).
- Phragmosperma** Theiss. & Syd. (1917), *Dothideomycetes*. See von Arx & Müller (*Stud. Mycol.* 9, 1975), Aptroot (*Nova Hedwigia* 66: 89, 1998).
- phragmospore**, differs from an amersospore (q.v.) and didymospore (q.v.) in having 2 to many transverse septa. See Anamorphic fungi.
- Phragmosporonema** Moesz (1924) ≡ *Diplosporonema*.
- Phragmostachys** Costantin (1888) = *Sterigmatobotrys* fide Bisby (*TBMS* 26: 138, 1943).
- Phragmostele** Clem. (1909) ≡ *Pucciniostele*.
- Phragmostilbe** Subram. (1959) = *Arthrosporium* fide Wang (*Mycol.* 64: 1175, 1972).
- Phragmotaenium** R. Bauer, Begerow, A. Nagler & Oberw. (2001), *Tilletiariaceae*. 1 (on *Poaceae*), India. See Bauer *et al.* (*MR* 105: 423, 2001).
- Phragmotelium** Syd. (1921), *Pucciniales*. c. 10 (on *Rubus* (*Rosaceae*)), Asia; Australia. See Thirumalachar (*Proc. Indian natn Sci. Acad. Part B. Biol. Sci.* 15: 186, 1942), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983; syn. of *Phragmidium*).
- Phragmothele** Clem. (1909) = *Thelidium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Phragmothyriella** Höhn. (1912) ≡ *Myriangiella*.
- Phragmothyriella** Speg. (1919) nom. dub., *Fungi*. See Petrak (*Sydowia* 5: 169, 1951).
- Phragmothyrites** W.N. Edwards (1922), *Fossil Fungi*. 13 (Tertiary), widespread. See Selkirk (*Proc. Linn. Soc. N. S. W.* 100: 70, 1975).
- Phragmothyrium** Höhn. (1912) = *Microthyrium* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Phragmotrichum** Kunze (1823), anamorphic *Pezizomycotina*, Cac/St.≡ -#eP.23. 4, Europe. See Sutton & Pirozynski (*TBMS* 48: 349, 1965), Shabunin (*Mikol. Fitopatol.* 31: 52, 1997; Russia).
- Phragmoxenidiaceae** Oberw. & R. Bauer (1990), *Tremellales*. 2 gen., 7 spp.
Lit.: Oberwinkler *et al.* (*Syst. Appl. Microbiol.* 13: 186, 1990), Roberts (*Windahlia* 22: 15, 1995).
- Phragmoxenidium** Oberw. (1990), *Phragmoxenidiaceae*. 1, Europe. See Oberwinkler (*Syst. Appl. Microbiol.* 13: 187, 1990).
- Phragmoxypium** Bat. & Cif. (1963) = *Ciferrioxypium* fide Hughes (*Mycol.* 68: 693, 1976).
- Phrototecha**, see *Prototheca*.
- Phruensis** Pinruan (2004), *Diaporthales*. 1, Thailand. See Pinruan *et al.* (*Mycol.* 96: 1165, 2004).
- Phthora** d'Hérelle (1909), *Pezizomycotina*. 1 (on *Coffea*), Guatemala.
- Phurmomyces** Thaxt. (1931), *Ceratomycetaceae*. 1, Asia. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- phyco-** (prefix), pertaining to algae.
- Phycoascus** Möller (1901) ? = *Pyronema* fide Eckblad (*Nytt Mag. Bot.* 15: 1, 1968).
- phycobiont**, the algal partner in a lichen (Scott, *Nature* 179: 486, 1957), photobiont (q.v.); cf. mycobiont.
- Phycodiscis** Clem. (1909) = *Knightiella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- phycolichenes** (obsol.), lichens in which the vegetative thallus morphology is determined by the photobiont and which are of uncertain systematic position as the sporocarps are unknown (e.g. *Cystocoleus*, *Racodium*).
- Phycomater** Fr. (1825) nom. dub., ? *Fungi*.
- Phycomelaina** Kohlm. (1968), ? *Phyllachorales*. 1 (on *Laminaria*), Europe; N. America. Affinities are uncertain. See Schatz (*Mycol.* 75: 762, 1983).
- Phycomyces** Kunze (1823), *Phycomycetaceae*. 3, widespread. See Benjamin & Hesseltine (*Mycol.* 51: 751, 1959; key), Carlile (*J. gen. Microbiol.* 28: 161, 1962; sporangiophore phototropism), Cerdá-Olmedo & Lipson (*Phycomyces*, 1987; review, lit.), Ootaki *et al.* (*Mycoscience* 37: 427, 1996; mating response), Yamazaki & Ootaki (*Mycoscience* 37: 269, 1996; zygosporangium formation), Yamazaki & Ootaki (*MR* 100: 984, 1996; progametangia), James *et al.* (*Nature* 443: 818, 2006; phylogeny), Wöstemeyer & Schimek in Heitman *et al.* (Eds.) (*Sex in Fungi*: 431, 2007; trisporic acid & mating), Dávila López *et al.* (*Nucleic Acids Research* 36: 3001, 2008; spliceosomal RNA gene phylogeny).
- Phycomycetaceae** Arx (1982), *Mucorales*. 2 gen., 6 spp.
Lit.: Benjamin & Hesseltine (*Mycol.* 51: 751, 1959), Yamazaki & Ootaki (*Mycoscience* 37: 269, 1996).
- Phycomycetes** J. Schröt. (1892) (obsol.). Class formerly used for fungi now treated in *Chromista* (q.v.) and some *Fungi* (*Chytridiomycota* and *Zygomycota*);

- best used only as a trivial term, 'phycomycetes'; an approx. syn. of 'lower fungi'.
- Phycomycites** D.E. Ellis (1915), Fossil Fungi. 3 (Jurassic), Germany; British Isles.
- phycomycosis**, a general term for a disease of humans or animals caused by a phycomycete. Cf. mucormycosis, zygomycosis.
- Phycomycotera**. Superdivision used by Moore (1971) for all fungi with non-septate hyphae (i.e. *Oomycota* and *Zygomycota* in the *Dictionary*, this edition); cf. *Septomycotera*.
- phycophilous**, growing with or on algae.
- Phycopsis** L. Mangin & Pat. (1912) [non *Phycopsis* (Fisch.-Oost.) Rothpletz 1896, *Algae*] = *Seuratia* fide Meeker (*CJB* 53: 2462, 1975).
- Phycorella** Döbbeler (1980), Dothideomycetes. 1 (biotrophic parasite of *Scytonema*), Australia. See Döbbeler (*Sydowia* 33: 33, 1980).
- Phycosiphon** A. Massal. (1859) = *Brachycarphium*.
- phycosymbiodeme**, joined lichen thalli with a single mycobiont but different photobionts (Renner & Galloway, *Mycotaxon* 16: 197, 1982); photomorph, phycotype.
- phycosymbiont**, phycobiont.
- phycotrophic** (of fungi), obtaining nutrients from algae (Dobbs, *Lichenologist* 4: 323, 1970).
- phycotype**, see type.
- Phylacia** Lév. (1845), Xylariaceae. Anamorph *Geniculosporium*. 7, America (tropical). See Dennis (*Kew Bull.*: 320, 1957), Pérez-Silva (*Boln. Soc. mex. Micol.* 6: 9, 1972), Silveira & Rogers (*Acta Amazon. Supl.* 15: 7, 1985; key 4 spp. Brazil), Rodrigues & Samuels (*Mem. N. Y. bot. Gdn* 49: 290, 1989), Hladki (*Lilloa* 41: 9, 2004; Argentina), Medel *et al.* (*Mycotaxon* 97: 279, 2006; Mexico), Stadler & Fournier (*Revta Iberoamer. Micol.* 23: 160, 2006; chemistry), Bitzer *et al.* (*MR* 112: 251, 2008; phylogeny, chemistry).
- Phylaciaceae** Speer (1980) = Xylariaceae.
- Phylacteria** (Pers.) Pat. (1887) = *Scyphopilus*.
- Phylacteriaceae** Imazeki (1953) = *Thelephoraceae*.
- Phyllachora** Nitschke ex Fuckel (1867) nom. rej. = *Scirrhia* fide Holm (*Taxon* 24: 475, 1973).
- Phyllachora** Nitschke ex Fuckel (1870) nom. cons., Phyllachoraceae. Anamorph *Linochora*. c. 944 (from living leaves), widespread. See Parbery & Langdon (*Aust. J. Bot.* 12: 265, 1964; species concepts), Parbery (*Aust. J. Bot.* 15: 271, 1967; key), Parbery (*Aust. J. Bot.* 19: 207, 1971; spp. on *Gramineae*), Kamat *et al.* (*Univ. Agric. Sci. Hebbal Monogr.* 4, 1978; key 88 Indian spp.), Parbery in Subramanian (Ed.) (*Taxonomy of fungi* 1: 263, 1978; fungi on), Cannon (*Mycol. Pap.* 163, 1991; spp. on *Leguminosae*), Cannon (*MR* 100: 1409, 1996; spp. on *Rosaceae*), Cannon & Evans (*MR* 103: 577, 1999; spp. on *Erythroxylaceae*), Hyde & Cannon (*Mycol. Pap.* 175: 114, 1999; spp. on palms), Pearce *et al.* (*Fungal Diversity* 3: 123, 1999; spp. on *Asclepiadaceae*), Winka & Eriksson (*Mycoscience* 41: 97, 2000; DNA), Pearce *et al.* (*Aust. Syst. Bot.* 14: 283, 2001; on *Proteaceae*), Bentes *et al.* (*Fungal Diversity* 12: 1, 2003; on *Xanthium*), Johnston & Cannon (*N.Z. J. Bot.* 42: 921, 2004; New Zealand), Pearce & Hyde (*Fungal Diversity Res. Ser.* 17: 308 pp., 2006; Australia).
- Phyllachoraceae** Theiss. & Syd. (1915), Phyllachorales. 51 gen. (+ 54 syn.), 1173 spp.
Lit.: Cannon (*Mycol. Pap.* 163: 302 pp., 1991), Hanlin *et al.* (*Mycotaxon* 44: 103, 1992), Cannon in McKey & Sprent (Eds) (*The Nitrogen Factor. Advances in Legume Systematics* 5: 179, 1994; coevolution), Cannon (*MR* 100: 1409, 1996; spp. on *Rosaceae*), Cannon (*Biodiversity of Tropical Microfungi*: 255, 1997; diversity), Malloch & Mallick (*CJB* 76: 1265, 1998), Silva-Hanlin & Hanlin (*Mycoscience* 39: 97, 1998), Silva-Hanlin & Hanlin (*Mycoscience* 39: 97, 1998; review), Cannon & Evans (*MR* 103: 577, 1999), Hyde & Cannon (*Mycol. Pap.* 175: 114, 1999; spp. on palms), Hyde & Cannon (*Mycol. Pap.* 175: 114 pp., 1999), Pearce *et al.* (*Fungal Diversity* 3: 123, 1999), Pearce *et al.* (*Aust. Syst. Bot.* 14: 283, 2001; spp. on *Proteaceae*), Pearce & Hyde (*Fungal Diversity Res. Ser.* 17: 308 pp., 2006).
- Phyllachorales** M.E. Barr (1983). Sordariomycetes. 2 fam., 63 gen., 1226 spp. Stromata absent to well-developed, immersed in plant tissue, often clypeate, usually black. Ascomata perithecial, usually thin-walled, the ostioles periphysate. Peridium usually composed of thin-walled compressed hyaline or brown tissue, sometimes irregular in form. Interascal tissue of simple rather wide thin-walled paraphyses, sometimes deliquescing. Asci ± cylindrical, thin-walled, not fissitunicate, persistent, usually with an inconspicuous J- apical ring. Ascospores usually hyaline, aseptate, occ. ornamented. Anamorphs usually coelomycetous, spermatial or disseminative. Appresoria usually formed as adhesion/penetration structures. Mostly biotrophic, some necrotrophic and a few saprobic, on leaves, stems, and roots, widespr. esp. trop. Fams:
- (1) **Phaeochoraceae**,
 - (2) **Phyllachoraceae**
- Lit.: Cannon (*SA* 7: 23, 1987; posn), Eriksson & Hawksworth (*SA* 11: 181, 1993), Winka & Eriksson (*Mycoscience* 41: 97, 2000; DNA).
- Phyllachorella** Syd. (1914), ? Dothideales. 1, India. See von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954; syn. with *Vestergrenia*), Kar & Maity (*Mycol.* 63: 1024, 1971).
- Phyllactinia** Lév. (1851), Erysiphaceae. Anamorph *Ovulariopsis*. 40, widespread. *P. guttata* (mildew of hazel (*Corylus*), birch (*Betula*), and other trees). See Braun (*Beih. Nova Hedwigia* 89, 1987; key), Hirata & Takamatsu (*Mycoscience* 37: 283, 1996; phylogeny), Takamatsu *et al.* (*Mycoscience* 39: 441, 1998; phylogeny), Saenz & Taylor (*CJB* 77: 150, 1999; phylogeny), Mori *et al.* (*Mycol.* 92: 74, 2000; phylogeny), Shin & Lee (*Mycotaxon* 83: 301, 2002; morphology), Takamatsu (*Mycoscience* 45: 147, 2004; phylogeny), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Takamatsu *et al.* (*MR* 112: 299, 2008; phylogeny).
- Phyllerites** Mesch. (1892), Fossil Fungi ? Fungi. 16 (Tertiary), Europe.
- Phyllerium** Fr. (1832) nom. dub., Fungi. Based on leaf outgrowths fide Fries (*Syst. mycol.* 3: 523, 1832).
- Phylleutypa** Petr. (1934), Phyllachoraceae. 2 (from living stems), Africa; north temperate. See Malloch & Malik (*CJB* 76: 1265, 1998).
- phyllidium**, lichen propagule formed by abstriction of a leaf-like or scale-like portion of the thallus. See Poelt (*Flora, Jena* 169: 23, 1980) (Fig. 22F).
- Phyllis** F. Wilson (1889) [non *Phyllis* L. 1753, *Rubiaceae*] = *Neophyllis*.
- Phylliscaceae** Th. Fr. (1860) = *Lichinaceae*.
- Phylliscidiopsis** Sambo (1937), Lichinaceae (L). 1, Ethiopia. See Moreno & Egea (*Acta Bot. Barcinon.* 41: 1, 1992).

- Phylliscidium** Forssell (1885), Lichinaceae (L). 1, Brazil. See Moreno & Egea (*Acta Bot. Barcinon.* 41: 1, 1992), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key).
- Phyllisciella** Henssen (1984), Lichinaceae (L). 3, southern hemisphere. See Moreno & Egea (*Acta Bot. Barcinon.* 41: 1, 1992), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key).
- Phylliscum** Nyl. (1855), Lichinaceae (L). 3, widespread. See Schultz & Büdel (*Lichenologist* 34: 39, 2002; key), Wedin *et al.* (*MR* 109: 159, 2005; phylogeny).
- Phyllobaeis** Kalb & Gierl (1993), Baeomycetaceae (L). 5, widespread (tropical). See Gierl & Kalb (*Herzogia* 9: 593, 1993; concept), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998), Peršoh *et al.* (*Mycol. Progr.* 3: 103, 2004; asci), Miądlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Phyllobatheliaceae** Bitter & F. Schill. (1927), Pezizomycotina (inc. sed.) (L). 2 gen. (+ 2 syn.), 9 spp.
Lit.: Harris (*More Florida Lichens*, 1995)
Lit.: Aptroot *et al.* (*Biblhca Lichenol.* 64, 1997), Aptroot *et al.* (*Biblhca Lichenol.* 64: 220 pp., 1997), Lücking (*Trop. Bryol.* 13: 87, 1997), Lücking (*Trop. Bryol.* 15: 45, 1998).
- Phyllobathelium** (Müll. Arg.) Müll. Arg. (1890), Phyllobatheliaceae (L). 8, C. & S. America. See Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952).
- Phylloblastia** Vain. (1921), ? Strigulaceae (L). 3, pantropical. See Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952), Aptroot in Galloway (Ed.) (*Systematics, conservation and ecology of tropical lichens*: 253, 1991), McCarthy (*Flora of Australia* 58 A: 242 pp., 2001), Herrera-Campos *et al.* (*Lichenologist* 36: 309, 2004; Mexico), Sérusiaux *et al.* (*Lichenologist* 39: 103, 2007; Europe, Madeira).
- Phylloboletellus** Singer (1952), Boletaceae. 1, C and S America. See Kuyper (*in litt.*), Singer & Digilio (*Lilloa* 25: 438, 1952) ? = Boletellus (Bolet.) fide.
- Phyllobolites** Singer (1942), Boletaceae. 1, S. America (tropical). See Singer (*Annls mycol.* 40: 59, 1942).
- Phyllobrassia** Vain. (1921) = Chroodiscus fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Phyllocarbon** Lloyd (1921) = Polyozellus fide Donk (*Beih. Nova Hedwigia* 5: 228, 1962).
- Phyllocardium** Korshikov (1927), Algae.
- Phyllocarpos** Poir. (1813) = Cladonia fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Phyllocaulon** (Tuck.) Vain. (1909) = Stereocaulon Hoffm. fide Zahlbruckner (*Catalogus Lichenum Universalis* 4, 1927).
- Phyllocelis** Syd. (1925), Pezizomycotina. 1 or 2, C. America.
- Phyllocharis** Fée (1825) = Strigula fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- phyllocladia**, the granular, verrucose, coralloid, squamuliform, digitate, peltate, or foliaceous parts of the thallus of *Stereocaulon* which contain the photobiont.
- Phyllocratera** Sérus. & Aptroot (1997), Phyllobatheliaceae (L). 1, Papua New Guinea. See Aptroot *et al.* (*Biblhca Lichenol.* 64, 1997).
- Phyllocrea** Höhn. (1918), Phyllachoraceae. 1 (from living leaves), S. America. See Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Phyllo dontia** P. Karst. (1883) = Cerrena fide Donk (*Verh. K. ned. Akad. Wet.* tweede sect. 62: 1, 1974).
- Phylloedia** Fr. (1849) = Phylloedium.
- Phylloedium** Fr. (1825), anamorphic Pezizomycotina, St.OeP.?. 1, Europe. See Sutton (*Mycol. Pap.* 141, 1977).
- Phyllogaster** Pegler (1969), Agaricaceae. 1, Ghana. Basidioma gasteroid. See Pegler & Young (*Proc. K. Ned. Akad. Wet. Ser. C, Biol. Med. Sci.* 72: 222, 1969).
- Phyllogloea** Lowy (1961), Phragmoxenidiaceae. 6, widespread (tropical). See Roberts (*Mycotaxon* 87: 187, 2003; Dominican Republic).
- Phyllographa** (Müll. Arg.) Räsänen (1943) nom. inval. = Opegrapha Ach. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Phyllohendersonia** Tassi (1902), anamorphic Pezizomycotina, Cpd. = eP.?. 28, widespread. See Sutton (*Mycol. Pap.* 141, 1977).
- Phyllomyces** Lloyd (1921) = Cordierites fide Zhuang (*Mycotaxon* 31: 261, 1988).
- Phyllonochaeta** Gonz. Frag. & Cif. (1927) nom. dub., Fungi. See Petrak (*Annls mycol.* 32: 317, 1934).
- Phyllopeltula** Kalb (2001), Peltulaceae (L). 2, Kenya; Venezuela. See Kalb (*Biblhca Lichenol.* 78: 158, 2001).
- Phyllopezis** Petr. (1949), ? Helotiales. 1, S. America.
- Phyllophiale** R. Sant. (1952) = Porina Müll. Arg. fide Lücking *et al.* (*Lichenologist* 30: 121, 1998), Lücking & Cáceres (*Lichenologist* 31: 349, 1999).
- Phyllophtharmaria** (Müll. Arg.) Zahlbr. (1905) ? = Leptosphaeria fide Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952).
- phylloplane**, the leaf surface; Last & Deighton (*TBMS* 48: 83, 1965), the non-parasitic biotas of the leaf surface.
- Phylloporia** Murrill (1904), Hymenochaetaceae. 7, widespread (pantropical). See Ryvarden & Johansen (*Prelim. Polyp. Fl. E. Afr.*: 230, 1980; key), Wagner & Fischer (*MR* 105: 773, 2001), Wagner & Ryvarden (*Mycol. Progr.* 1: 105, 2002; phylogeny and taxonomy).
- Phylloporina** (Müll. Arg.) Müll. Arg. (1890) = Porina Müll. Arg. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Phylloporina** C.W. Dodge (1948), Pezizomycotina (L). 1, Kerguelen.
- Phylloporis** Clem. (1909), Strigulaceae (L). 1, widespread. See Vězda (*Folia geobot. phytotax.* 19: 177, 1984), Hawksworth (*SA* 5: 151, 1986), Lücking & Lücking (*Herzogia* 11: 143, 1995; Costa Rica), Malcolm & Galloway (*New Zealand Lichens Checklist, Key, and Glossary*, 1997).
- Phylloporthe** Syd. (1925), Diaporthales. 1, America (tropical). See Barr (*Mycol. Mem.* 7, 1978), Cannon (*Fungal Diversity* 7: 17, 2001).
- Phylloporus** Qué. (1888), Boletaceae. c. 50, cosmopolitan (mostly tropical). See Kuyper (*in litt.*), Corner (*Nova Hedwigia* 20: 793, 1970; Malaysia), Singer & Gómez (*Brenesia* 22: 163, 1984; Costa Rica) ? = Boletus (Bolet.) fide.
- Phyllops** Raf. (1817) nom. dub., Fungi.
- Phyllopsora** Müll. Arg. (1894), Ramalinaceae (L). 81, widespread (esp. tropical). See Swinscow & Krog (*Lichenologist* 13: 203, 1981), Brako (*Mycotaxon* 35: 1, 1989), Timdal & Krog (*Mycotaxon* 77: 57, 2001; Africa), Upreti *et al.* (*Biblhca Lichenol.* 86: 185, 2003; India), Elix (*Australasian Lichenology* 59: 23, 2006; Australia).
- Phyllopsoraceae** Zahlbr. (1905) = Ramalinaceae.
- Phyllopta** (Fr.) Fr. (1825) nom. dub., ? Trichosporonaceae. See Donk (*Taxon* 7: 239, 1958), Donk (*Persoo-*

nia 4: 306, 1966).

Phyllopyrenia C.W. Dodge (1948) nom. dub. ? = *Coccotrema*.

Phyllopyreniaceae Zahlbr. (1903) = *Coccotremataceae*.

Phyllosphaera Dumort. (1822) nom. rej. prop. ≡ *Phyllosticta*.

phyllosphere, the zone immediately surrounding a leaf; frequently used in the sense of phylloplane (q.v.). See Preece & Dickinson (Eds) (*Ecology of leaf surface micro-organisms*, 1970), Dickinson & Preece (Eds) (*Microbiology of aerial plant surfaces*, 1976), Blakeman (Ed.) (*Microbial ecology of the phylloplane*, 1981), Fokkema & van der Heuvel (Eds) (*Microbiology of the phyllosphere*, 1986). Cf. rhizoplane; spermoplane.

Phyllosticta Pers. (1818) nom. cons., anamorphic *Guignardia*, Cpd.0eH.1/19. 92, widespread. See van der Aa (*Stud. Mycol.* 5, 1973), Punithalingam (*Mycol. Pap.* 136, 1974), Punithalingam & Woodhams (*Nova Hedwigia* 36: 151, 1982; conidial appendages), Yip (*MR* 93: 489, 1989; 5 n.spp. from Australia), Petrini *et al.* (*Sydowia* 43: 148, 1991; key spp. on conifers), Leuchtmann *et al.* (*MR* 96: 287, 1992; isozyme polymorphism in endophytic spp.), Muthumary *et al.* (*Mycotaxon* 47: 147, 1993; ontogeny), Okane *et al.* (*CJB* 79: 101, 2001; on *Ericaceae*), Zhou & Stanosz (*Mycol.* 93: 516, 2001; phylogeny), Aa & Vanev (*A Revision of the Species Described in Phyllosticta*, 2002; nomenclator), Baayen *et al.* (*Phytopathology* 92: 464, 2002; *G. citricarpa*), Pandey *et al.* (*MR* 107: 439, 2003; endophytes), Crous *et al.* (*Stud. Mycol.* 55: 235, 2006; phylogeny).

Phyllostictaceae Fr. (1849) = *Botryosphaeriaceae*.

Phyllostictella Tassi (1901) ? = *Microsphaeropsis* Höhn. fide Sutton (*Mycol. Pap.* 141, 1977).

Phyllostictina Syd. & P. Syd. (1916) = *Phyllosticta* fide van der Aa (*Stud. Mycol.* 5, 1973).

Phyllostictites Babajan & Tasl. (1970), *Fossil Fungi*. 1 (Tertiary), former USSR.

Phyllothelium Trevis. (1861) = *Trypethelium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Phyllotopsis E.-J. Gilbert & Donk ex Singer (1936), *Agaricales*. 5, widespread (temperate). Belongs to *Marasmiaceae* or *Tricholomataceae*. See Johannesen (*Bleeksoppen* 26: 23, 1998).

Phyllotremella Lloyd (1920) = *Resupinatus* fide Kuyper (*in litt.*).

Phyllotus P. Karst. (1879) = *Resupinatus* fide Kuyper (*in litt.*) Lectotypification has been contested; under another lectotypification it becomes the correct name for *Pleurocybella*.

Phylogenetic analysis. Systematics methods that aim to reconstruct the genealogical descent of organisms by means of objective and repeatable analysis, and from this pattern to propose a falsifiable hypothesis of natural classification or phylogeny. The theory is largely based on concepts introduced by the German entomologist Willi Hennig (1913-1976) which revolutionized systematic research through emphasis on evolutionary processes rather than shared characters. Hennig himself referred to his methodology as phylogenetic systematics, but for a time proponents of his methods preferred the term **cladistics**, derived from the Greek *κλάδος*, branch. Since around 2000 that term has fallen into disuse, and almost all researchers refer to their discipline as phylogenetics, or

phylogenetic analysis.

Phylogenetic methodologies are based upon three fundamental assumptions: that taxa are united into natural groups on the basis of shared derived characters (**synapomorphies**); that all groups recognized must descend from a single ancestor (i.e. they are monophyletic) and that the most **parsimonious** pattern (that is the one requiring the least number of steps to resolve the relationships of the taxa) is the one most likely to be correct. Groups defined using shared primitive characters (**symplesiomorphies**) are likely to be paraphyletic and thus not include all the descendants of an ancestor. Groups delimited that do not share a common ancestor are polyphyletic and often result from convergent (non-homologous) characters. The product of phylogenetic analysis is a branching diagram (**phylogenetic tree** or **cladogram**, frequently referred to informally as a **tree**) which shows the pattern of relationships between the organisms based on the characters used.

Phylogenetic analysis methods were initially developed using morphology data sets and manual calculation, but now molecular data are used almost exclusively and powerful computers are required. Genes or gene fragments are amplified from extracted DNA using specific primers, and sequenced using equipment that is usually highly automated and optimized for high throughput. The resulting sequences must first be **aligned**, taking into account insertions and deletions and variations in overall sequence length. This is done using a computer package such as ClustalW (Chenna *et al.*, *Nucleic Acids Res.* 31: 3497, 2003; Larkin *et al.*, *Bioinformatics* 23: 2947, 2007; <http://www.clustal.org>), either down-loaded or via a web-based service. Many users prefer manually to adjust the alignment that is generated, to compensate for ambiguities in the sequence traces etc. The aligned sequences are then trimmed to a common length and output (typically in NEXUS format) so they can be read by phylogenetics packages. These use complex statistical algorithms to generate phylogenetic trees, often with numerous alternative settings to allow for differences in sequence characteristics, presumed evolutionary models, use of molecular clocks etc.

Currently, the three most widely used algorithms for phylogenetic analysis are:

Parsimony analysis (using the PAUP package; Swofford, *PAUP*: phylogenetic analyses using parsimony (*and other methods)*, 2002).

Maximum likelihood estimation (e.g. Stamatakis *et al.*, *Bioinformatics* 21: 456, 2005).

Bayesian analysis (using the MrBayes package; Huelsenbeck & Ronquist, *Bioinformatics* 17: 754, 2001; Ronquist *et al.*, <http://www.mrbayes.csit.fsu.edu/>).

In some cases the output is restricted to a text-based depiction of the resulting trees, which can be visualized using e.g. **Treeview** (<http://taxonomy.zoology.gla.ac.uk/rod/treeview/>). There are several freely available integrated software packages that make phylogenetic analysis somewhat more user-friendly, including **MESQUITE** (version 2.5: <http://mesquiteproject.org/mesquite/mesquite/>) and **MEGA** (Tamura *et al.*, *Mol. Biol. Evol.* 24: 1596, 2007; version 4: <http://www.megasoftware.net/>).

Correct interpretation of phylogenetic trees is critically important: all the tree generation methods are

based on statistical assumptions that may not be justifiable in all cases, and they merely represent the most probable evolutionary pathway by which the organisms included have come into being. Trees must be **rooted** with the inclusion and specification of an **outgroup** – a taxon or group of taxa that are known to be outside of but related to the group in question. Phylogenetic analyses involve repeated analyses of the data, sometimes with many thousands of repli-

cates, each of which produces a subtly different branching pattern or branch lengths. A **consensus** tree represents the most likely evolutionary pathway in statistical terms, and the degree of likelihood that this is the correct **topology** (or branching pattern) can also be measured statistically. This may be achieved using the **bootstrap** resampling technique (Felsenstein, *Evolution* 39: 783, 1985; Nei & Kumar,

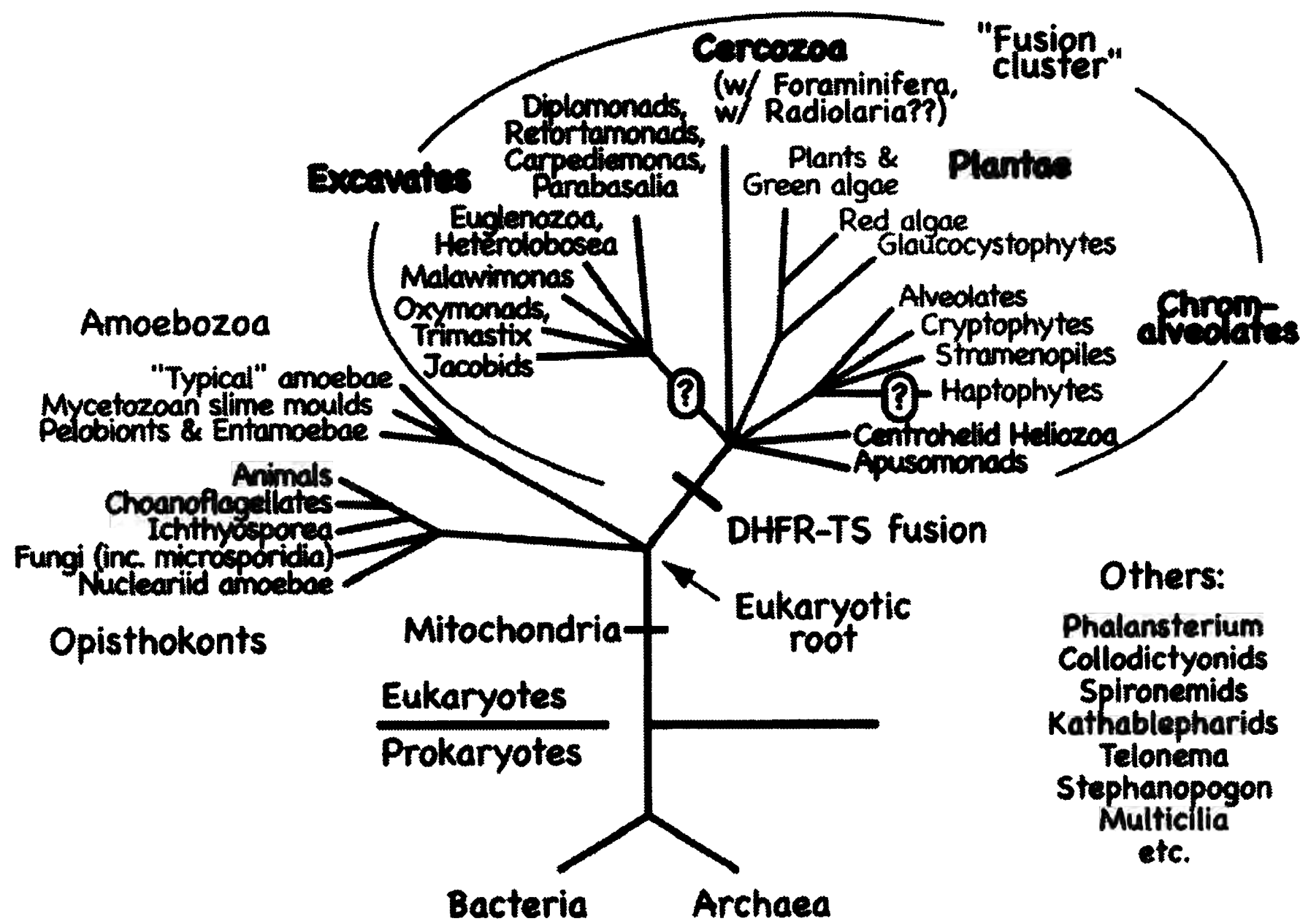


Fig. 31. Phylogenetic tree of eukaryotes based Simpson & Rogers, Eukaryotic evolution: getting to the root of the problem (*Current Biology* 12: R691-R693, 2002).

Molecular evolution and phylogenetics, 2000) by comparing trees with those generated after random replacement of nucleotides within the sequences. The proportion of individual branching events with identical structure provides a measure of robustness of the analysis; a bootstrap value of less than about 70% is considered by most to be an unreliable indicator of relationships. Bootstrapping may be used in conjunction with several phylogenetic analysis methods, including parsimony and maximum likelihood analysis. Bayesian analysis is assessed using posterior probabilities (PP; the posterior distribution of trees, see Ronquist *et al.*, 2005); here strong support for a topology can be inferred from a PP figure of more than 0.95. Results from any of these techniques are only as reliable as the original data, and problems with alignment in particular can lead to serious anomalies. Many different genes and gene fragments have been explored as potential indicators of evolutionary pathways for fungi. They show varying degrees of conservation, allowing their use for analysis of relationships at different levels of the taxonomic hierar-

chy. The most widely used remain ribosomal genes within nuclei or mitochondria; these are present in multiple copies which makes amplification easier (although there are instances of sequence heterogeneity within organisms). Of these, the 18S (SSU) fragment is relatively conserved and has been widely used to infer relationships at family level and above, and the 25S (LSU) fragment is more variable and is useful at genus or species level. The two ITS (internal transcribed spacer) regions of ribosomal DNA which are more variable again, are most widely used to investigate species relationships, although there are many cases where the level of variation is insufficient to distinguish reliably between taxa commonly accepted at species level. The search for the most effective gene for use in species-level diagnosis in fungi continues (**genetic barcoding**; see e.g. Seifert *et al.* (*Proc. Nat. Acad. Sci* 104: 3901, 2007; barcoding of fungi), Kress & Erickson (*PNAS* 105: 2761, 2008; introduction to barcoding), <http://barcoding.si.edu/> and <http://www.barcodinglife.org/>). Other widely used genes in phylogenetic research include those

coding for α -tubulin, transcription elongation factor-1 α (EF-1 α), RNA polymerase B (RPB), glyceraldehyde 3-phosphate dehydrogenase (GAPDH) and mitochondrial ATP synthase F0 subunit 6 (ATP6). Primers for amplification of many of these genes may be found at the AFTOL website (<http://aftol.org/>).

Lit.: Forey *et al.* (*Cladistics: a practical course in systematics*, 1992); Linder (*S. Afr. J. Bot.* **54**: 208, 1988, review for botanists); Scotland *et al.* (Eds) (*Models in phylogeny reconstruction*, 1994); Page & Holmes (*Molecular evolution: a phylogenetic approach*, 1998); Nei & Kumar, *Molecular evolution and phylogenetics*, 2000); Felsenstein (*Inferring phylogenies*, 2004), See also websites associated with the software packages detailed above, and numerous articles posted on GENBANK (<http://www.ncbi.nlm.nih.gov/>) and EMBL (<http://www.embl.de/>).

See also Classification, Coevolution, Kingdoms of fungi, Phylogeny.

Phylogeny. Mycologists' views on phylogeny, the evolution of a group of organisms through time, have been based traditionally on comparative morphology, cytology, hyphal wall chemistry, ultrastructure, and to a lesser degree fossils (see Fossil fungi). The advent of cladistic and molecular approaches has led to major changes in understanding the relationships of fungal phyla.

The three kingdoms including fungi as traditionally circumscribed (see Kingdoms of fungi) are shown by molecular studies of 16S-like ribosomal RNA sequences to be phylogenetically remote (Fig. 31).

Current data mostly support the initial indications that *Animalia* and *Fungi* are sister groups and most probably arose from a choanozoan-like protozoan ancestor (see Adl *et al.*, *J. Eukaryotic Microbiol.* **52**: 399, 2005; Baldauf *et al.*, *Science* **290**: 972, 2000; Cavalier-Smith, in Rayner, Brasier & Moore (Eds), *Evolutionary biology of the fungi*: 339, 1987, in McLaughlin *et al.* (Eds) *The Mycota* **7A**: 3, 2001); Cracraft & Donaghue (Eds), *Assembling the Tree of Life*, 2004; Steenkamp *et al.*, *Mol. Biol. Evol.* **23**: 93, 2006; van der Peer *et al.*, *J. Mol. Evol.* **51**: 565, 2000; Wainright *et al.*, *Science* **260**: 340, 1993). These two kingdoms have been informally grouped with the members of the DRIPs clade [DRIPs is an acronym of the original members of the clade: *Dermocystidium*, rosette agent, *Ichthyophonous*, and *Psorospermium*], microsporidians and the choanoflagellates in the Opisthokonta (q.v.) (see Baldauf *et al.*, *Science* **290**: 972, 2000; Philip *et al.*, *Mol. Biol. Evol.* **22**: 1175, 2005), though the most authors now regard the *Microsporidia* (q.v.) as members of the Kingdom *Fungi* (see e.g. Gill & Fast, *Gene* **375**: 103, 2006). No molecular data have been found to support the hypothesis for a red algal (*Rhodophyta*) ancestry of the *Ascomycota* and *Basidiomycota* which was strongly argued for by Demoulin (see *Bot. Rev.* **40**: 315, 1974, *BioSystems* **18**: 347, 1985).

'Fungi' in the other two kingdoms seem to have arisen polyphyletically. Within the Protozoa (q.v.) the fungus-like groups are all slime moulds but these various groups are not closely related and even such taxa as the acrasids are now thought to be quite different in origin. Molecular data are now showing where these groups belong. The Acrasids are now included among the amoeboid flagellate protozoa (*Heterolobosea*); the true slime moulds, protostelids and dictyostelids cluster together with another amoeboid

protozoan group, *Rhizopoda*, which is informally known as the Ramicristates and the plasmodiophorids cluster together with the amoeboid, photosynthetic chlorarachnids and the cercomonads (a diverse group of soil flagellates). Other taxa such as *Fonticula* and the copromyxids are now thought to be independent lineages (Patterson, 1999).

Major new research elucidating relationships within the true fungi has been published in the last five years; see especially Hibbett *et al.* (*MR* **111**: 509, 2007), James *et al.* (*Nature* **443**: 818, 2006), Liu *et al.*, *BMC Evol. Biol.* **6**: 74, 2006), Lutzoni *et al.* (*Am. J. Bot.* **91**: 1446, 2004) and papers in the *Deep Hypha* issue of *Mycologia* (*Mycol.* **98** (6), 2006, publ. 2007). Within the Kingdom *Fungi*, analyses of molecular data strongly support the monophyly of the *Ascomycota* and *Basidiomycota* (recognized as Subkingdom *Dikarya*), and also led to acceptance of five further phyla – the *Blastocladiomycota*, *Chytridiomycota*, *Glomeromycota*, *Microsporidia* and *Neocallimastigomycota*. The *Zygomycota* as accepted in the previous edn of this *Dictionary* is no longer considered to be a viable taxonomic unit, with its components including the *Mucorales*, *Endogonales*, 'Trichomycetes' and others shown to be only distantly related. The new system promises a robust framework within which to develop classifications of lower-order groups.

Insights into evolution of the phylum *Ascomycota* can be found in the apparently basal position of *Neolecta*, associated in a grouping with *Pneumocystis*, *Schizosaccharomyces* and *Taphrinales*, sometimes referred to as the archiascomycetes. These morphologically disparate taxa are here placed within subphylum *Taphrinomycotina*, alongside the ascomycetous yeast subphylum *Saccharomycotina* and the *Pezizomycotina* (syn. *Ascomycotina*) that contains the vast bulk of filamentous taxa. Major changes since the last edn of this *Dictionary* include remodeling of the major lichenized groups, with the most speciose taxon now named the *Lecanoromycetes*, which includes the subclasses *Lecanoromycetidae* and *Ostropomycetidae*. *Aspergillus*, *Penicillium* and similar fungi are confirmed as related to morphologically disparate groups including the black yeasts (*Chaetothyriales*) and some pyrenocarpous lichenized taxa (*Verrucariales*). Studies have underlined time and again that many of the morphological structures used in traditional classifications of the *Ascomycota* have evolved on multiple occasions, presumably in response to common evolutionary pressures.

Even more dramatic changes have resulted in the new classification of the *Basidiomycota*. Three familiar groups are recognized as subphyla, the *Puccinimycotina* (rusts and relatives), *Ustilaginomycotina* (smuts etc.) and *Agaricomycotina* (agarics, polypores, 'gasteromycetes', jelly fungi etc.). Within the *Agaricomycotina* many of the traditional groups based on anatomical structure have been shown to be artificial. One of the most ancient lineages of the *Agaricomycetes* appears to be the *Cantharellales*, which includes *Rhizoctonia* and *Tulasnella* as well as the chanterelles and their relatives. The agarics and boletes cluster together within the *Agaricomycetidae*, earthstars, phalloid taxa and many basidiomycetous truffles form a distinct lineage (the *Phallomycetidae*) and the relatives of *Russula* include *Hericium* and

Stereum.

The *Chytridiomycota* constitute the main phylum of the *Fungi* that possesses motile zoospores. Their systematic arrangement has also undergone profound change as a result of molecular phylogenetic research, with the *Blastocladiomycota* now separated at phylum level (James *et al.*, *Mycol.* **98**: 860, 2006). The morphologically reduced genus *Rozella* appears to represent the most basal clade of all the true *Fungi*, though the position of the *Microsporidia* (strange protozoan-like fungi that lack mitochondria) remains to be stabilized. Major groups within the *Chytridiomycota* include the *Neocallimastigales* (rumen fungi) as well as the chytrids and *Spizellomycetales*. Many of the groups need further study, and further nomenclatural changes are likely.

In most, but not all analyses the *Glomerales* are basal to the ascomycete and basidiomycete lineage, and the group has now been elevated to phylum level as the *Glomeromycota*. This is particularly significant given their suggested role as mycorrhizal fungi associated with early land plants and the recent report of fossil glomeralean fungi from mid-Ordovician deposits (c. 460 Myr ago) (see Redecker *et al.*, *Science* **289**: 1920, 2000; Simon *et al.*, *Nature* **363**: 67, 1993).

The *Zygomycota* are no longer recognized as a phylogenetically coherent entity (see Sugiyama, *Mycoscience* **39**: 487, 1998; James *et al.*, *Can. J. Bot.* **78**: 336, 2000; White *et al.*, *Mycol.* **98**: 872, 2006). Further research is necessary, but there are strong indications that even the zygomycetes as traditionally recognized are paraphyletic with the *Glomeromycota*, *Ascomycota* and *Basidiomycota*. Two of the groups traditionally treated as trichomycetes are now understood to have protist affinities, and the *Entomophthorales* in their usual circumscription are now shown to be polyphyletic. Formerly included among the trichomycetes, *Amoebidium* and its relatives have been suggested to be a member of the DRIPs clade based on molecular evidence (see Ustinova *et al.*, *Protist* **151**: 253, 2000; White *et al.*, *Mycol.* **98**: 872, 2006), confirming the observations of Lichtwardt (*Trichomycetes*: 279, 1986), who thought that *Amoebidium* had arisen independently from a protozoan ancestor and was unrelated to any other *Trichomycetes*.

The predominantly autotrophic *Chromista* contain two separate heterotrophic lineages that include 'fungal' taxa. Both arose from an ancestral heterokont flagellate with chloroplasts. One lineage comprises the oomycetes and hyphochytrids with its sister taxon the marine flagellate, *Developayella*. The other lineage leads to the labyrinthulids and thraustochytrids (the slime nets), largely characterized by the presence of bothrosomes. Molecular data tend to support the morphological groups recognized in the oomycetes, now reflected in two subclasses: *Peronosporomycetidae* and *Saprolegniomycetidae*, although the position of *Rhipidium*, treated as a separate subclass by Dick (*Can. J. Bot.* **73**: S712, 1995) is uncertain since it appears basal in the oomycete phylogeny (see Peterson & Rosendahl, *MR* **104**: 1295, 2000).

The poor representation of fungi in the fossil record has stimulated much research in recent years using molecular methods to estimate the dates of major evolutionary radiations within the group. Statistical methods have been refined in recent years to take into account different rates of nucleotide substitution

in different lineages (Peterson *et al.*, *Proc. Nat. Acad. Sci. USA* **101**: 6536, 2004). Berbee & Taylor (*CJB* **71**: 1114, 1993) calculated that the three main fungal phyla diverged from the *Chytridiomycota* approximately 550 Myr ago. The *Ascomycota*/*Basidiomycota* split most probably occurred at about 400 Myr ago after plants invaded the land and the dicot/monocot divergence occurred (Taylor & Berbee, *Mycol.* **98**: 838, 2006), but possibly as early as 1500 Myr ago if the fungal fossil *Paleopyrenomycetes devonicus* belongs to the *Sordariomycetes* (Taylor *et al.*, *Mycol.* **97**: 269, 2006; Padovan *et al.*, *J. Mol. Evol.* **60**: 726, 2005) and 1800 Myr ago based on calibrations derived from assumed divergence of mammals and birds 300 Myr ago. Many ascomycetous yeasts and moulds (e.g. *Eurotiales*) evolved after the origin of angiosperms, probably in the last 200 Myr. See also **Fossil fungi**.

Fungi are associated with some of the earliest remains of land plants, and may well have played a crucial role in enabling life out of water. Church (*J. Bot., Lond.* **59**: 7, 1921) considered that 'lichens' might be transmigrants, the earliest colonizers of land (see also Corner, *The life of plants*, 1964). Land plants may, however, have their origins in a green alga-oomycete symbiosis (Pirozynski & Malloch, *BioSystems* **6**: 153, 1975), and it has even been argued that plants are of biphyetic origin with some parts of the fungal genome (Jørgensen, *BioSystems* **31**: 193, 1993) or even 'inside-out' lichens as they contain organelles questionably of fungal origin (Atstatt, *Ecology* **69**: 17, 1988).

Revolutions in the development of automated gene sequencing have provided enormously more data with which to test evolutionary hypotheses compared with even five years ago. The first complete human genome to be sequenced, containing over 3 billion base pairs, was presented only in 2003, but by June 2008 genome sequencing projects were under way or completed for over 70 fungal species (see <http://www.ncbi.nlm.nih.gov/Genomes/>). The challenge is now to move from this *embarras de richesses* in terms of data to its effective analysis. It is now common practice to analyse phylogenies using multiple gene sequences (as with the studies presented in *Mycol.* **98** (6), 2006). One recent paper has mined data from 34 complete genome sequences to produce a phylogeny of the *Fungi* based on 29 universally conserved protein-encoding gene sequences (Cornell *et al.*, *Genome Res.* **17**: 1809, 2007).

Phylogenies may also focus on the other end of the taxonomic spectrum, at or below the species level. Molecular methods have revolutionized study of population biology, biogeography and microevolutionary processes. New methods of DNA extraction mean that unculturable taxa can be included in phylogenetic analyses, and dried material from fungal reference collections etc. can be used more extensively. Many morphospecies are now shown to be aggregates of taxa with distinct metabolic, ecological or pathological properties, though the level of the taxonomic hierarchy at which these should be recognized is debatable. A further major benefit of the molecular phylogenetic revolution is the ability to integrate anamorphic taxa effectively within the mainstream fungal classifications, and researchers are increasingly blurring the nomenclatural distinction between sexual and asexual morphs.

- See Classification, Coevolution, Kingdoms of fungi, Phylogenetic analysis.
- phylum**, a taxonomic rank between kingdom and class; a division; see Classification.
- Phymatium** Chevall. (1826) = *Elaphomyces* fide Fries (*Syst. mycol.* 3: 57, 1829).
- Phymatodiscus** Speg. (1919) = *Myriangium* fide von Arx (*Persoonia* 2: 421, 1963).
- Phymatomyces** Kobayasi (1937) = *Barssia* fide Trappe (*Mycotaxon* 9: 247, 1979).
- Phymatopsis** Tul. ex Trevis. (1857) = *Abrothallus* fide Keissler (*Rabenh. Krypt.-Fl.* 8, 1930).
- Phymatosphaeria** Pass. (1875) = *Myriangium* fide von Arx (*Persoonia* 2: 421, 1963).
- Phymatosphaeriaceae** Speg. (1888) = *Myriangiaceae*.
- Phymatostroma** Corda (1837) nom. dub. = *Leucosporium* fide Holubová-Jechová (*Sydowia* 45: 97, 1993).
- Phymatotrichopsis** Hennebert (1973), anamorphic *Rhiziniaceae*, Hso.0eH.6. 1, N. America. *P. omnivorum*, root rot of cotton and other plants. See Mouton (*Rev. Myc. suppl. colon.* 2 18: 69, 1953), Baniecki & Bloss (*Mycol.* 61: 1054, 1969), Hennebert (*Persoonia* 7: 199, 1973), Marek (*Phytopath.* 95: S65, 2005; posn. in *Pezizales*).
- Phymatotrichum** Bonord. (1851) = *Botrytis* fide Hennebert (*Persoonia* 7: 183, 1973).
- Physalacria** Peck (1882), *Physalacriaceae*. 30, widespread (tropical; southern hemisphere). See Berthier (*Bibliotheca Mycol.* 98, 1985; world monogr.), Horak & Desjardin (*Aust. J. Bot.* 7: 153, 1994; taxonomy), Antonín & Mossebo (*Mycotaxon* 83: 419, 2002; Africa), Tanaka *et al.* (*Mycoscience* 45: 143, 2004; Australasia).
- Physalacriaceae** Corner (1970), *Agaricales*. 11 gen. (+ 12 syn.), 169 spp. *Physalacriaceae* is listed as nom. rej. against *Tricholomataceae*.
Lit.: Berthier (*Bibliotheca Mycol.* 98: 128 pp., 1985), Horak & Desjardin (*Aust. Syst. Bot.* 7: 162, 1994), Antonín & Mossebo (*Mycotaxon* 83: 419, 2002), Moncalvo *et al.* (*Mol. Phylogen. Evol.* 23: 357, 2002), Poinar & Brown (*MR* 107: 765, 2003), Tanaka *et al.* (*Mycoscience* 45: 143, 2004), Wilson & Desjardin (*Mycol.* 97: 667, 2005), Binder *et al.* (*Am. J. Bot.* 93: 547, 2006), Dentinger & McLaughlin (*Mycol.* 98: 746, 2006).
- Physalidiella** Rulamort (1990), anamorphic *Pezizomycotina*, Hso.0bP.1. 2, Italy; Cuba. See Rulamort (*Bull. Soc. bot. Centre-Ouest Nouv. sér.* 21: 512, 1990).
- Physalidiopsis** R.F. Castañeda & W.B. Kendr. (1990), anamorphic *Pezizomycotina*, Hso.0bP.1. 1, Cuba. See Castañeda & Kendrick (*Univ. Waterloo Biol. Ser.* 32: 36, 1990).
- Physalidium** Mosca (1965) [non *Physalidium* Fenzl 1866, *Cruciferae*] = *Physalidiella*.
- Physalospora** Niessl (1876), *Hyponectriaceae*. 36 (on dead leaves etc.), widespread. The genus has been confused with *Botryosphaeria* (*Botryosph.*), and is probably polyphyletic as currently circumscribed. See Barr (*Mycol.* 68: 611, 1976; nomencl.), Kohlmeyer *et al.* (*Bot. Mar.* 38: 175, 1995), Hoffmann & Hafellner (*Bibliotheca Lichenol.* 77: 1, 2000; excl. spp. on lichens), Sivanesan & Shivas (*Fungal Diversity* 9: 169, 2002).
- Physalosporella** Speg. (1910) nom. dub., *Pezizomycotina*. See Petrak & Sydow (*Annls mycol.* 32: 28, 1934).
- Physalosporina** Woron. (1911) = *Stigmatula* fide Cannon (*Mycol. Pap.* 163, 1991).
- Physalosporopsis** Bat. & H. Maia (1955), *Dothideomycetes*. 1, Brazil. See Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Physcia** (Schreb.) Michx. (1803), *Physciaceae* (L.). c. 73, widespread. See Awasthi (*J. Indian bot. Soc.* 39: 1, 1960; India), Frey (*Ber. schweiz. bot. Ges.* 73: 389, 1963), Thomson (*Beih. Nova Hedwigia* 7, 1963; N. Am.), Moberg (*Symb. bot. upsal.* 22 no. 1, 1977), Moberg (*Nordic J. Bot.* 6: 843, 1986; key 21 spp. E. Afr.), Moberg & Hansen (*Meddr Grønland Biosc.* 22, 1986; keys), Moberg (*Herzogia* 8: 249, 1989; Eur.), Moberg (*Nordic J. Bot.* 10: 319, 1990; key 34 spp. C. & S. Am.), Moberg (*Symb. bot. upsal.* 32: 163, 1997; Sonoran Desert), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998; DNA), Myllys *et al.* (*Mycol.* 93: 335, 2001; species pair concept), Elvebakk & Moberg (*Lichenologist* 34: 311, 2002; Chile), Wedin *et al.* (*Taxon* 51: 655, 2002; phylogeny), Helms *et al.* (*Mycol.* 95: 1078, 2003; phylogeny), Moberg (*Symb. bot. upsal.* 34 no. 1: 257, 2004; S Africa), Simon *et al.* (*J. Mol. Evol.* 60: 434, 2005; rDNA introns), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Türk & Obermayer (*Central European Lichens*: 119, 2006; Austria), Honegger & Zippler (*MR* 111: 424, 2007; mating systems).
- Physciaceae** Zahlbr. (1898) nom. cons., *Teloschistales* (L.). 17 gen. (+ 27 syn.), 512 spp.
Lit.: Hafellner *et al.* (*Herzogia* 5: 39, 1979; key gen.), Aptroot (*Fl. Guianas, E.* 1, 1987; 48 spp. Guianas), Aptroot (*Cryptog. Bryol.-Lichénol.* 9: 141, 1988), Moberg & Hansen (*Meddr Grønland Biosc.* 22: 389, 1988; keys 17 foliose spp. Greenland), Aptroot & Berendsen (*Proc. K. Ned. Akad. Wet. Ser. C, Biol. Med. Sci.* 92: 409, 1989; pruina), Rambold *et al.* (*Pl. Syst. Evol.* 192: 31, 1994; ascus types), Giralt & Llimona (*Mycotaxon* 62: 175, 1997), Nimis & Tretiach (*Bryologist* 100: 217, 1997), Nordin (*Symb. bot. upsal.* 32: 195, 1997; ultrastr.), Esslinger & Bratt (*Lichenogr. Thomsoniana North American Lichenology in Honor of John W. Thomson*: 25, 1998), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998; DNA), Chen & Wang (*Mycotaxon* 73: 335, 1999), Moberg & Nash (*Bryologist* 102: 1, 1999), Esslinger (*Bull. Calif. Lichen Soc.* 7: 1, 2000), Giralt *et al.* (*Lichenologist* 32: 105, 2000), Lohtander *et al.* (*Mycol.* 92: 728, 2000; phylogeny, Scandinavia), Mayrhofer *et al.* (*Muelleria* 12: 169, 1999), Wedin *et al.* (*CJB* 78: 246, 2000; rels with *Caliciaceae*), Dahlkild *et al.* (*Bryologist* 104: 527, 2001), Grube & Arup (*Lichenologist* 33: 63, 2001), Nordin & Mattsson (*Lichenologist* 33: 3, 2001; phylogeny), Scheidegger *et al.* (*Lichenologist* 33: 25, 2001; evolutionary trends), Anon. in Anon. (Ed.) (*Nordic Lichen Flora* 2: *Physciaceae*, 2002), Wedin *et al.* (*Taxon* 51: 655, 2002), Helms *et al.* (*Mycol.* 95: 1078, 2003), Tibell (*MR* 107: 1403, 2003), Crespo *et al.* (*Taxon* 53: 405, 2004), Cubero *et al.* (*MR* 108: 498, 2004), Lumbsch *et al.* (*Mol. Phylogen. Evol.* 31: 822, 2004), Obermayer *et al.* (*Symb. bot. upsal.* 34 no. 1: 327, 2004), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny).
- Physcidia** Tuck. (1862), *Ramalinaceae* (L.). 7, widespread. See Kalb & Elix (*Bibliotheca Lichenol.* 57: 265, 1995; key).
- Physciella** Essl. (1986) ? = *Phaeophyscia* fide Hawksworth (*SA* 5: 151, 1986).

Physciomyces E.A. Thomas ex Cif. & Tomas. (1953) = *Physcia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

physcion, see parietin.

Physciopsis M. Choisy (1950) = *Hyperphyscia* fide Hafellner *et al.* (*Herzogia* 5: 39, 1979).

Physconia Poelt (1965) nom. cons., Physciaceae (L.) c. 26, widespread. See Moberg (*Symb. bot. upsal.* 22 no. 1, 1977), Moberg (*Nordic J Bot.* 7: 719, 1987; key 3 spp., E. Afr.), Esslinger (*Mycotaxon* 51: 91, 1994; N America), Nordin (*Symb. bot. upsal.* 32 no. 1: 195, 1997; ultrastr.), Esslinger (*Bull. Calif. Lichen Soc.* 7: 1, 2000; California), Lohtander *et al.* (*Mycol.* 92: 728, 2000; Scandinavia), Nordin & Mattsson (*Lichenologist* 33: 3, 2001; phylogeny), Chen & Hu (*Mycotaxon* 86: 185, 2003; China), Helms *et al.* (*Mycol.* 95: 1078, 2003; phylogeny), Cubero *et al.* (*MR* 108: 498, 2004; phylogeny, revision), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Türk & Obermayer (*Central European Lichens*: 119, 2006; Austria), Divakar *et al.* (*MR* 111: 1311, 2007; phylogeny, anatomy).

physiologic form (Stakman & Levine), see physiologic race.

physiologic race, one of a group of forms alike in morphology but unlike in certain cultural, physiological, biochemical, pathological, or other characters. The use of this term in place of biologic form, etc. was a recommendation of the International Botanical Congress, 1935. The term 'race' has been used in different senses by plant pathologists, the classical approach of using tests on differential hosts now being replaced by smaller flexible groups of host genotypes permitting characterization by virulence. See Caten (*in* Wolfe & Caten, *Populations of plant pathogens: their dynamics and genetics*: 21, 1987; review), Dennis (*Proc. Linn. Soc. Lond.* 163: 47, 1952; taxonomic treatment), Johnson (*Biol. Rev.* 28: 105, 1953; variation), Classification, special form, Species.

Physiology. Fungal physiology is the study of their mechanical, physical and biochemical functions, their adaptations to stresses and mechanisms for their development. Good introductory texts are: Berry (*Physiology of industrial fungi*, 1988) and Garraway & Evans (*Fungal nutrition and physiology*, 1984). Griffin (*Fungal physiology*, 2nd ed, 1996) summarizes fungal physiology from the viewpoint of the physical and chemical factors and processes behind the functioning of fungi, integrating discoveries in molecular genetics with conventional whole organism and biochemical approaches. At the more encyclopaedic level, Smith & Berry (Eds) (*The filamentous fungi*, 4 vols, 1975-83) and volumes of Esser & Lemke (Eds) (*The Mycota*, 1994-, e.g. Esser *et al.* (Eds), *The Mycota* 8: 1, 2001) are recommended, though now some are now dated. Specialist treatments include: Ayers & Boddy (*Water, fungi and plants*, 1986), Bennett & Ciegler (*Secondary metabolism and differentiation in fungi*, 1983), Boddy *et al.* (*Nitrogen, phosphorus and sulphur utilisation by fungi*, 1989), Burnett & Trinci (*Fungal walls and hyphal growth*, 1989), Calvo *et al.*, *Microbiol. Mol. Biol. Rev.* 66: 447, 2002; relations between secondary metabolism and fungal development), Cooke & Whipps (*Ecophysiology of fungi*, 1983), Cox (*In: In* Robson *et al.* (Eds) *Exploitation of Fungi*, 2007), Elliott (*Reproduction in fungi: genetical and physio-*

logical aspects, 1994), Frankland *et al.* (*Decomposer basidiomycetes: their biology and ecology*, 1982), Jennings (*Stress tolerance of fungi*, 1993; *The physiology of fungal nutrition*, 1995), Jennings & Rayner (*The ecology and physiology of the fungal mycelium*, 1984), Kershaw (*Physiological ecology of lichens*, 1985), Lewis (*MR* 95: 897, 1991; sugars), Moore *et al.* (*Developmental biology of higher fungi*, 1985), Smith (*Fungal differentiation*, 1983), Szaniszló (*Fungal dimorphism*, 1985), Vicente *et al.* (*Surface physiology of lichens*, 1985), Weete (*Lipid biochemistry of fungi and other organisms*, 1981), Winkelmann & Winge (*Metal ions in fungi*, 1994), Yu & Keller (*Annual Review of Phytopathology* 43: 437, 2005), Zhdanova & Vasilevskaya (*Melanin biosynthesizing fungi in extreme environments*, 1988). Special studies and reviews devoted to physiology of different ecological groups of fungi include: **anaerobic fungi**, study of physiology of fungal development in anaerobic conditions (Lübbenhüsen *et al.*, *MR* 107: 223, 2003); **marine fungi**, especially, their growth, enzyme production and secondary metabolites (Jensen & Fenical, *In: Hyde, K.D. (Ed.) Fungi in marine environments. Fungal diversity research series* 7: 293, 2002; Kis-Papo *et al.*, *Microbial ecology* 45: 83, 2003; Molitoris & Schaumann, *In: The biology of marine fungi*, 35, 1986); **mycorrhizal fungi**, the physiological interaction within the root (regulation of host defences, bidirectional transport of nutrients, modification of gene expression, carbon metabolism) and effects of the mycorrhiza upon the whole plant (Bago *et al.*, *Plant physiology* 124: 949, 2000; Bago *et al.*, *Plant Physiology* 128: 108, 2002; Kapulnik & Douds *Arbuscular mycorrhizas: physiology and function*, 2000; Le Quéré *et al.*, *Mol. plant microbe interactions MPMI* 18: 659, 2005; Olsson *et al.*, *Appl. Environ. Microbiol.* 71: 2592, 2005; Trepanier *et al.*, *Appl. Environ. Microbiol.* 71: 5341, 2005), contribution of arbuscular mycorrhiza in maintaining antioxidant and carbon metabolism in plants under water stress (Goicoechea *et al.*, *J. Plant Physiol.* 162: 27, 2005), biofertilizing, bioprotecting and bioregulating role of arbuscular mycorrhizal fungi in plant growth and health promotion in agricultural systems (Gianinazzi *et al.*, *Mycorrhizal technology in agriculture: from genes to bioproducts*, 2002); **soil fungi**, their nutritional requirements and place in ecosystems (Cullings *et al.*, *Appl. Environ. Microbiol.* 71: 1996, 2005); **thermophilic and thermotolerant fungi**, especially their enzymes (Bhabhra *et al.*, *Infect. Immun.* 72: 4731, 2004; Maheshwari *et al.*, *Microbiology and Molecular Biology Reviews* 64: 461, 2000; Sandgren *et al.*, *Protein Sci.* 12: 2782, 2003).

Bakers' yeast is by far the most studied fungus, physiologically and biochemically (see *Saccharomyces*). Because yeasts in general are easy to handle experimentally in comparison with other fungi, there is an extensive literature on their physiology and biochemistry, the best entries into which are Berry *et al.* (*Yeast biotechnology*, 1987), Rose & Harrison (*The yeasts* 3-4, 1989-91) and van der Heijden (Ed.) (*Mycorrhizal Ecology*, 2002). Adaptation mechanisms of yeast cells to environmental stress, specific adaptations of their growth and metabolism to nutrient depletion, osmotic and heat shock, salt and oxidative stress are discussed by Hohmann & Mager (*Yeast stress responses*, 2003), Guerra *et al.* (*Microbiology* 151: 805, 2005). For results of molecular biology

studies using *Saccharomyces cerevisiae*, and some other yeast species as model eukaryotes to study their growth mechanisms, division, elongation, pseudohyphal growth, mating and hormonal attraction see Madhani, *From a to α: yeast as a model for cellular differentiation*, 2007). Summarized data on the physiology, cell biology and genetics of the dimorphic fungus *Yarrowia lipolytica* are given by Barth & Gaillardin (*FEMS Microbiology Reviews* 19: 219, 1997).

Advances in Microbial Physiology, *Ann. Rev. Phytopath.* and *Microbiol. Mol. Biol. Rev.* contain significant review articles. Because of the power of molecular biology, many of key physiological findings about fungi, albeit for a restricted number of genera (particularly *Aspergillus*, *Neurospora*, *Saccharomyces*), are in such journals as *J. biol. Chem.* and *Mol. cell. Biol.*

General reviews of lichen physiology are given by Ahmadjian (*The lichen symbiosis*, edn 2, 1993), Ahmadjian & Hale (Eds) (*The lichens*, 1974), Brown *et al.* (Eds) (*Lichenology: progress and problems*, 1976), Brown (Ed.) (*Lichen physiology and cell biology*, 1985), Hale (*The biology of lichens*, 1983), Kappen (Ed.) (New species and novel aspects in ecology and physiology of lichens. In honour of O.L. Lange. *In: Bibliotheca Lichenologica* 67: 1, 1997), Nash (*Lichen Biology*, 1996), Quispel (*Encycl. pl. physiol.* 11: 577, 1959), Seaward (Ed.) (*Lichen ecology*, 1977; ecophysiology), Smith (*Biol. Rev.* 37: 537, 1962). All these publications have extensive bibliographies.

See also Air pollution, Anaerobic fungi, Antibiotics, Diurnal cycles, Lichens, Light and fungi, Metabolic products, Nutrition, Pigments, Spore discharge, Symbiosis, etc.

Physisporinus P. Karst. (1889), Meripilaceae. 2, Europe; Uganda. See Gilbertson & Ryvarden (*N. Amer. Polyp.* 2: 628, 1987), Ipulet & Ryvarden (*Syn. Fung.* 20: 87, 2005; Uganda).

Physisporus Chevall. (1826) nom. rej. prop. ≡ *Pereniporia*.

Physma A. Massal. (1854), Collemataceae (L.). c. 12, widespread. See Degelius (*Svensk bot. Tidskr.* 49: 136, 1955), Verdon & Elix (*Acta Bot. Fenn.* 150: 209, 1994; key 4 Australasian spp.), Jørgensen & Aptroot (*Lichenologist* 34: 441, 2002; Taiwan).

Phymaceae Walt. Watson (1929) = Collemataceae.

Physmatomyces E.A. Thomas ex Cif. & Tomas. (1953) = *Physma*.

Physmatomyces Rehm (1900), ? Helotiales. 1, Brazil.

Physocladia Sparrow (1932), Cladochytriaceae. 1, N. America.

Physocystidium Singer (1962), Tricholomataceae. 1, Trinidad. See Singer (*Persoonia* 2: 410, 1962).

Physoderma Wallr. (1833), Physodermataceae. 50, widespread. *P. maydis* (maize brown spot), *P. alfalfae* (on *Medicago*). See Karling (*Lloydia* 13: 29, 1950), Sparrow (*TMSJ* 3: 16, 1962), Sparrow (*TBMS* 60: 340, 1973; type), Lange & Olson (*Protoplasma* 102: 323, 1980), Hadar (*C.R. Acad. Sci. Paris Sér. III* 294: 329, 1982).

Physodermataceae Sparrow (1952), Blastocladales. 1 gen. (+ 2 syn.), 50 spp.

Lit.: Hadar (*Compt. Rend. Hebd. Seances Acad. Sci. Ser. 3* 294: 329, 1982; in *Spizellomycetales* but this doubtful as TEM unclear), Barr in McLaughlin *et al.* (Eds) (*The Mycota A Comprehensive Treatise on*

Fungi as Experimental Systems for Basic and Applied Research 7A: 93, 2001).

Physodontia Ryvarden & H. Solheim (1977), Hymenochaetales. 1, Europe. See Ryvarden & Solheim (*Mycotaxon* 6: 375, 1977), Larsson (*MR* 111: 1056, 2007).

Physokermicola Brain (1923) nom. dub., anamorphic *Saccharomycetes*.

Physomitra Boud. (1885) ≡ *Gyromitra*.

Physomyces Harz (1890) = *Monascus* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Physonema Lév. (1847), anamorphic *Phragmidium*. 1, widespread (temperate). Anamorph name for (I). See Laundon (*Mycol. Pap.* 102, 1965).

Physopella Arthur (1906) = *Phakopsora*. Anamorph name for (II). fide Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003).

Physorhizophidium Scherff. (1926), Chytridiaceae. 1 (on diatoms), Europe; N. America.

Physospora Fr. (1835) nom. dub. = *Rhinotrichum* fide Sumstine (*Mycol.* 3: 45, 1911), Donk (*Taxon* 11: 95, 1962).

Physosporella Höhn. (1919), Hyponectriaceae. 1, Germany. See Barr (*Mycol.* 68: 611, 1976), Cannon (*MR* 100: 1409, 1996; as *Plectosphaera*).

Physosporellaceae Höhn. ex M.E. Barr (1976) = *Hyponectriaceae*.

phytoalexin, a metabolite produced by a plant in response to infection by a fungus or other pathogen (or by an abiotic factor) inhibitory to the invading pathogen. Reviews: Cruickshank, *Ann. Rev. Phytopath.* 1: 351, 1963; Kuć, *Ann. Rev. Phytopath.* 10: 207, 1972; Ingram, *Bot. Rev.* 38: 343, 1972. Cf. antibiotics.

Phytoalexins include: capsidiol, glyceollin, ipomearone, kievitone, phaseollin, pisatin, rishitin, wyerone (q.v.).

phytoalternarin (A, B, C), host-specific toxins produced by *Alternaria kikuchiana* (black spot of Japanese pears; *Pyrus serotina*) (Park *et al.*, *Physiol. Pl. Pathol.* 9: 167, 1976).

Phytoconis Bory (1797) nom. rej. prop. = *Lichenomphalia* fide Kuyper (*in litt.*) The name has been used for the anamorph of *Lichenomphalia*. See, Gams (*Öst. bot. Z.* 109: 376, 1962), Poelt & Jülich (*Herzogia* 1: 331, 1969), Oberwinkler (*Ber. Deut. Bot. Ges.* 4: 139, 1970), Redhead & Kuyper (*Arctic Alpine Mycology* 2: 319, 1987), Redhead & Kuyper (*Mycotaxon* 31: 221, 1988), Jørgensen & Ryman (*Taxon* 38: 305, 1989).

Phytocordyceps C.H. Su & H.H. Wang (1986) = *Cordyceps* fide Su & Wang (*Mycotaxon* 26: 337, 1986), Sung *et al.* (*Stud. Mycol.* 57, 2007).

phytolysine, a plant tissue macerating enzyme from *Plowrightia ribesia* (Neaf-Roth *et al.*, *Phytopath. Z.* 40: 283, 1961).

Phytomyxinae. An order for *Plasmodiophora*, *Phytomyxa*, *Sorosphaera* and *Tetramyxa*.

phytopathology, the branch of science for plant disease; see Plant pathogenic fungi.

Phytosociology. see *Mycosociology*.

Phytotoxic mycotoxins (toxins injurious to plants; see also phytotoxin (2) under *Toxins*). May be host specific (e.g. helminthosporoside, phytoalternarins, victorin, q.v.) or non-host specific (e.g. alternaric acid, baccatin, chaetoglobosin, culmomarasmin, diaporthin, fusaric acid, fusicoccin, helminthosporal, macrocyclic trichothecenes, ophiobolin (cochliobolin), skyrin, tentoxin, zearalenone, q.v.).

Fungi producing phytotoxic mycotoxins have potential as mycoherbicides for control of weeds. Phytotoxic mycotoxins biologically active against *Trifolium repens* and *Pueraria montana* have been found among metabolites of a *Sclerotinia* sp. (Yeon-Kyu Hong, *Plant Pathology Journal* 20: 52, 2004). Macrocyclic trichothecenes produced by *Myrothecium verrucaria* exhibit phytotoxicity to both weeds and crops (beans, corn, tobacco, wheat) causing a range of damage (Cutler & Jarvis, *Environmental and Experimental Botany* 25: 115, 1985; Abbas *et al.*, *Phytochemistry* 59: 309, 2002). These mycotoxins including epiroridin, epiisororidin, roridins, trichoverrins and verrucarins are effective against *Lemna pausicostata* and *Pueraria montana* (Abbas *et al.*, *Phytochemistry* 58: 269, 2001). *Fusarium* toxins such as enniatin and fumonisin, as well as fusaric and dehydrofusaric acids, reportedly have herbicidal properties (Hershenhorn *et al.*, *Plant Science* 86: 155, 1992; Zonno & Vurro, *Phytoparasitica* 30: 519, 2002). Seed germination of *Orobancha ramosa* is inhibited by fusaric acids, and *Striga hermonthica*, a serious pest of African crops, is totally suppressed by other fusaric metabolites (Idris *et al.*, *Phytopathologia Mediterranea* 42: 65, 2003). Mycotoxins produced by *Alternaria alternata*, *Fusarium* species, *Myrothecium verrucaria* and *Phomopsis foeniculi* showed phytotoxic effects, i.e. chlorosis, necrosis and other symptoms, particularly on seedlings (Lamprecht *et al.*, *Phytopathology* 84: 383, 1994; Corsaro *et al.*, *Carbohydr. Res.* 308: 349, 1998; Abbas *et al.*, *Phytochemistry* 59: 309, 2002). Phytotoxic mycotoxins may inhibit translation in eukaryotic ribosomes (Masuda *et al.*, *J. Experimental Botany* 58: 1617, 2007). Trichoverrins, atranone and some *Fusarium* toxins are also weakly cytotoxic for mammals (Ueno & Ueno, *Toxicology, Biochemistry and Pathology of Mycotoxins*, 107, 1978; Abbas *et al.*, *Phytochemistry* 59: 309, 2002).

Reviews: Pringle & Scheffer (*Ann. Rev. Phytopath.* 2: 133, 1964), Wright (*Ann. Rev. Microbiol.* 22: 269, 1968), Wood *et al.* (Eds) (*Phytotoxins in plant disease*, 1972), Strobel (*Ann. Rev. Pl. Physiol.* 25: 541, 1974), Durbin (Ed.) (*Toxins in plant diseases*, 1981), Uraguiche & Yamazaki [eds] (*Toxicology, Biochemistry and Pathology of Mycotoxins*, 1978).

Lit.: Abbas *et al.* (*Phytochemistry* 58: 269, 2001; *Phytochemistry* 59: 309, 2002), Corsaro *et al.* (*Carbohydr. Res.* 308: 349, 1998), Cutler & Jarvis (*Environmental and Experimental Botany* 25: 115, 1985), Hershenhorn *et al.* (*Plant Science* 86: 155, 1992), Idris *et al.* (*Phytopathologia Mediterranea* 42: 65, 2003), Lamprecht *et al.* (*Phytopathology* 84: 383, 1994), Masuda *et al.* (*J. Experimental Botany* 58: 1617, 2007), Ueno & Ueno (*Toxicology and biochemistry of mycotoxins*. In Uraguiche & Yamazaki [eds] *Toxicology, Biochemistry and Pathology of Mycotoxins*, 107, 1978), Yeon-Kyu Hong (*Plant Pathology Journal* 20: 52, 2004), Zonno & Vurro (*Phytoparasitica* 30: 519, 2002).

phytotoxin, see toxin.

Picardella I.I. Tav. (1985), Laboulbeniaceae. 2, Europe. See Tavares (*Mycol. Mem.* 9: 276, 1985), Santamaria (*Revta Ibér. Micol.* 6: 13, 1989).

Piccolia A. Massal. (1856), Lecanorales (L). 1, pan-tropical. See Hafellner (*Biblthca Lichenol.* 58: 107, 1995), Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Hafellner (*Symb. bot. upsal.* 34 no. 1:

87, 2004).

Piceomphale Svrček (1957), Helotiales. Basal to a clade including *Rustroemiaceae* and *Sclerotiniaceae*. See Holst-Jensen *et al.* (*Mycol.* 89: 885, 1997; DNA), Gernandt *et al.* (*Mycol.* 93: 915, 2001; phylogeny), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).

Pichia E.C. Hansen (1904), Pichiaceae. 112, widespread. Highly polyphyletic, soon to be subdivided. See Poncet (*Mycopathologia* 57: 99, 1975; numerical tax.), Miller *et al.* (*Syst. Appl. Microbiol.* 12: 191, 1989; OFAGE), Kurtzman (*Mycol.* 84: 72, 1992; DNA-relatedness), Yamada *et al.* (*Biosc., Biotechn., Biochem.* 58: 1245, 1994; gen. concept), Kurtzman in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 273, 1998), Suzuki & Nakase (*J. gen. appl. Microbiol.* Tokyo 45: 239, 1999), Kurtzman (*Int. J. Syst. Evol. Microbiol.* 50: 395, 2000), Mikata & Ueda-Nishimura (*Antonie van Leeuwenhoek* 77: 159, 2000), Masih *et al.* (*FEMS Microbiol. Lett.* 202: 109, 2001; biocontrol), Ueda-Nishimura & Mikata (*Antonie van Leeuwenhoek* 79: 371, 2001), Schweigkofler *et al.* (*Organ. Divers. Evol.* 2: 1, 2002; phylogeny), Suh & Blackwell (*FEMS Yeast Res.* 5: 87, 2004; beetle associates), Sutar *et al.* (*Journal of Medical Microbiology* 53: 119, 2004; strain typing), Friel *et al.* (*Journal of Applied Microbiology* 98: 783, 2005; genetic diversity), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny), Villa-Carvajal *et al.* (*Antonie van Leeuwenhoek* 90: 171, 2006; molecular identification), Wu *et al.* (*FEMS Yeast Res.* 6: 305, 2006; genetic diversity), Rivera *et al.* (*Biol. J. Linn. Soc.* 93: 475, 2008; experimental evolution).

Pichiaceae Zender (1925), Saccharomycetales. 6 gen. (+ 18 syn.), 133 spp.

Lit.: Sugiyama *et al.* (*Mycol.* 98: 996, 2006), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).

Picoa Vittad. (1831), Pezizales. 4 (hypogeous), widespread. See Montecchi (*Micologia e Vegetazione Mediterranea* 13: 131, 1999), Moreno *et al.* (*MR* 104: 378, 2000), Popolizio (*Riv. Micol.* 49: 155, 2006; Italy), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).

Picromyces Battarra ex Earle (1909) = Hebeloma.

Pidoplitchkoviella Kiril. (1975), Xylariales. 1 (from soil), British Isles/raine. See von Arx *et al.* (*Beih. Nova Hedwigia* 94: 104, 1988), Suh & Blackwell (*Mycol.* 91: 836, 1999; phylogeny).

piedra, black, see *Piedraia*; white -, see *Trichosporon*.

Piedraia Fonseca & Leão (1928), Piedraiaceae. Anamorph *Trichosporon*. 2 (on hair), widespread (tropical). *P. hortae* (black piedra of humans). See Boedijn (*Mycopathologia* 11: 354, 1959), van Uden *et al.* (*Revta bras. Biol.* 3: 271, 1963), Takashio & Vanbreuseghem (*Mycol.* 63: 612, 1971), de Hoog & Guého in Ajello & Hay (Eds) (*Topley & Wilson's Microbiology and Microbial Infections* edn 9 4: 191, 1998), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).

Piedraiaceae Viégas ex Cif., Bat. & S. Camposa (1956), Capnodiales. 1 gen. (+ 4 syn.), 2 spp.

Lit.: Hoog & Guého (*Topley & Wilson's Microbiology and Microbial Infections* Edn 9. Vol. 4. Medical Mycology: 191, 1998), Kane & Summerbell (*Manual of Clinical Microbiology*: 1275, 1999), Lumbsch & Lindemuth (*MR* 105: 901, 2001), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).

Piemycus Raf. (1813) = *Piesmucus*.

Pierstonia Harkn. (1899) = *Choiromyces* fide Trappe

- (*TBMS* 65: 496, 1975).
- Piesmocus** Raf. (1808) ? = *Bovista* fide Stalpers (*in litt.*).
- Pietria fungaia**, see stone-fungus.
- Piggotia** Berk. & Broome (1851), anamorphic *Venturiaceae*, Cac.0eP.19. 3, widespread (temperate). See Sutton (*The Coelomycetes*, 1980), Braun (*Arnoldia* 15: 44, 1998), Johnston (*N.Z. J. Bot.* 37: 703, 1999).
- Pigments**. The text of this entry is unrevised and remains the same as for the ninth edition. Characteristic pigments are produced by a wide variety of fungi. Species of *Drechslera* s.l. give hydroxyanthraquinones (e.g. helminthosporin ('maroon' in colour), catenarin (red), cynodontin ('bronze'), tritisporin (red brown)); the similar compound, erythroglaucon (red) is produced by forms of *Aspergillus glaucus* which gives in addition, auroglaucon (orange) and flavoglaucon (yellow). Among other pigments, investigations have been made on aurofusarin (orange yellow) and rubrofusarin from *Fusarium culmorum*; aurantin (yellow) and oosporin (purple-brown with ferric chloride (FeCl₃) from *Chrysonilia sitophila* (teleomorph *Neurospora sitophila*); boletol (blue) from *Boletus luridus* and other species; citromycetin, chrysogenin, citrinin, fulvic acid, and other yellow pigments from *Penicillium*. Many mycotoxins are pigmented, e.g. naphthoquinones from *Penicillium* and *Aspergillus*. 'Yellow rice' refers to the colour of rice infected by pigment and toxin producing species of *Penicillium*. Important fungal sex hormones such as trisporic acid from *Blakeslea trispora* are carotenoid pigments (Turner & Aldridge, *Fungal metabolites* II, 1983). Pigments from fungi are involved in biodeterioration of commodities, such as paint. The Chinese red rice (ang-kak, q.v.) is used for colouring food. See Wolf (*J. Elisha Mitch. Sci. Soc.* 89: 184, 1973; synthesis, 261 refs).
- Many pigments occur in lichens and may be red (e.g. rhodophyscin), yellow (e.g. usnic acid (q.v.), stictaurin), orange (e.g. parietin, q.v.), bright emerald green (e.g. vulpinic acid), or brown (e.g. *Parmelia*-brown). The chemical structures of pigments in thalli are mainly known whilst those of apothecial tissues (e.g. epithecium colours) are less understood. Lichen pigments are mainly pulvic acid derivatives, usnic acids, and anthraquinones.
- See see Carotene, Dyeing, Metabolic products, Wood attacking fungi.
- Pila** Speg. (1923) [non *Pila* C.E. Bertrand & Renault 1892, fossil *Algae*] = *Gastropila*.
- Pilacre** Fr. (1829) nom. dub., *Agaricomycetes*. See Donk (*Persoonia* 4: 325, 1966).
- Pilacrella** J. Schröt. (1887) = *Atractiella* fide Oberwinkler & Bauer (*Sydowia* 41: 224, 1989).
- Pilaira** Tiegh. (1875), *Mucoraceae*. 4 (esp. coprophilous), widespread (north temperate). See Zycha *et al.* (*Mucorales*, 1969; key), Mil'ko (*Mikol. Fitopatol.* 4: 262, 1970), Fletcher (*J. Biol. Educ.* 5: 229, 1971), Fletcher (*TBMS* 61: 553, 1973; phototropism), Wood & Cooke (*TBMS* 86: 672, 1986; parasitism), Wood & Cooke (*TBMS* 88: 247, 1987; nutrition), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny).
- Pilát** (Albert; 1903-1974; Czech). Student of Velenovský (q.v.), Charles University (1926); Scientific Assistant and Research Officer (1930-1948) then Head, Botanical Department (1948-1965) then Head, Mycological Department (1965-1974), National Museum, Prague. An authority on basidiomycetes, particularly wood-inhabiting and mycorrhizal species, particularly of Europe and temperate Asia; rediscovered the lost collections of Corda (q.v.). *Publs. Atlas des Champignons de l'Europe* (1934-1948) [including *Pleurotus* (1935); *Polyporaceae* (1936-1942); *Agaricus* (1951)]; *Houby Československa ve Svém Životním Prostředí* (1969). *Biogs, obits etc.* Kotlaba & Pouzar (*TBMS* 65: 163, 1975) [portrait]; Singer (*Mycol.* 67: 445, 1975) [portrait]; Stafleu & Cowan (*TL-2* 4: 265, 1983).
- Pilatia** Velen. (1934) = *Urceolella* fide Raschle (*Sydowia* 29: 170, 1977).
- Pilatoporus** Kotl. & Pouzar (1990) = *Fomitopsis* fide Ryvarden (*Syn. Fung.* 5: 201, 1991).
- pileate**, having a pileus.
- pileipellis**, see pellis.
- pileocystidium**, see cystidium.
- Pileodon** P. Roberts & Hjortstam (1998), *Gloeophyllales*. 2, Brunei; Philippines. See Hjortstam *et al.* (*Kew Bull.* 53: 817, 1998), Nakasone (*Sydowia* 56: 258, 2004).
- Pileolaria** Castagne (1842), *Pileolariaceae*. c. 15 (on *Anacardiaceae*), widespread. See Hüseyin & Selçuk (*Pakist. J. Bot.* 36: 203, 2004; Turkey).
- Pileolariaceae** Cummins & Y. Hirats. (1983), *Pucciniales*. 4 gen. (+ 3 syn.), 34 spp.
Lit.: Gardner & Hodges (*Mycol.* 77: 575, 1985), Hiratsuka (*Mycotaxon* 31: 517, 1988), Dianese *et al.* (*Fitopatol. Brasil* 18: 342, 1993), Chen *et al.* (*Mycoscience* 37: 91, 1996), Walker (*Australasian Mycologist* 20: 3, 2001), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003), Wingfield *et al.* (*Australas. Pl. Path.* 33: 327, 2004), Aime (*Mycoscience* 47: 112, 2006).
- pileolus**, a small pileus.
- pileus**, the hymenium-supporting part of the basidioma of non-resupinate *Agaricomycetes*; cap (Fig. 4A).
- Pilgeriella** Henn. (1900), *Parodiopsidaceae*. Anamorph *Septoidium*. 2, S. America.
- Pilidiella** Petr. & Syd. (1927), anamorphic *Schizoparme*. 12, widespread. See Sutton (*The Coelomycetes*, 1980), Castlebury *et al.* (*Mycol.* 94: 1017, 2002; phylogeny), Van Niekerk *et al.* (*MR* 108: 283, 2004; phylogeny), Rossman *et al.* (*Mycoscience* 48: 135, 2007; review).
- Pilidium** Kunze (1823), anamorphic *Discohainesia*, St.0eH.15. 2, widespread. See Sutton (*The Coelomycetes*, 1980), Palm (*Mycol.* 83: 787, 1992; synanamorph *Hainesia*), Rossman *et al.* (*Mycol. Progr.* 3: 275, 2004; phylogeny), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Piligena** Schumach. (1821) = *Onygena* fide Saccardo (*Syll. fung.* 20: 230, 1911).
- Pilimelia** W.D. Kane (1966), *Actinobacteria*. q.v.
- Piline** Theiss. (1917) = *Perisporiopsis* Henn. fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Pillulasclerotes** Stach & Pickh. (1957), *Fossil Fungi*. 1 (Carboniferous), Germany.
- Pilobolaceae** Corda (1842), *Mucorales*. 2 gen. (+ 4 syn.), 6 spp.
Lit.: Kirk & Benny (*TBMS* 75: 123, 1980), Hu *et al.* (*Mycosystema* 2: 111, 1989), Cacialli *et al.* (*Funghi e Ambiente* 78-79: 13, 1998), Voigt & Wöstemeyer (*Gene* 270: 113, 2001).
- Pilobolus** Tode (1784), *Pilobolaceae*. 5 (coprophilous), widespread. See Grove *in* Buller (*Researches on Fungi* 6: 190, 1934), Zycha *et al.* (*Mucorales*, 1969),

- Nand & Mehrotra (*Sydowia* 30: 283, 1978; spp.), Bourret & Keierleber (*Arch. Mikrobiol.* 126: 43, 1980; spore germination), Foos & Royer (*CJB* 65: 1063, 1987; growth temp), Hu *et al.* (*Mycosystema* 2: 111, 1989; revision), Eysker (*Res. Vet. Sci.* 50: 29, 1991; dispersal of cattle lungworm), Horie *et al.* (*Mycoscience* 39: 463, 1998; gravitropic response), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny), White *et al.* (*Mycol.* 98: 872, 2006; phylogeny).
- Pilocarpaceae** Zahlbr. (1905), Lecanorales (L). 11 gen. (+ 11 syn.), 259 spp.
Lit.: Awasthi & Mathur (*Proc. Indian Acad. Sci. Pl. Sci.* 97: 481, 1987), Kalb & Vězda (*Nova Hedwigia* 51: 435, 1990), Lücking (*Nova Hedwigia* 52: 267, 1991), Lücking *et al.* (*Bot. Acta* 107: 393, 1994), Cáceres (*Mycotaxon* 71: 383, 1999), Thor *et al.* (*Symb. bot. upsal.* 32: 72 pp., 2000), Andersen & Ekman (*Lichenologist* 36: 27, 2004), Andersen & Ekman (*MR* 109: 21, 2005).
- Pilocarpon** Vain. (1890) = *Byssoloma* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pilocintractia** Vánky (2004), ? Anthracoideaceae. 2 (in seeds of *Fimbristylis* (*Cyperaceae*)), S. Asia; Australia; C. & S. America. See Vánky (*Mycol. Balcanica* 1: 169, 2004), Vánky (*Mycotaxon* 95: 1, 2006; key).
- Pilocratera** Henn. (1891) = *Cookeina*.
- Piloderma** Jülich (1969), Atheliaceae. 6, widespread. See Jülich (*Willdenowia* Beih. 7, 1972).
- Pilodermataceae** Jülich (1982) = Atheliaceae.
- Pilonema** Nyl. (1860) = *Polychidium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pilopeza** Fr. (1849) = *Psilopezia*.
- Pilophora** Wallr. (1833) [non *Pilophora* Jacq. 1802, *Palmae*] = *Rhizopus* fide Hesseltine (*Mycol.* 47: 344, 1955) See *Crinofera*.
- Pilophoraceae** Stizenb. (1862) = Cladoniaceae.
- Pilophoron** (Tuck.) Tuck. (1858) = *Pilophorus* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pilophorum** Nyl. (1857) = *Pilophorus*.
- Pilophorus** Th. Fr. (1857), Cladoniaceae (L). 11, widespread (esp. temperate). See Jahns (*Lichenologist* 4: 199, 1970; Eur.), Hawksworth *et al.* (*Taxon* 21: 327, 1972; nomencl.), Jahns (*Mycotaxon* 13: 289, 1981; monogr., key), Hertel & Rambold (*Pl. Syst. Evol.* 158: 289, 1989; gen. concept), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998; phylogeny), Wedin & Döring (*MR* 103: 1131, 1999; DNA), Wedin *et al.* (*Lichenologist* 32: 171, 2000; phylogeny), Stenroos *et al.* (*Mycol. Progr.* 1: 267, 2002; phylogeny), Harada & Yoshimura (*Lichenology* 3: 11, 2004; nomencl.), Myllys *et al.* (*Taxon* 54: 605, 2005; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Piloporia** Niemelä (1982), Polyporaceae. 2, widespread. See Niemelä (*Karstenia* 22: 13, 1982).
- Pilosace** (Fr.) Quél. (1873) nom. dub., Agaricales. See Singer (*Agaric. mod. Tax.*, 1951).
- pilose**, covered with hairs.
- Pilospora** E.I. Hazard & Oldacre (1975), Microsporidia. 2.
- Pilula** Harker, Sarjeant & Caldwell (1990), Fossil Fungi. 1.
- Pilula** Masee (1910) = *Dimerina* fide Clements & Shear (*Gen. Fung.*, 1931).
- Pilulina** Arnaud (1954), anamorphic *Pezizomycotina*, Hso.0eP.?. 1, France.
- Pimina** Grove (1888) = *Zygosporium* fide Mason (*Mycol. Pap.* 5, 1941).
- Piminella** Arnaud (1954) = *Gonytrichum* fide Gams & Holubová-Jechová (*Stud. Mycol.* 13, 1976).
- Pinacisca** A. Massal. (1854) = *Hymenelia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pinatubo** J.B. Manandhar & Mew (1996), anamorphic *Pezizomycotina*, Hso.?.?. 1, Philippines. See Manandhar & Mew (*Mycotaxon* 60: 203, 1996).
- Pindara** Velen. (1934) = *Helvella*. Clusters within *Helvella*, but that genus is polyphyletic. fide Svrček (*Česká Mykol.* 1: 45, 1947), Kristiansen (*Agarica* 5: 105, 1984), Landvik *et al.* (*Mycol.* 91: 278, 1999).
- pine moss**, species of *Alectoria* and *Bryoria*.
- pine mushroom**, see matsu-take.
- Pinnaticoemansia** Kurihara & Degawa (2006), Kickxellaceae. 1, Japan. See Kurihara & Degawa (*Mycoscience* 47: 205, 2006).
- Pinoyella** Castell. & Chalm. (1919) = *Trichophyton* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pinuzza** Gray (1821) = *Suillus* Gray fide Singer (*Farlowia* 2: 223, 1945).
- Pionnotes** Fr. (1849) = *Fusarium* fide Wollenweber & Reinking (*Die Fusarien*: 6, 1935).
- pionnotes** (of *Fusarium*), a spore mass having a fat-like or grease-like appearance; **pseudo-**, see sporodochium.
- Pionospora** Th. Fr. (1859) = *Pertusaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Boqueras & Llimona (*Mycotaxon* 88: 471, 2003).
- Piperivora** Siboe, P.M. Kirk & P.F. Cannon (1999), anamorphic *Pezizomycotina*, Hso.?.?. 1, Kenya. See Siboe *et al.* (*Mycotaxon* 73: 298, 1999).
- Piptarthron** Mont. ex Höhn. (1918), anamorphic *Planistroma*, Cpd.0eH/≡ eH.1. 7 (on *Agavaceae*), widespread. See Sutton (*The Coelomycetes*, 1980), Sutton (*TBMS* 81: 407, 1983), Ramaley (*Mycotaxon* 42: 63, 1991; teleomorph), Ramaley (*Mycotaxon* 55: 255, 1995; key 6 spp.), Ramaley (*Mycotaxon* 66: 509, 1998).
- Piptocephalidaceae** J. Schröt. (1886), Zoopagales. 3 gen. (+ 9 syn.), 70 spp.
Lit.: Benjamin (*Aliso* 4: 321, 1959), Benjamin (*Aliso* 5: 273, 1963), Benjamin (*Mycol.* 48: 1, 1966), Patil & Patil (*Indian Phytopath.* 47: 217, 1994), Tanabe *et al.* (*Mol. Phylogen. Evol.* 30: 438, 2004).
- Piptocephalis** de Bary (1865), Piptocephalidaceae. 24 (mycoparasites esp. of *Mucorales*), widespread. See Dobbs & English (*TBMS* 37: 375, 1954; *P. xenophila* on non-mucoralean hosts), Leadbetter & Mercer (*TBMS* 39: 17, 1956), Leadbetter & Mercer (*TBMS* 40: 109, 1957; zygospores), Benjamin (*Aliso* 4: 321, 1959), Berry (*Mycol.* 51: 824, 1961; parasitism), Zycha *et al.* (*Mucorales*, 1969; key), Kuzuha (*J. Jap. Bot.* 51: 123, 1976), Kirk (*TBMS* 70: 335, 1978), Jeffries (*Mycol.* 71: 209, 1979), Manocha (*CJB* 63: 772, 1985; mycoparasitism), Manocha & McCullough (*CJB* 63: 967, 1985; mycoparasitism), Gräfenhan (*A Taxonomic Revision of the Genus Piptocephalis (Fungi)*, 1998), Ho (*Taiwania* 49: 188, 2004; Taiwan), Tanabe *et al.* (*J. gen. appl. Microbiol. Tokyo* 51: 267, 2005; phylogeny), White *et al.* (*Mycol.* 98: 872, 2006; phylogeny).
- Piptoporaceae** Jülich (1982) = Fomitopsidaceae.
- Piptoporus** P. Karst. (1881), Fomitopsidaceae. 4, widespread. *P. betulinus*, razor strop fungus, on birch. See Corner (*Beih. Nova Hedwigia* 78: 140, 1984).

- Piptostoma** Berk. & Broome (1875) nom. dub., Fungi. See Petch (*Ann. R. bot. Gdns Peradeniya* 6: 341, 1917) ? lapsus for *Piptostomum*.
- Piptostomum** Lév. (1845) nom. dub., anamorphic *Pezizomycotina*. See Höhnelt (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt. 1* 119: 617, 1910).
- Piptostroma** Fr. (1849) = *Piptostomum*.
- Pirella** Bainier (1882), Mucoraceae. 2, widespread. See Benny (*A taxonomic revision of the Thamniaceae (Mucorales)*, 1973), Benny & Schipper (*Mycol.* 84: 52, 1992), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny), Liu (*Mycosystema* 23: 301, 2004; China).
- Pirex** Hjortstam & Ryvarden (1985), Meruliaceae. 1, N. America. See Hjortstam & Ryvarden (*Mycotaxon* 24: 287, 1985).
- Piricauda** Bubák (1914), anamorphic *Pezizomycotina*, Hso.#eP.24. 4, neotropics. See Hughes (*CJB* 38: 921, 1960), Mercado Sierra *et al.* (*Mycotaxon* 63: 155, 1997; Mexico), Mercado Sierra *et al.* (*MR* 109: 723, 2005; monogr.).
- Piricaudilium** Hol.-Jech. (1988), anamorphic *Pezizomycotina*, Hso.#eP.24. 1, Cuba. See Holubová-Jechová (*Česká Mykol.* 42: 200, 1988), Heredia Abarca *et al.* (*Mycotaxon* 64: 203, 1997).
- Piricaudiopsis** J. Mena & Mercado (1987), anamorphic *Pezizomycotina*, Hso.#eP.24. 1, Cuba. See Mena & Mercado (*Acta Bot. Cubana* 51: 1, 1987).
- Piricularia**, see *Pyricularia*.
- piricularin**, a phytotoxin from *Pyricularia oryzae* (Togashi *et al.*, *Ann. phytopath. Soc. Japan* 25: 142, 1960).
- piriform**, see pyriform.
- Piriformospora** Sav. Verma, Aj. Varma, Rexer, G. Kost & P. Franken (1998), Sebaciniales. 1, India. See Verma *et al.* (*Mycol.* 90: 897, 1998), Begerow *et al.* (*MR* 108: 1257, 2004; posn.).
- Piringa** Speg. (1910) [non *Piringa* Juss. 1820, *Rubiaceae*] = *Camarosporium* fide Petrak & Sydow (*Annls mycol.* 33: 157, 1935).
- Pirisporea** Faurel & Schotter (1966), anamorphic *Pezizomycotina*, Cpd.0eH.?. 1, Algeria. See Faurel & Schotter (*Revue Mycol. Paris* 30: 341, 1965).
- Piriurella** Cookson & Eisenack (1979), Fossil Fungi. 2 (Cretaceous – Tertiary), Australia; Canada. ? = *Alternaria* (Hyphom.) fide Smith & Chaloner (*N. Jb. Geol. Paläont. Mh.* 11: 701, 1979).
- Pirobasidium** Höhn. (1902) = *Coryne* fide Groves & Wilson (*Taxon* 16: 35, 1967).
- Pirogaster** Henn. (1901) = *Scleroderma* fide Demoulin (*in litt.*).
- Piromonas** E. Liebet. (1910), Chytridiomycetes. 3, Europe. See Orpin (*J. gen. Microbiol.* 99: 107, 1977; life history).
- Piromyces** J.J. Gold, I.B. Heath & Bauchop (1988), Neocallimastigaceae. 8 (anaerobic rumen fungi), widespread. See Gaillard-Martinie *et al.* (*Curr. Microbiol.* 24: 159, 1992), Ho *et al.* (*Fungal Diversity* 4: 37, 2000), Wubah (*Biodiversity of Fungi Inventory and Monitoring Methods*: 501, 2004).
- Pirostoma** (Fr.) Fuckel (1870) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Pirostoma** (Fr.) Sacc. (1896) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Pirostomella** Sacc. (1914), anamorphic *Pezizomycotina*, Hsy.0eP.?. 2, Philippines.
- Pirottaea** Sacc. (1878), Helotiales. 26, widespread (esp. north temperate). See Nannfeldt (*Symb. bot. upsal.* 25 no. 1: 1, 1985; key 23 spp.), Gamundí (*Fl. criptog. Tierra del Fuego* 10, 1987), Johnston (*N.Z. J. Bot.* 36: 645, 1998; NZ spp.), Nauta & Spooner (*Mycologist* 14: 65, 2000; key British spp.).
- Pirozynskia** Subram. (1972), anamorphic *Maurodothina*, Hso.1eP.24. 2, Canada; USA. See Subramanian (*Curr. Sci.* 41: 711, 1972).
- Pirozynskiella** S.J. Hughes (2007), *Pezizomycotina*. 1 (on sooty moulds), pantropical. See Hughes (*Mycol.* 99: 628, 2007).
- pisatin**, a phytoalexin (q.v.) from pea (*Pisum sativum*).
- Pisocarpiaceae** Corda (1838) = *Pisolithaceae*.
- Pisocarpium** Link (1808) = *Pisolithus*.
- Pisolithaceae** Ulbr. (1928) = *Sclerodermataceae*.
- Pisolithus** Alb. & Schwein. (1805), *Sclerodermataceae*. 5 (ectomycorrhizal), widespread. See Marx (*Can. J. Microbiol.* 23: 217, 1977; ecology), Martin *et al.* (*New Phytol.* 139: 341, 1998; taxonomy), Chambers & Cairney (*Pisolithus – Ectomycorrhizal fungi, key genera in profile*, 1999; ecology), Martin *et al.* (*New Phytol.* 153: 345, 2002; phylogeography), Kanchanaprayudh *et al.* (*Mycoscience* 44: 287, 2003; phylogeny), Thomas *et al.* (*Mycotaxon* 87: 405, 2003; hypogeous species from Australia).
- Pisomyxa** Corda (1837), ? Eurotiales. 2, S. America; Madeira.
- Pistillaria** Fr. (1821), Typhulaceae. c. 50, widespread (north temperate). See Berthier (*Bull. mens. Soc. linn. Lyon Num. Spéc.* 46, 1976), Siepe (*Z. Mykol.* 65: 187, 1999) = *Typhula* (Typhul.) fide.
- Pistillina** Qué. (1880), Typhulaceae. 4, widespread (north temperate). See Corner (*Ann. Bot. Mem.* [A monograph of *Clavaria* and allied genera] 1, 1950).
- Pithoascaceae** Benny & Kimbr. (1980) = *Microascaceae*.
- Pithoascina** Valmaseda, A.T. Martínez & Barrasa (1987) = *Eremomyces* fide Malloch & Sigler (*CJB* 66: 1929, 1988).
- Pithoascus** Arx (1973), *Microascaceae*. Anamorphs *Arthrographis*-like, *Scopulariopsis*. 6, widespread. See von Arx (*Persoonia* 7: 367, 1973; key), Malloch (*SA* 6: 147, 1987; status), Valmaseda *et al.* (*CJB* 65: 1802, 1987; concept), von Arx *et al.* (*Beih. Nova Hedwigia* 94, 1988), Abbott *et al.* (*Mycol.* 94: 362, 2002; synonymy with *Microascus*), Issakainen *et al.* (*Medical Mycology* 41: 31, 2003; phylogeny).
- Pithomyces** Berk. & Broome (1875), anamorphic *Leptosphaerulina*, Hso.≡ -#P.1. 20, widespread. See facial eczema. See Ellis (*Mycol. Pap.* 76, 1960; key), Rao & de Hoog (*Stud. Mycol.* 28: 1, 1986; key), Roux (*TBMS* 86: 319, 1986; teleomorph), Morgan-Jones (*Mycotaxon* 30: 29, 1987; synonymy), Brewer *et al.* (*Proc. N.S. Inst. Sci.* 38: 73, 1989; production of sporidesmin and sporidesmolides), Zhang & Zhang (*Mycotaxon* 85: 241, 2003; China).
- Pithosira** Petr. (1949), anamorphic *Pezizomycotina*, Hsp.0eP.?. 1, S. America. See von Arx (*Persoonia* 11, 1981; redescr.).
- Pithospermum** Mont. ex Berk. & Broome (1856) = *Sporoschisma* fide Mussat (*Syll. fung.* 15: 294, 1901).
- Pithya** Fuckel (1870), *Sarcoscyphaceae*. Anamorph *Molliardiomyces*. 5, widespread (north temperate). See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949), Denison (*Mycol.* 64: 616, 1972), Meléndez-Howell *et al.* (*Anales Inst. Biol. Univ. Nac. México* 60: 9, 1990), Harrington *et al.* (*Mycol.* 91: 41, 1999; phylogeny).
- Pithyella** Boud. (1885), *Hyaloscyphaceae*. 8, wide-

- spread. See Korf & Zhuang (*Mycotaxon* 29: 1, 1987), Galán *et al.* (*MR* 98: 1137, 1994), Döbbeler (*Feddes Repert.* 115: 5, 2004; on bryophytes).
- Pittierodonthis** Chardón (1939) = *Protoscypha* fide Kutorga & Hawksworth (*SA* 15: 1, 1997).
- Pittostroma** Kowalski & T.N. Sieber (1992), anamorphic *Pezizomycotina*. 1, Poland. See Kowalski & Sieber (*MR* 96: 685, 1992).
- Pitya**, see *Pithya*.
- pityriasis versicolor** ('tinea versicolor'), a superficial skin disease of humans (*Malassezia furfur*).
- Pityrosporum** Sabour. (1904) = *Malassezia* fide Keddie (*XIII Int. Congr. Derm. (Munich)*: 867, 1968) See pityriasis versicolor.
- Placella** Syd. (1938), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, Australia.
- Placentaria** Auersw. ex Rabenh. (1851) ? = *Periola* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Placidiopsis** Beltr. (1858), Verrucariaceae (L). 20, widespread. See Thomson (*Bryologist* 90: 27, 1987; key 2 N. Am. spp.), Breuss (*Nova Hedwigia* 58: 229, 1994; key 2 N. Afr. spp.), Breuss (*Öst. Z. Pilzk.* 5: 65, 1996; revision), Gueidan *et al.* (*MR* 111: 1145, 2007; phylogeny).
- Placidium** A. Massal. (1855), Verrucariaceae (L). 30, widespread. See Brusse (*Annln naturh. Mus. Wien Ser. B, Bot. Zool.* 98: 35, 1996; key), Gueidan *et al.* (*MR* 111: 1145, 2007; phylogeny).
- Placoasterella** Sacc. ex Theiss. & Syd. (1915), Asterinaceae. 3, Africa; Australia. See Tyson & Griffiths (*TBMS* 66: 249, 1976; morphology, ultrastr.).
- Placoasterina** Toro (1930), ? Asterinaceae. 1, S. America.
- Placocarpus** Trevis. (1860), Verrucariaceae (L). 1, Europe. See Breuss (*Pl. Syst. Evol.* 148: 313, 1985), Gueidan *et al.* (*MR* 111: 1145, 2007; phylogeny).
- Placocrea** Syd. (1939), ? Mycosphaerellaceae. 1, Ecuador. See Petrak (*Sydowia* 6: 336, 1952).
- Placoderma** (Ricken) Ulbr. (1928) = *Piptoporus* fide Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974).
- Placodes** Quéf. (1886) = *Fomes*.
- Placodiella** (Zahlbr.) Szatala (1941) = *Solenopsora* fide Hafellner (*Beih. Nova Hedwigia* 79: 241, 1984).
- placodioid** (of a crustose lichen thallus), disc-shaped with plicate lobes at the circumference (Fig. 21C).
- placodiomorph**, a 2-celled spore with a thickened septum which may or may not have a pore. Cf. polarilocular.
- Placodiomyces** E.A. Thomas ex Cif. & Tomas. (1953) = *Lecanora* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Placodion** Adans. (1763) nom. rej. = *Peltigera* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Placodiplodia** Bubák (1916), anamorphic *Pezizomycotina*, St.1eP.15. 2, Philippines. See Buchanan (*Mycol. Pap.* 156, 1987).
- Placodium** (Ach.) DC. (1805) = *Caloplaca* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- placodium**, see stroma, thyriothecium.
- Placodium** Weber ex F.H. Wigg. (1780) = *Xanthoria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Placodium** Hill (1773) nom. dub., *Fungi* (L). See Laundon (*in litt.*).
- Placodonthis** Syd. (1928), ? *Pezizomycotina*. 1, West Indies.
- Placographa** Th. Fr. (1860) = *Lithographa* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Placoeppia** (Zahlbr.) Oxner (1956) nom. inval. = *Heppia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- placoid**, see placodioid.
- Placolecania** (J. Steiner) Zahlbr. (1906) = *Solenopsora* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Placolecanora** Räsänen (1940) = *Protoparmeliopsis*.
- Placolecidaceae** Hafellner (1984) = *Catillariaceae*.
- Placolecis** Trevis. (1857), *Catillariaceae* (L). 1, Europe. See Schneider (*Biblthca Lichenol.* 13, 1980), Makryi (*Botanicheskii Zhurnal* 88: 123, 2003; Russia).
- Placomaronea** Räsänen (1944), *Candelariaceae* (L). 2 or 3, S. America. See Osorio (*Bryologist* 77: 463, 1974), Poelt (*Phyton Horn* 16: 189, 1974; key), Westberg *et al.* (*MR* 111: 1277, 2007; phylogeny).
- Placomelan** Cif. (1962), anamorphic *Dothidasteroma*, Cpt.0eH.?. 1, Dominican Republic. See Ciferri (*Atti Ist. bot. Univ. Lab. crittog. Pavia sér.* 5 19: 124, 1962).
- placomycetoid**, pileus with diam : stipe ratio <1. Cf. campestroid.
- Placonema** (Sacc.) Petr. (1921), anamorphic *Pezizomycotina*, St.0-1eH.19. 3, S. America. See Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993).
- Placonemina** Petr. (1921), anamorphic *Pezizomycotina*, St.1eH.15. 1, former Czechoslovakia.
- Placoparmelia** Henssen (1992), *Parmeliaceae* (L). 1, Argentina. See Henssen (*Lichenologist* 24: 134, 1992), Calvelo (*Lichenology in Latin America. History, Current Knowledge and Applications* [Proceedings of GLAL-3, Terceiro Encontro do Grupo Latino-Americano de Liqueólogos, São Paulo, Brazil, 24-28 September, 1997]: 117, 1998; key).
- Placopezizia** Höhn. (1916) = *Leptotrochila* fide Schüepp (*Phytopath. Z.* 36: 236, 1959).
- Placophomopsis** Grove (1921) = *Phomopsis* (Sacc.) Bubák. fide Sutton (*Mycol. Pap.* 141, 1977).
- Placopsis** (Nyl.) Linds. (1867), *Trapeliaceae* (L). 56, widespread. See Lamb (*Lilloa* 13: 151, 1947), Brodo (*Biblthca Lichenol.* 57: 59, 1995; key 3 N. Am. spp.), Moberg & Carlin (*Symb. bot. upsal.* 31 no. 3: 319, 1996; Norway), Moberg & Carlin (*Lichenologist* 31: 647, 1999; Africa), Galloway (*Biblthca Lichenol.* 78: 49, 2001; New Zealand), Lumbsch *et al.* (*MR* 105: 16, 2001; phylogeny), Makarova & Shapiro (*Nov. sist. Niz. Rast.* 35: 167, 2001; Russia), Galloway (*Mitteilungen aus dem Institut für Allgemeine Botanik Hamburg* 30-32: 79, 2002; S America, key), Schmitt *et al.* (*Mycol.* 95: 827, 2003; phylogeny), Galloway (*Biblthca Lichenol.* 88: 147, 2004; New Zealand), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Galloway & Arvidsson (*Biblthca Lichenol.* 96: 87, 2007; Ecuador), Lumbsch *et al.* (*MR* 111: 1133, 2007).
- Placopyrenium** Breuss (1987), Verrucariaceae (L). 14, Europe; Asia. See Ménard & Roux (*Mycotaxon* 53: 129, 1995), Gueidan *et al.* (*MR* 111: 1145, 2007; phylogeny).
- Placosoma** Syd. (1924), Asterinaceae. 1, New Zealand. See Hughes (*N.Z. Jl Bot.* 16: 311, 1978).
- Placosphaerella** Pat. (1897) nom. conf., anamorphic *Pezizomycotina*. See Petrak (*Sydowia* 5: 195, 1951).
- Placosphaeria** (De Not.) Sacc. (1880), anamorphic

- Dothideales*, St.0eH.?. 50, widespread.
- Placosphaerina** Maire (1917), anamorphic *Pezizomycotina*, St.≡ eH.?. 1, Algeria.
- Placostroma** Theiss. & Syd. (1914) = *Phyllachora* Nitschke ex Fuckel (1870) fide Cannon (*Mycol. Pap.* 163, 1991).
- Placostromella** Petr. (1947), *Dothideomycetes*. 2, China. See Inácio *et al.* (*Mycol. Progr.* 4: 133, 2005).
- Placothallia** Trevis. (1853) = *Rinodina* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Placotheca** Syd. (1931), anamorphic *Pezizomycotina*, St.0eH.?. 1, Philippines.
- Placotheliomyces** Cif. & Tomas. (1953) ≡ *Placothelium*.
- Placothelium** Müll. Arg. (1893), *Verrucariaceae* (L). 1, USA.
- Placothyrium** Bubák (1916), anamorphic *Pezizomycotina*, St.0fH.10. 1, Europe.
- Plactogene** Theiss. (1917) = *Dimerina* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Placuntium** Ehrenb. (1818) = *Rhytisma* fide Minter (*in litt.*), Eckblad & Torkelsen (*Agarica* 7: 60, 1986).
- Placynthiaceae** Å.E. Dahl (1950) nom. cons., *Peltigerales* (L). 5 gen. (+ 15 syn.), 32 spp.
Lit.: Henssen (*Symb. bot. upsal.* 32: 75, 1997), Henssen & Tønsberg (*Bryologist* 103: 108, 2000), Wiklund & Wedin (*Cladistics* 19: 419, 2003), Miadlikowska & Lutzoni (*Am. J. Bot.* 91: 449, 2004), Wedin & Wiklund (*Symb. bot. upsal.* 34 no. 1: 469, 2004), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Jørgensen (*Nordic Lichen Flora* 3: *Cyanolichens*: 134, 2007).
- Placynthiella** Elenkin (1909), *Trapeliaceae* (L). 7, widespread. See Coppins & James (*Lichenologist* 16: 241, 1984; key), Coppins *et al.* (*Lichenologist* 19: 93, 1987; nomencl.), Lumbsch (*J. Hattori bot. Lab.* 83: 1, 1997), Schmitt *et al.* (*Mycol.* 95: 827, 2003; phylogeny), Lendemer (*Opuscula Philolichenum* 1: 75, 2004; N America), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Lumbsch *et al.* (*MR* 111: 1133, 2007).
- Placynthiella** Gyeln. (1939) = *Placynthiella* Elenkin fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Placynthiomyces** Cif. & Tomas. (1953) ≡ *Placynthium*.
- Placynthiopsis** Zahlbr. (1932), *Placynthiaceae* (L). 1, central Africa.
- Placynthium** (Ach.) Gray (1821), *Placynthiaceae* (L). 25, widespread (esp. temperate). See Gyelnik (*Rabenh. Krypt.-Fl.* 9 2.2, 1940; Eur.), Henssen (*CJB* 41: 1687, 1963; N. Am.), Weber (*Muelleria* 3: 250, 1970; Australia), Burgaz *et al.* (*Cryptog. Mycol.* 23: 367, 2002; Iberian peninsula), Miadlikowska & Lutzoni (*Am. J. Bot.* 91: 449, 2004; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- plage** (1) a smooth, paler-coloured, or colourless spot on a surface; (2) (of basidiospores), esp. a smooth spot above the hilar appendage.
- Plagiocarpa** R.C. Harris (1973) = *Lithothelium* fide Aptroot (*Biblthca Lichenol.* 44, 1991).
- Plagiographis** C. Knight & Mitt. (1860) ? = *Opegrapha* Ach. fide Redinger (*Feddes Repert.* 43: 49, 1938).
- Plagiolagnion** Schrantz (1962) = *Oxydothis* fide Barr (*Mycol.* 68, 1976), Hyde (*Sydowia* 46: 265, 1995).
- Plagionema** Subram. & K. Ramakr. (1953) = *Ciliochorella* fide Chona & Munjal (*Indian Phytopath.* 8: 74, 1955).
- Plagiophiale** Petr. (1955), *Diaporthales*. 2, Europe; N. America. See Barr (*Mycol. Mem.* 7, 1978), Barr (*Mycotaxon* 41: 287, 1991).
- Plagiorhabdus** Shear (1907) = *Strasseria* fide Höhnelt (*Mitt. bot. Inst. tech. Hochsch. Wien* ser. 2 2: 26, 1925).
- Plagiosphaera** Petr. (1941), *Sordariomycetes*. 5, widespread. See Walker (*Mycotaxon* 11: 94, 1980), Barr (*Mycotaxon* 39: 43, 1990; posn).
- Plagiostigme** Syd. (1925), *Diaporthales*. 1, C. America. See Petrak (*Sydowia* 18: 382, 1965).
- Plagiostigmella** Petr. (1949), anamorphic *Pezizomycotina*, Cpd.0eH.?. 1, S. America.
- Plagiostoma** Fuckel (1870), *Gnomoniaceae*. Anamorphs *Asteroma*, *Discula*. 22, Europe; N. America. See Bolay (*Ber. schweiz. bot. Ges.* 81: 398, 1972), Barr (*Mycol. Mem.* 7, 1978; key 13 spp.), Monod (*Beih. Sydowia* 9: 1, 1983), Barr (*Mycotaxon* 41: 287, 1991; N. Am. spp.), Fröhlich & Hyde (*MR* 99: 727, 1995), Okada & Katumoto (*Mycoscience* 41: 615, 2000; Japan), Castlebury *et al.* (*Mycol.* 94: 1017, 2002; phylogeny), Sogonov *et al.* (*Sydowia* 57: 102, 2005; phylogeny), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Plagiostomella** Höhn. (1917) = *Plagiostoma* fide Barr (*Mycol. Mem.* 7: 232 pp., 1978).
- Plagiostromella** Höhn. (1917), *Dothideomycetes*. 4, India; Japan. See Bose & Müller (*Sydowia* 31: 1, 1979; key).
- Plagiothecium** Schrantz (1961) [non *Plagiothecium* Bruch & Schimp. 1851, *Musci*] ≡ *Plagiolagnion*.
- Plagiothelium** Stirt. (1881) = *Anthracotheceum* fide Aptroot (*Australasian Lichenology* 60: 35, 2007).
- Plagiotrema** Müll. Arg. (1885) = *Pseudopyrenula* fide Harris (*Lichenographia Thomsoniana*: 133, 1998).
- Plagiotus** Kalchbr. ex Roum. (1879) nom. inval. = *Anthracophyllum* fide Kuyper (*in litt.*).
- Planctomyces** M. Gimesi (1924) nom. dub., ? Fungi. See Wawrik (*Sydowia* 6: 443, 1952), Skerman *et al.* (*Approved list of bacterial names*, 1980), Schlesner & Stackebrandt (*Syst. Appl. Microbiol.* 8: 174, 1986; assigned to new order *Planctomycetales*) Also considered a bacterium by.
- plane**, flat.
- Planetella** Savile (1951), *Anthracoideaceae*. 1 (on *Cyperaceae*), Canada. Resembles *Anthracoidea*. See Savile (*CJB* 29: 326, 1951), Vánky (*Cryptog. Stud.* 1: 159 pp., 1987), Piepenbring (*Frontiers in Basidiomycote Mycology*: 117, 2004).
- planetism** (of oomycetes), the condition of having motile stages.
- Planistroma** A.W. Ramaley (1991), ? *Planistromellaceae*. Anamorph *Piptarthron*. 2 (on *Yucca*), N. America. See Ramaley (*Mycotaxon* 42: 63, 1991), Eriksson & Hawksworth (*SA* 12: 38, 1993; posn), Ramaley (*Mycotaxon* 66: 509, 1998).
- Planistromella** A.W. Ramaley (1993), *Planistromellaceae*. Anamorph *Kellermania*. 7, USA. See Eriksson & Hawksworth (*SA* 12: 38, 1993; posn), Ramaley (*Mycotaxon* 47: 259, 1993), Ramaley (*Mycotaxon* 66: 509, 1998), Sivanesan & Shivas (*Fungal Diversity* 9: 175, 2002; on *Opuntia*; key).
- Planistromellaceae** M.E. Barr (1996), ? *Dothideales*. 5 gen. (+ 1 syn.), 30 spp.
Lit.: Ramaley (*Mycotaxon* 55: 255, 1995), Barr (*Mycotaxon* 60: 433, 1996), Ramaley (*Mycotaxon* 66: 509, 1998).
- Planobispora** Thiemann & Beretta (1968), *Actinobac-*

teria. q.v.

planoconvex, a flat zygote.

planocyte (planont), a motile cell.

planogamete, a motile gamete; zoogamete.

Planomonospora Thiemann, Pagani & Beretta (1967), Actinobacteria. q.v.

planont, see planocyte.

Planoroccellaceae Elenkin (1929) = Roccellaceae.

planospore, a zoospore.

planozygote (1) a motile zygote; (2) a flat zygote (of a pileus or spore), convex but somewhat flat.

Plant pathogenic fungi. A large proportion of fungal species live in association with plants, as saprobes on plant surfaces or dead plant tissue, as mutualists in mycorrhizal associations or as endophytes or parasites of living plants. Some, e.g. *Pucciniales*, *Erysiphaceae*, are obligate parasites of plants. Many parasitic fungi are highly phytopathogenic and induce severe and frequently economically important diseases. They are the most important agents of plant disease; more than 60 per cent of the literature on plant diseases is devoted to fungal infections. Plant pathogens are represented in all the major groups of fungi and some groups, e.g. *Ustilaginales* (smuts), *Pucciniales* (rusts), *Peronosporaceae* (downy mildews), *Erysiphaceae* (powdery mildews), are known by the common names of the diseases for which they are responsible. Other groups important as plant pathogens are basidiomycetes (frequently wood-attacking), and a wide range of ascomycetes, represented particularly on living tissues by their anamorphs. (The teleomorph of a pathogen frequently develops only on dead plant tissue in the terminal phase of the disease.)

The symptoms of fungus diseases in plants are diverse. They may be roughly classified as **necrosis** - death of tissues (cf. anthracnose, blight, canker, damping-off, scab, shot hole); **wilting** - loss of turgor due to the mechanical plugging of the vessels by hyphae or to the action of a toxin secreted by the pathogen; **hyperplasia** - overgrowth (cf. galls, witches' brooms); and **hypoplasia** - dwarfing (and chlorosis).

Transmission of plant pathogenic fungi may be by air (either dry or moist, as in droplet transmission), water, soil, seeds and other propagating material, plant debris, and insects and other animal agents. Humans have spread many important diseases within one country, from one country to another, and from one part of the world to another by transporting infected material in the course of trade.

Control of parasitic disease is (fide Whetzel) based on exclusion, eradication, protection, and immunization. Quarantine procedures, inspection at ports, and legislation governing the movement of plants and plant products, the growth of susceptible plants under conditions unfavourable for the development of the pathogen, and the use of disease-free seed or planting material are based on exclusion. Eliminating ('roguing') diseased plants, the cutting-out of diseased parts, heat treatment of seed material, and the use of eradicant fungicides on infected plants (i.e. against the pathogen) are examples of methods based on eradication. Among protective measures are the dusting or spraying of healthy plants with fungicides. The use of immune or resistant varieties is an example of 'immunization', but active immunization, which is so important in the control of many diseases of animals and man, is of little value against plant diseases. The three main strategies for plant disease control are:

phytosanitation (quarantine, removal of inoculum sources, crop rotation, clean seed etc.); protection (use of fungicides, avoidance of predisposing cultural conditions) and resistance (use of disease resistance cultivars). The new sciences of genetic engineering and genomics are making a huge impact on development of resistant cultivars, e.g. Kamoun & Smart (*Plant disease* 89: 692, 2005; review of genomics and late blight of potato and tomato), Punja (2004).

Lit.: The literature on plant disease is large, but well covered by review journals and databases (see below). See also the CABI *Crop protection compendium* CD. The standard general phytopathological texts all deal with fungal diseases, as do most monographs on diseases of particular crop plants. Here a selection has been made of general works and review journals. For additional references see Moreau (*Rev. mycol., Paris* 27: 41, 1962), RAM 46: 1 and 113, 1967 (select bibliogr.), Waller & Lenné (*Plant pathologist's pocketbook*, 2001). See also Fungicides, gene-for-gene, Genetics, Geographical distribution, Mycotoxicoses, physiologic race, Seed-borne fungi, Special forms.

General: Agrios (*Plant pathology*, 1969; edn 3, 1985), Alford (*Pest and disease management handbook*, 2000), APS (*Compendia of plant diseases*, series), Brown & Brotzman (*Phytopathogenic fungi: a scanning electron stereoscopic survey*, 1979), Bruell (*Soilborne plant pathogens*, 1987), Buczacki & Harris (*Collins photoguide to pests, diseases and disorders of garden plants*, 1998), Butler & Jones (*Plant pathology*, 1949), Gaumann (*Principles of plant infection*, 1950) [trans. of *Pflanzliche Infektionslehre*, 1946; edn 2, 1951], Heald (*Manual of plant diseases*, 1926, edn 2, 1933), Holton *et al.* (Eds) (*Plant pathology, problems and progress, 1908-1958*, 1959), Horsfall & Cowling (Eds) (*Plant disease, an advanced treatise* 5 vols, 1977-80), Horsfall & Dimond (Eds) (*Plant pathology, an advanced treatise*, 3 vols, 1959-60), Horst (*Westcott's plant disease handbook*, edn 6, 2001), Kronstad (Ed.) (*Fungal pathology*, 2000), Schumann (*Plant diseases: their biology and social impact*, 1991), Schumann & D'Arcy (*Essential plant pathology*, 2006; textbook with CD), Smith *et al.* (*European handbook of plant diseases*, 1988), Stakman & Harrar (*Principles of plant pathology*, 1957), Strange (*Introduction to plant pathology*, 480 pp., 2003), Tarr (*Principles of plant pathology*, 1971), Vanderplank (*Plant diseases: epidemics and control*, 1963), Vidhyasekaran (*Concise encyclopaedia of plant pathology*, 619 pp., 2004), Walker (*Plant pathology*, 1950; edn 3, 1969), Wood (*Physiological plant pathology*, 1967).

Grasses: Murray *et al.* (*A colour handbook of diseases of small grain cereal crops*, 1998), Smiley *et al.* (Eds) (*Compendium of turfgrass diseases*, edn 3, 2005).

Tropical: Holliday (*Fungus diseases of tropical crops*, 1980), Ploetz (*Diseases of tropical fruit crops*, 2003), Ploetz (*Plant disease* 91: 644, 2007; review), Roger (*Phytopathologie des pays chauds*, 3 vol. 1951-54), Thurston (*Tropical plant diseases*, 1984), Weber (*Bacterial and fungal diseases of plants in the tropics*, 1973).

Forest pathology: Boyce (*Forest pathology*, edn 3, 1961), Browne (*Pests and diseases of forest plantation trees. An annotated list of the principle species occurring in the British Commonwealth*, 1968), Dis-

eases of widely planted forest trees (1964; lists diseases and their distribution), *Forestry abstracts* 1939- [also as TREE-CD], Anse & Lewis (Eds) (*Compendium of conifer diseases*, 1997), Hepting (*Diseases of forest and shade trees in the United States* [Agric. Handb. Forest Serv. US 386], 1971), Jones & Benson (*Diseases of woody ornamentals and trees in nurseries*, 2001), Lundquist & Hamelin (Eds) (*Forest pathology: from genes to landscape*, 2005), Peace (*Pathology of trees and shrubs with special reference to Britain*, 1961), Sinclair & Lyon (*Diseases of trees and shrubs* edn 2, 2005). See also Wood-attacking fungi.

Resistance: Hang (*Plant pathogenesis and resistance; biochemistry and physiology of plant-microbe interactions*, 2001), Punja (Ed.) (*Fungal disease resistance in plants: biochemistry, molecular biology and genetic engineering*, 2004), Talbot (Ed.) (*Plant pathogen interactions*, 2004).

Legislation and quarantine: Ebbels (*Principles of plant health and quarantine*, 2003), Ebbels & King (Eds) (*Plant health*, 1979), CABI/EPPO (*Quarantine pests from Europe*, 1992), McGee (*Plant pathogens and the worldwide movement of seeds*, 1997).

Methods: Babcock *et al.* (*Plant disease* 91: 476; review of genetic resources for plant pathology), Fox (*Principles of diagnostic techniques in plant pathology*, 1993), Ingram & Helgeson (Eds) (*Tissue culture methods for plant pathologists*, 1980), Riker & Riker (*Introduction to research on plant diseases*, 1936), Schots *et al.* (Eds) (*Modern assays for plant pathogenic fungi: identification, detection and quantification*, 1994), Waller & Lenné (*Plant pathologist's pocketbook*, 2001).

Identification: Arx (*Plant pathogenic fungi*, 1987), Brandenburger (*Parasitische Pilze au Gefasspflanzen in Europa*, 1985), Brooks (*Plant diseases*, edn 2, 1953), Farr *et al.* (*Fungi on plants and plant products in the United States*, 1989), Hodge (*The fungal spore and disease initiation in plants and animals*, 1991), Holliday (*A dictionary of plant pathology, IMI Descriptions of fungi and bacteria* (1964-), Kreisel (*Die phytopathogen-Grosspilze Deutschlands*, 1961), Lindquist (*Revta Fac. Agron. Univ. nac. La Plata* 43: 1, 1967; key), Names of British plant diseases and their control [Phytopath. Pap. 28, 1984], 1989), Rossman *et al.* (*A literature guide for the identification of plant pathogenic fungi*, 1987), Stevens (*The fungi which cause plant disease*, 1913; *Plant disease fungi*, 1925 [reprint, 1966]), Viennot-Bourgin (*Les champignons parasites des plantes cultivées*, 1949).

History: Ainsworth (*Introduction to the history of plant pathology*, 1981), Large (*The advance of the fungi*, 1940), Parris (*A chronology of plant pathology*, 1968), Schumann (*Plant diseases: their biology and social impact*, 1991), Whetzel (*An outline of the history of phytopathology*, 1918), *Phytopathological classics* (1926-).

Serial publications and review journals: *Advances in plant pathology*, 1982-95; *Annual review of phytopathology*, 1963-; *Eur. j. forest path.*, 1971-1999, 2000- as *Forest path.*; *Eur. j. plant path.*, 1895-; *Plant disease reporter*, 1917-1979, 1980- as *Plant disease*; *Plant pathology*, 1952-; *Review of applied mycology*, 1922-69 (abstracts; *Index* 1-40 (1922-61), 1968), 1970- as *Review of plant pathology* [also available in a variety of electronic formats, incl. PEST-

CD; see Literature].

plaque, a clear area in a bacterial colony caused by localized viral lysis; also applied to similar areas in fungal cultures (e.g. Riegman & Wessels, *TBMS* 75: 325, 1980).

Plasia Sherwood (1981), anamorphic *Xylogramma*, St.≡ eH.15/16. 1, Europe. See Sherwood (*TBMS* 77: 197, 1981).

plasma membrane, see plasmalemma.

plasmalemma, outer membrane composed of phospholipids and proteins which surrounds a cell and regulates exchange of materials between the cell and its environment; the limiting (boundary) membrane of the cytoplasm; cell, cytoplasmic, or plasma membrane.

plasmalemmasome, an intracytoplasmic vesicle (formed by invagination of the plasmalemma) filled with tubular diverticula. Cf. lomasome.

plasmamembranic vesicle, sporangial vesicle, the membrane of which is the same membrane bounding the protoplasm within the sporangium, c.f. homohylic vesicle, precipitative vesicle.

plasmatoogosis (of *Pythiaceae*), a bud-like outgrowth (like a prosperangium in form) in the host tissue (Sideris, *Mycol.* 23: 255, 1931).

plasmodesma (pl. -ta), an isthmus-like strand of protoplasm connecting adjacent cells.

plasmodia, see plasmodium.

plasmodic granules, very small, dark-coloured particles on the surface of the peridium, and frequently of the spores, in the *Cribrariaceae*; dictydine granules.

plasmodiocarp (of *Mycetozoa*), a sessile and vein-like sporangium, like part of the larger veins of a plasmodium.

plasmodium (pl. **plasmodia**) (of *Myxogastria*), a multinucleate, motile mass of protoplasm bounded by a plasma membrane but lacking a wall, generally reticulate, characteristic of the growth phase; Alexopoulos (*Mycol.* 52: 17, 1961) distinguishes: **protoplasmodium**, an undifferentiated microscopic plasmodium which gives rise to a single sporangium, as in *Echinosteliales*; **aphanoplasmodium**, a plasmodium composed of a network of undifferentiated strands of non-granular protoplasm, as in *Stemonitis*; **phaneroplasmodium**, a plasmodium composed of a well-differentiated advancing fan and thick strands of granular protoplasm exhibiting ecto- and endoplasmic regions, as in *Physarales*; **aggregate plasmodium**, **pseudoplasmodium** (of *Acrasiales*), a structure formed by the massing of separate myxamoebae or cells before reproduction (a grex); **filoplasmodium**, the net-like pseudoplasmodium of the *Labyrinthulales*.

plasmogamospore, aeciospore (Laundon, *TBMS* 58: 345, 1972).

plasmogamy, fusion of two cells or plasmodial cytoplasms without karyogamy (nuclear fusion) or a precursor to karyogamy.

Plasmophagus De Wild. (1895), Chytridiales. 3 (in algae), Europe. See Dick (*Straminipilous Fungi*: 670 pp., 2001).

Platisma Hoffm. (1790) = *Cetraria* fide Santesson & Culberson (*Bryologist* 69: 100, 1966).

Platisma P. Browne ex Adans. (1763) = *Ramalina* fide Santesson & Culberson (*Bryologist* 69: 100, 1966).

Platismatia W.L. Culb. & C.F. Culb. (1968), *Parmeliaceae* (L). 10, widespread. See Culberson & Culberson (*Contr. US natn Herb.* 34: 449, 1968; monogr.),

- Thell *et al.* (*Cryptog. Bryol.-Lichénol.* 19: 307, 1998; phylogeny), Wedin *et al.* (*MR* 103: 1152, 1999; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Platisphaera** Dumort. (1822) nom. rej. $\equiv$ Lophiostoma fide Holm (*Taxon* 24: 475, 1975).
- Platistoma**, see *Platystoma*.
- Platistomum**, see *Platystomum*.
- Platycarpa** Couch (1949), Eocronartiaceae. 2 (on *Pteridophyta*), America. See Couch (*Mycol.* 41: 427, 1949), Oberwinkler & Bandoni (*TBMS* 83: 369, 1984).
- Platycarpium** P. Karst. (1905) = Fusamen fide von Arx (*Verh. K. ned. Akad. Wet. Amst.* C 51: 1, 1957).
- Platychora** Petr. (1925), Venturiaceae. Anamorph *Piggotia*. 2, widespread (north temperate). See Sivanesan (*Bitunicate Ascomycetes and their Anamorphs*, 1984), Winton *et al.* (*Mycol.* 99: 240, 2007; phylogeny).
- Platyglœa** J. Schröt. (1887), Platyglœaceae. c. 2, widespread. See Bandoni (*Mycol.* 48: 821, 1956; key), Dueñas (*Nova Hedwigia* 72: 441, 2001; Iberian).
- Platyglœaceae** Racib. (1909), Platyglœales. 4 gen. (+ 5 syn.), 6 spp.
Lit.: Berres *et al.* (*Mycol.* 87: 821, 1995), Bandoni (*Mycoscience* 39: 31, 1998), Oberwinkler *et al.* (*Kew Bull.* 54: 763, 1999), Chen & Oberwinkler (*Mycotaxon* 76: 279, 2000), Dueñas (*Nova Hedwigia* 72: 441, 2001), Bauer *et al.* (*Mycol.* 96: 960, 2004), Lutz *et al.* (*Mycol.* 96: 614, 2004), Lutz *et al.* (*Mycol.* 96: 1316, 2004), Lutz *et al.* (*MR* 108: 227, 2004), Nakamura *et al.* (*MR* 108: 641, 2004), Wingfield *et al.* (*Australas. Pl. Path.* 33: 327, 2004).
- Platyglœales** R.T. Moore (1990). Pucciniomycetes. 2 fam., 11 gen., 19 spp. Fams:
 (1) Eocronartiaceae
 (2) Platyglœaceae
 For *Lit.* see under fam.
- platygonidia**, photobionts occurring in stellately or orbicular spreading colonies (e.g. *Cephaleuros*) (obso.).
- Platygramma** G. Mey. (1825) nom. rej. prop. = Phaeographis fide Lücking *et al.* (*Taxon* 56: 1296, 2007; nomencl.).
- Platygramma** Leight. (1854) = Enterographa fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Platygramme** Fée (1874), Graphidaceae (L). 9, pantropical. See Staiger (*Bibliotheca Lichenol.* 85, 2002), Nakanishi *et al.* (*Bull. natn. Sci. Mus. Tokyo*, B 29: 83, 2003; Japan), Archer (*Telopea* 11: 59, 2005; Australia), Archer (*Systematics & Biodiversity* 5: 9, 2007; Solomon Is).
- Platygrapha** Berk. & Broome (1870) [non *Platygrapha* Nyl. 1855] ? = Ocellularia fide Sherwood (*Mycotaxon* 3: 233, 1976).
- Platygrapha** Nyl. (1855) = Schismatomma fide Tehler (*Op. Bot.* 118: 1, 1993).
- Platygraphis** Hook. f. (1867) $\equiv$ *Platygrapha* Nyl.
- Platygraphomyces** Cif. & Tomas. (1953) $\equiv$ *Platygrapha* Nyl.
- Platygraphopsis** Müll. Arg. (1887), Ostropales (L). 1, America (tropical); Papua New Guinea. See Awasthi (*Bibliotheca Lichenol.* 40, 1991; Indian subcontinent).
- Platypeltella** Petr. (1929), Microthyriaceae. 2, C. America. See Farr (*Mycotaxon* 15: 448, 1982).
- platyphyllous**, broadly lobed.
- Platyphyllum** Vent. (1799) nom. rej. $\equiv$ Cetraria.
- Platysma** Hill (1773) = Ramalina fide Santesson & Culberson (*Bryologist* 69: 100, 1966).
- platysmoid** (1) (of lichen thalli), loosely attached foliose thalli with ascending lobes, as in *Platismatia* (obso.); (2) (of tissues), a scleroplectenchyma in which the hyphae are brown (Yoshimura & Shimada, *Bull. Kochi Gakuen Jun. Coll.* 11: 13, 1980).
- Platysphaera** Trevis. (1877) $\equiv$ *Platisphaera*.
- Platysphaeria**, see *Platisphaera*.
- Platyspora** Wehm. (1961) = Comoclathris fide Shoemaker & Babcock (*CJB* 70: 1617, 1992), Barr (*SA* 12: 27, 1993).
- Platysporoides** (Wehm.) Shoemaker & C.E. Babc. (1992), Pleosporaceae. 12, widespread. See Shoemaker & Babcock (*CJB* 70: 1617, 1992), Barr (*SA* 11: 27, 1993).
- Platysticta** Cooke (1889) = Stictis fide Sherwood (*Mycotaxon* 6: 215, 1977).
- Platystoma** (Fr.) Bonord. (1851) = Lophiostoma fide Mussat (*Syll. fung.* 15: 295, 1901).
- Platystomaceae** J. Schröt. (1894) = Lophiostomataceae.
- Platystomum** Trevis. (1877) = Lophiostoma fide Chesters & Bell (*Mycol. Pap.* 120, 1970), Eriksson (*SA* 10: 144, 1991), Abdel-Wahab & Jones (*Mycoscience* 41: 379, 2000).
- Platythecium** Staiger (2002), Graphidaceae. 17, widespread. See Staiger (*Bibliotheca Lichenol.* 85: 385, 2002), Nakanishi *et al.* (*Bull. natn. Sci. Mus. Tokyo*, B 29: 83, 2003; Japan), Adawadkar & Makhija (*Mycotaxon* 92: 387, 2005; India), Archer (*Bibliotheca Lichenol.* 94, 2006; Australia), Archer (*Systematics & Biodiversity* 5: 9, 2007; Solomon Is).
- Pleamphisphaeria** Höhn. (1919) $\equiv$ Titanella fide Harris (*Mem. N. Y. bot. Gdn* 49, 1989).
- Plearthonis** Clem. (1909) = Arthonia fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Plecopteromyces** Lichtw., Ferrington & López-Lastra (1999), Legeriomycetaceae. 3 (in *Plecoptera*), Australia; S. America. See Lichtwardt *et al.* (*Mycol.* 91: 1060, 1999), Ferrington *et al.* (*Mycol.* 97: 254, 2005; Tasmania), White (*MR* 110: 1011, 2006; phylogeny).
- Plecostoma** Desv. (1809) $\equiv$ Geastrum.
- Plecotrichum** Corda (1831) nom. dub., anamorphic *Pezizomycotina*. See Hughes (*CJB* 36: 798, 1958).
- Plectania** Fuckel (1870), Sarcosomataceae. Anamorph *Conoplea*. 15, widespread (north temperate). See Korf (*Mycol.* 49: 107, 1957), Paden (*Fl. Neotrop.* 37: 1, 1983; 4 sect.), Li & Kimbrough (*CJB* 73: 1761, 1995; ultrastr.), Zhuang & Wang (*Mycotaxon* 67: 355, 1998; spp. China), Harrington *et al.* (*Mycol.* 91: 41, 1999; phylogeny), Medel & Chacón (*Acta Bot. Mexicana* 50: 11, 2000; Mexico), Calonge & Mata (*Mycotaxon* 81: 237, 2002; Costa Rica), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Plectascales**. *Ascomycota* with ascoma in which the asci were irregularly distributed; sometimes extended and including *Erysiphales*, *Eurotiales* (q.v.) and *Myriangiaceae*. See also *Plectomycetes*.
- plectenchyma**, a thick tissue formed by hyphae becoming twisted and fixed together; synchyma (Vuillemin); it is **prosenchyma** (proso-) when the hyphal elements are seen to be hyphae; **pseudoparenchyma** (para-), when they are not; Vuillemin (1912) distinguished as **merenchyma** tissue derived by cell division in several planes, and Degelius (1954) used **euthyplectenchyma** for hyphal tissue with no cellu-

- lar structure. Yoshimura & Shimada (*Bull. Kochi Gakuen Jun. Coll.* 11: 13, 1980) key nine categories of plectenchyma, **chalaroplectenchyma** (hyphal walls not united, lumina wide), **pallisadoplectenchyma** (hyphae parallel, not coherent, with intercellular spaces), **platysmoid** (a scleroplectenchyma with brown hyphal walls), **scleroplectenchyma** (cell-walls thickened, lumina narrow), **scleroprosoplectenchyma** (hyphae parallel, cohering, walls thick, lumina narrow), and **serioplectenchyma** (hyphae parallel, cohering, walls not thick, lumina wide).
- Plectobasidiales** Gäum. (1926). See *Melanogastrales*, *Sclerodermatales* and *Tulostomatales*.
- Plectocarpon** Fée (1825), Roccellaceae. 10 (on lichens, esp. *Peltigerales*), widespread. See Hawksworth & Galloway (*Lichenologist* 16: 85, 1984), Diederich & Etayo (*Nordic Jl Bot.* 14: 589, 1994; key 7 spp.), Ertz *et al.* (*Bryologist* 106: 465, 2003), Ertz *et al.* (*Biblthca Lichenol.* 91: 155 pp., 2005; revision).
- Plectodiscella** Woron. (1914) = *Elsinoë* fide Jenkins (*J. agric. Res.* 44: 689, 1932).
- Plectodiscellaceae** Woron. (1914) = *Elsinoaceae*.
- Plectolitus** Kohlm. (1960) = *Amylocarpus* fide Kohlmeyer & Kohlmeyer (*Syn. Pl. Marine Fungi*, 1971), Crumlish & Curran (*Mycologist* 8: 83, 1994).
- Plectomyces** Thaxt. (1931), *Ceratomycetaceae*. 1, Philippines. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- Plectomycetes**. Class of *Ascomycota* with $\pm$ globose non-ostiolate ascomata; formerly frequently used for *Elaphomycetales*, *Erysiphales*, *Eurotiales*, *Meliolales*, *Microascales* and *Onygenales* but now recognized as heterogeneous, the non-ostiolate habit having repeatedly evolved. Reintroduced by Berbee & Taylor (1992) in a restricted sense (see *Ascomycota*).
Lit.: Benny & Kimbrough (*Mycotaxon* 12: 1, 1980; keys 90 gen., 6 orders, 12 fams, excluded gen. names), Malloch (*in* Kendrick (Ed.), *The whole fungus* 1: 153, 1979; *in* Reynolds (Ed.), 1981: 73, placement of *all* fams in orders also characterized by ostiolate or apothecioid taxa), Stchigel & Guarro (*MR* 111: 1100, 2007; review of cleistothecial taxa).
- Plectomyriangium** C. Moreau & M. Moreau (1950) = *Lecideopsella* fide Eriksson & Hawksworth (*SA* 9: 15, 1991).
- Plectonaemella** Höhn. (1915), anamorphic *Pezizomycotina*, Cpd.0eH.?. 1, Europe.
- plectonematogenous**, of conidiogenous cells arising from rope-like strands of interwoven hyphae (not from single hyphae), the strands intertwined and not synnematus; funiculose. See Gams (*Cephalosporium-artige Schimmelpilze*, 1971).
- Plectopeltis** Syd. (1927), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, C. America; Australia. See Reynolds & Gilbert (*Aust. Syst. Bot.* 18: 282, 2005).
- Plectophoma** Höhn. (1907) = *Asteromella* fide Sutton (*Mycol. Pap.* 141, 1977).
- Plectophomella** Moesz (1922), anamorphic *Pezizomycotina*, St.0eH.15. 3, Europe. See Guarro *et al.* (*J. Clin. Microbiol.* 44: 4279, 2006; from human).
- Plectophomopsis** Petr. (1922), anamorphic *Pezizomycotina*, St.0eH.?. 1, Europe.
- Plectopsora** A. Massal. (1860) = *Lempholemma* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Plectopycnis** Bat. & A.F. Vital (1959), anamorphic *Dothideomycetes*. 1, neotropics. See von Arx (*in litt.*), Farr (*Mycol.* 78: 269, 1986).
- Plectosclerotes** Stach & Pickh. (1957), *Fossil Fungi*. 2 (Carboniferous), Germany.
- Plectosira** Petr. (1929), anamorphic *Pezizomycotina*, Cpd/St.0eH.?. 1, Europe.
- Plectosphaera** Theiss. (1917) = *Phyllachora* Nitschke ex Fuckel (1870) fide Cannon (*Mycol. Pap.* 163, 1991), Summerell *et al.* (*Fungal Diversity* 23: 323, 2006; culture of *P. eucalypti*, link to *Amphisphaeriaceae*).
- Plectosphaeraceae** Theiss. (1916) = *Phyllachoraceae*.
- Plectosphaerella** Kirschst. (1938) = *Plectosphaerina*.
- Plectosphaerella** Kleb. (1929), *Plectosphaerellaceae*. Anamorph *Plectosporium*. 2, widespread. See Gams & Gerlagh (*Persoonia* 5: 177, 1968), Uecker (*Mycol.* 85: 470, 1993; ontogeny), Palm *et al.* (*Mycol.* 87: 397, 1995), Pitt & Gams (*Nova Hedwigia* 81: 311, 2005), Sung *et al.* (*Stud. Mycol.* 57, 2007), Zare *et al.* (*Nova Hedwigia* 85: 463, 2007).
- Plectosphaerellaceae** W. Gams, Summerb. & Zare (2007), *Hypocreomycetidae* (inc. sed.). 5 gen. (+ 1 syn.), 56 spp.
Lit.: Zare *et al.* (*Nova Hedwigia* 85: 463, 2007).
- Plectosphaerina** Kirschst. (1938) = *Omphalospora* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Plectosporium** M.E. Palm, W. Gams & Nirenberg (1995), anamorphic *Plectosphaerella*, Hso.1eH.15/16/19. 1, widespread. See Palm *et al.* (*Mycol.* 87: 398, 1995), Gams *et al.* (*Taxon* 53: 193, 2004; nomencl.), Pitt & Gams (*Nova Hedwigia* 81: 311, 2005; on *Alisma*), Sung *et al.* (*Stud. Mycol.* 57, 2007), Zare *et al.* (*Nova Hedwigia* 85: 463, 2007).
- Plectronidiopsis** Nag Raj (1979), anamorphic *Pezizomycotina*, Cac.1eH.19. 1, Chile. See Nag Raj (*CJB* 57: 1397, 1979).
- Plectronidium** Nag Raj (1977), anamorphic *Pezizomycotina*, Cac.0eH.19. 4, widespread. See Sutton & Pascoe (*TBMS* 87: 249, 1986), Alcorn & Sutton (*Aust. Syst. Bot.* 12: 169, 1999; Australia).
- Plectrothrix** Shear (1902), anamorphic *Pezizomycotina*, Hso.0eH.?. 1, N. America.
- Pleiobolus**, see *Plejobolus*.
- Pleiochaeta** (Sacc.) S. Hughes (1951), anamorphic *Pezizomycotina*, Hso.≡ eH-P.10. 4, widespread. *P. setosa* (lupin leaf spot). See Castañeda Ruiz *et al.* (*Mycotaxon* 57: 457, 1996), Yang & Sweetingham (*Australas. Pl. Path.* 31: 273, 2002; on legumes).
- Pleioapatella** Rehm (1908), *Helotiales*. 1, N. America.
- Pleioapyrenis**, see *Pleopyrenis*.
- pleiosporous**, having many spores.
- Pleiostrictis** Rehm (1882) = *Mellitiosporium* fide Sherwood (*Mycotaxon* 5: 1, 1977).
- Pleioptomella** Syd. & P. Syd. (1917) = *Mendogia* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Pleioptomellina** Bat., J.L. Bezerra & H. Maia (1964), *Dothideomycetes*. 1, Brazil. See Batista *et al.* (*Portugaliae Acta Biologica Série B* 7: 373, 1964).
- pleioxeny**, the condition of plurivorous parasitism.
- Pleistophora** Gurley (1893), *Microsporidia*. 34.
- Pleistosporidium** Codreanu-Balcescu & Codreanu (1982), *Microsporidia*. 1.
- Plejobolus** (E. Bommer, M. Rousseau & Sacc.) O.E. Erikss. (1967) = *Robergea* fide Sherwood-Pike (*in litt.*).
- Plenocatenulis** Bat. & Cif. (1959), anamorphic *Pezizomycotina*, Cpt.0eH.?. 2, USA. See Batista & Ciferri (*Mycopath. Mycol. appl.* 11: 63, 1959).
- Plenodomus** Preuss (1851), anamorphic *Leptosphaeriaceae*. 1, widespread. See Boerema & Kesteren (*Per-*

- sonia* 3: 17, 1963), Boerema *et al.* (TBMS 77: 61, 1981), Câmara *et al.* (Mycol. 94: 630, 2002; phylogeny), Boerema *et al.* (Phoma Identification Manual Differentiation of Specific and Infra-Specific Taxa in Culture: 470 pp., 2004; monograph), Torres *et al.* (Mycotaxon 93: 333, 2005; phylogeny, separation from *Phoma*).
- Plenophysa** Syd. & P. Syd. (1920), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1 or 2, Philippines; Sri Lanka.
- Plenotrichaius** Bat. & Valle (1961), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, Brazil. See Batista & Valle (Publicações Inst. Micol. Recife 337: 9, 1961), Farr (Mycol. 78: 269, 1986).
- Plenotrichella** Bat. & A.F. Vital (1959) = Myxothyriopsis fide von Arx (*in litt.*), Reynolds & Gilbert (Aust. Syst. Bot. 18: 265, 2005; as '*Plenotrichiella*').
- Plenotrichopsis** Bat. (1961), anamorphic *Pezizomycotina*, Cpt.0eH.38. 1, Brazil. See Batista (Publicações Inst. Micol. Recife 338: 33, 1961).
- Plenotrichum** Syd. (1927), anamorphic *Pezizomycotina*, Cpt.0eH.39. 2, C. America; China.
- Plenozythia** Syd. & P. Syd. (1916), anamorphic *Pezizomycotina*, Cpd.0eH.?. 1 or 2, Asia.
- pleoanamorphy**, having more than one anamorph. See Hennebert (*in* Sugiyama (Ed.), *Pleomorphic fungi: the diversity and its taxonomic implications*, 1987), States of fungi.
- Pleochaeta** Sacc. & Speg. (1881), Erysiphaceae. Anamorph *Streptopodium*. 6, widespread. See Kimbrough (Mycol. 55: 608, 1963; development), Kimbrough & Korf (Mycol. 55: 619, 1963), Braun (Beih. Nova Hedwigia 89, 1987; key), Mori *et al.* (Mycol. 92: 74, 2000; phylogeny), Takamatsu (Mycoscience 45: 147, 2004; phylogeny), Kiss *et al.* (MR 110: 1301, 2006; on *Celtis*), Wang *et al.* (Mycol. 98: 1065, 2006; phylogeny), Takamatsu *et al.* (MR 112: 299, 2008; phylogeny).
- Pleochroma** Clem. (1909) = Candelariella.
- Pleococcum** Desm. & Mont. (1849) nom. dub., anamorphic *Pezizomycotina*. See Höhnelt (Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt. 1 119: 617, 1910).
- Pleoconis** Clem. (1909) = Peccania fide Hawksworth *et al.* (Dictionary of the Fungi edn 8, 1995).
- Pleocouturea** G. Arnaud (1911), anamorphic *Pezizomycotina*. 1, France. See Sutton (Mycol. Pap. 141, 1977).
- Pleocryptospora** J. Reid & C. Booth (1969), Diaporthales. 1, Brazil. See Reid & Booth (CJB 47: 1055, 1969).
- Pleocyta** Petr. & Syd. (1927) = Phaeocytostroma fide Sutton (Mycol. Pap. 97, 1964).
- Pleodothis** Clem. (1909) = Sydowia fide von Arx & Müller (Stud. Mycol. 9, 1975).
- Pleogibberella** Sacc. ex Berl. & Voglino (1886), Nectriaceae. 2 (on *Palmae* fruits), India; Brazil. See Rossman *et al.* (Stud. Mycol. 42: 248 pp., 1999).
- Pleoglonis** Clem. (1909) = Hariotia.
- Pleolecis** Clem. (1909) = Steinia.
- Pleolpidium** A. Fisch. (1892) = Rozella fide Sparrow (Aquatic Phycomycetes Edn 2: 1187 pp., 1960).
- Pleomassaria** Speg. (1880), Pleomassariaceae. Anamorph *Prosthemia*. 4, widespread (temperate). See Barr (Mycotaxon 49: 129, 1993; synonymy with *Splanchnonema*), Hantula *et al.* (MR 102: 1509, 1998; anamorph), Paavolainen *et al.* (Mycol. 92: 253, 2000; biological species), Lumbsch & Lindemuth (MR 105: 901, 2001; phylogeny), Tanaka *et al.* (Mycoscience 46: 248, 2005; Japan), Kruys *et al.* (MR 110: 527, 2006; phylogeny).
- Pleomassariaceae** M.E. Barr (1979), Pleosporales. 12 gen. (+ 2 syn.), 86 spp.
Lit.: Barr (Mycotaxon 15: 349, 1982; keys 24 spp.), Barr (Mycotaxon 49: 129, 1993; cladistic analysis, key gen.), Liew *et al.* (Mol. Phylogen. Evol. 16: 392, 2000), Lumbsch & Lindemuth (MR 105: 901, 2001), Shoemaker *et al.* (Can. J. Pl. Path. 25: 384, 2003).
- Pleomeliola** (Sacc.) Sacc. (1899), ? Meliolaceae. 1 or 2, Europe; N. America.
- Pleomelogramma** Speg. (1909), ? Herpotrichiellaceae. 1, S. America. See Petrak & Sydow (Annls mycol. 32: 21, 1934).
- Pleomeris** Syd. (1921) = Puccinia fide Dietel (Nat. Pflanzenfam. 6, 1928).
- Pleomerium** Speg. (1918), Meliolaceae. 1 (from leaves), Brazil.
- pleomorphic** (1) of fungi having more than one independent form or spore-stage in the life cycle, especially of holomorphs comprising a teleomorph and one or more anamorphs; polymorphic; see Savile (Mycol. 61: 1161, 1970), Sugiyama (Ed.) (Pleomorphic fungi: their diversity and its taxonomic implications, 1987), States of fungi; (2) (of dermatophytes), changes due to 'degeneration' in culture.
- pleomorphism**, the condition of being pleomorphic.
- Pleonectria** Sacc. (1876) = Nectria fide Rossman *et al.* (Stud. Mycol. 42: 248 pp., 1999).
- pleont**, any one of the two or more states of a pleomorphic fungus (Delphino, 1887).
- Pleophalis** Clem. (1909) = Spheconisca fide Hawksworth *et al.* (Dictionary of the Fungi edn 8, 1995).
- Pleophragma** Fuckel (1870), Sporormiaceae. 1, Europe. See von Arx & Müller (Stud. Mycol. 9, 1975), Réblová & Svrcek (Czech Mycol. 49: 193, 1997; Czech Republic).
- Pleopsidium** Körb. (1855), Acarosporaceae (L.). 3, widespread. See Hafellner (Nova Hedwigia 56: 281, 1993), Hafellner (Cryptog. bot. 5: 99, 1995), Obermayer (Ann. bot. fenn. 33: 231, 1996; Tibet), Lutzoni *et al.* (Am. J. Bot. 91: 1446, 2004; phylogeny), Reeb *et al.* (Mol. Phylogen. Evol. 32: 1036, 2004; phylogeny), Crewe *et al.* (MR 110: 521, 2006; phylogeny), Miadlikowska *et al.* (Mycol. 98: 1088, 2006; phylogeny), Reeb *et al.* (J. Mol. Evol. 64: 285, 2007; evolution), Knudsen *et al.* (Opuscula Philolichenum 5: 1, 2008; S America).
- Pleopus** Paulet (1808) ? = Gyromitra fide Hawksworth *et al.* (Dictionary of the Fungi edn 8, 1995).
- Pleopyrenis** Clem. (1909) = Pyrenopsis fide Hawksworth *et al.* (Dictionary of the Fungi edn 8, 1995).
- Pleoravenelia** Long (1903) = Ravenelia fide Dietel (Nat. Pflanzenfam. 6, 1928).
- Pleorinis** Clem. (1909) = Rinodina fide Hawksworth *et al.* (Dictionary of the Fungi edn 8, 1995).
- Pleoscutula** Vouaux (1913), ? Leotiomyces. 2 (lichenicolous), neotropics. See Hafellner (Herzogia 6: 289, 1983), Diederich & Etayo (Lichenologist 32: 423, 2000; key), Etayo (Biblthca Lichenol. 84, 2002; Colombia).
- Pleoseptum** A.W. Ramaley & M.E. Barr (1995), ? Leptosphaeriaceae. 1 (on *Yucca*), N. America. See Ramaley & Barr (Mycotaxon 54: 75, 1995).
- Pleosphaerellula** Naumov & Czerepan. (1952), Dothideomycetes. 1 (on *Cornus*), former USSR. See Naumov & Czerepanova (Bot. Mater. Otd. Sporov.

- Rast. Bot. Inst. Komarova Akad. Nauk S.S.S.R.* 8: 149, 1952).
- Pleosphaeria** Henssen (1964) nom. illegit. = *Pyrenothrix* fide Henssen (*Ber. dt. bot. Ges.* 77: 320, 1964), Herrera-Campos *et al.* (*Mycol.* 97: 356, 2005).
- Pleosphaeria** Speg. (1881), *Pezizomycotina*. 15, widespread. See Petrak (*Annls mycol.* 38: 197, 1940).
- Pleosphaeropsis** Died. (1916) = *Aplosporella* fide Petrak & Sydow (*Beih. Rep. spec. nov. regn. veg.* 42, 1927).
- Pleosphaeropsis** Vain. (1921) = *Norrinia* Vain.
- Pleosphaerulina** Pass. (1891) = *Sacchettoecium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pleospilis** Clem. (1909) = *Spirographa* fide Santesson (*The lichens and lichenicolous fungi of Sweden and Norway*, 1993).
- Pleospora** Rabenh. ex Ces. & De Not. (1863) nom. cons., *Pleosporaceae*. Anamorph *Stemphylium*. c. 63, widespread. *P. herbarum* (anamorph *Stemphylium botryosum*), plurivorous, causes leaf spots of legumes, lettuce and storage fruit spot of apple. See Müller (*Sydowia* 5: 248, 1951), Wehmeyer (*Monogr. Pleospora segreg.*, 1961; keys), Crivelli (*Über die heterogene Ascomycetengattung Pleospora Rbh.*, 1983; gen. concept, keys), Simmons (*Mycotaxon* 25: 287, 1986), Simmons (*Sydowia* 38: 284, 1986), Holm & Holm (*Sydowia* 45: 167, 1993; 9 spp. Svalbard), Henssen (*SA* 13: 202, 1995; ontogeny), Dong *et al.* (*MR* 102: 151, 1998; phylogeny), Silva-Hanlin & Hanlin (*MR* 103: 153, 1999; DNA), Simmons (*Harvard Pap. Bot.* 6: 199, 2001), Câmara *et al.* (*Mycol.* 94: 660, 2002; phylogeny), Kodsueb *et al.* (*Mycol.* 98: 571, 2006; phylogeny), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny), Wang *et al.* (*MR* 111: 1268, 2007; phylogeny).
- Pleosporaceae** Nitschke (1869), *Pleosporales*. 36 gen. (+ 37 syn.), 769 spp.
- Lit.*: Holm (*Symb. bot. upsal.* 14 no. 3: 1, 1957), Wehmeyer (*Monogr. Pleospora segreg.*, 1961; keys), Corlett (*Nova Hedwigia* 24: 347, 1975; ontogeny), Shoemaker & Babcock (*CJB* 65: 373, 1987), Sivanesan (*Mycol. Pap.* 158: 261 pp., 1987), Crous *et al.* (*MR* 99: 1098, 1995), Borchardt *et al.* (*Phytopathology* 88: 322, 1998), Checa (*Mycotaxon* 68: 205, 1998; Iberian spp.), Dong *et al.* (*MR* 102: 151, 1998; phylogeny), Shimizu *et al.* (*J. gen. appl. Microbiol.* Tokyo 44: 251, 1998), Turgeon & Berbee (*Molecular Genetics of Host-Specific Toxins in Plant Disease*: 153, 1998), Berbee *et al.* (*Mycol.* 91: 964, 1999), Shoemaker (*CJB* 76: 1559, 1998), Silva-Hanlin & Hanlin (*MR* 103: 153, 1999), Yun *et al.* (*Proc. natn Acad. Sci. U.S.A.* 96: 5592, 1999), Farr *et al.* (*Mycol.* 92: 145, 2000), Olivier *et al.* (*Mycol.* 92: 736, 2000), Pryor & Gilbertson (*MR* 104: 1312, 2000), Câmara *et al.* (*Mycol.* 94: 660, 2002), Serdani *et al.* (*MR* 106: 561, 2002), Berbee *et al.* (*MR* 107: 169, 2003), Pryor & Bigelow (*Mycol.* 95: 1141, 2003), Peever *et al.* (*Mycol.* 96: 119, 2004), Kodsueb *et al.* (*Mycol.* 98: 571, 2006), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny), Wang *et al.* (*MR* 111: 1268, 2007; phylogeny).
- Pleosporales** Luttr. ex M.E. Barr (1987). *Pleosporomycetidae*. 23 fam., 332 gen., 4764 spp. Thallus or stroma absent or rarely poorly developed. Ascomata perithecial or rarely cleistothecial, sometimes clypeate, variable in form but usually ± globose, thick-walled, immersed or erumpent, black, normally open-

ing by a well-developed lysigenous ostiole, sometimes hairy or setose; peridium usually thick, composed of pseudoparenchymatous cells. Interascal tissue of cellular or trabeculate pseudoparaphyses, often immersed in J- gel. Asci usually ± cylindrical, fissitunicate, with a well-developed ocular chamber, rarely also with a poorly defined ring, not blueing in iodine. Ascospores hyaline to brown, septate, thin or thick-walled, sometimes muriform, often with a gelatinous sheath. Anamorphs hyphomycetous or coelomycetous, varied and often prominent. Fams.:

- (1) **Arthopyreniaceae**
- (2) **Corynesporascaceae**
- (3) **Cucurbitariaceae**
- (4) **Dacampiaceae**
- (5) **Delitschiaceae**
- (6) **Diademaceae**
- (7) **Didymosphaeriaceae**
- (8) **Fenestellaceae**
- (9) **Leptosphaeriaceae**
- (10) **Lophiostomataceae**
- (11) **Massarinaceae**
- (12) **Melanommataceae**
- (13) **Montagnulaceae**
- (14) **Mytilinidiaceae**
- (15) **Naetrocymbaceae**
- (16) **Parodiellaceae**
- (17) **Phaeosphaeriaceae**
- (18) **Phaeotrichaceae**
- (19) **Pleomassariaceae**
- (20) **Pleosporaceae**
- (21) **Sporormiaceae**
- (22) **Testudinaceae**
- (23) **Venturiaceae**

Several further fams may belong here, including *Zopfiaceae*, but more extensive molecular data are needed.

Lit.: Checa (*Mycotaxon* 68: 205, 1998; Iberian spp.), Kruys *et al.* (*MR* 110: 527, 2006; coprophilous taxa), Liew *et al.* (*Mol. Phylog. Evol.* 16: 392, 2000; interascal tissue, phylogeny), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny), Silva-Hanlin & Hanlin (*MR* 103(2): 153, 1999), Wang *et al.* (*MR* 111: 1268, 2007; phylogeny), Winka *et al.* (*Mycol.* 90: 822, 1998; phylogeny).

Pleosporites Y. Suzuki (1910), *Fossil Fungi*. 2 (Cretaceous), India; Japan.

Pleosporomycetidae C.L. Schoch, Spatafora, Crous & Shoemaker (2007), *Dothideomycetes*. Ord.:

Pleosporales

For *Lit.* see fam.

Pleosporonites R.T. Lange & P.H. Sm. (1971), *Fossil Fungi*. 1 (Eocene), Australia.

Pleosporopsis Oerst. (1866) ? = *Coniochaeta* fide Petrini (*Sydowia* 44: 169, 1993), Læssøe (*SA* 13: 43, 1994).

Pleostigma Kirschst. (1939) = *Teichosporella* fide Petrak (*Annls mycol.* 38: 297, 1940).

Pleostomella, see *Pleiostomella*.

Pleothelis M. Choisy (1949) = *Muellerella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Pleotrichiella Sivan. (1984), *Dothideomycetes*. 1, Australia. See Sivanesan (*TBMS* 83: 531, 1984).

Pleovalsa Kirschst. (1936) = *Fenestella* fide Petrak (*Annls mycol.* 38: 189, 1940).

plerotic, of an oospore which completely fills the oogonial cavity; but also of an oospore which occupies >65% of the oogonium volume (Dick *et al.*, 1992).

- Plesiospora** Drechsler (1971), anamorphic *Pezizomycotina*, Hso.0eH.1. 1, USA; Japan; British Isles. See Drechsler (*Sydowia* 24: 174, 1970), Glockling & Holbrook (*Mycologist* 17: 150, 2003).
- pleuracrogenous**, formed at the end and on the sides.
- Pleurance** Fr. (1849) = *Schizothecium*.
- Pleurella** E. Horak (1971), *Tricholomataceae*. 1, New Zealand. See Horak (*N.Z. J. Bot.* 9: 477, 1971).
- pleuro-** (in combination), side, at the side.
- Pleuroascus** Masee & E.S. Salmon (1901), *Pseudeurotiaceae*. 10, widespread. Familial placement uncertain, probably close to *Connersia*. See Lodha in Subramanian (Ed.) (*Taxonomy of fungi* 1: 241, 1978), Barrasa & Moreno (*An. Jard. bot. Madr.* 41: 31, 1984), Suh & Blackwell (*Mycol.* 91: 836, 1999; phylogeny), Sogonov *et al.* (*Mycol.* 97: 695, 2005; phylogeny).
- Pleurobasidium** Arnaud (1951) nom. inval., *Thelephoraceae*. 1, Europe.
- pleurobasidium**, see *basidium*.
- Pleurobotrya** Berk. [not traced] ? = *Botrytis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pleurocatena** G. Arnaud ex Aramb. (1981) nom. inval. = *Pleurocatena* G. Arnaud ex Aramb., Gamundí, W. Gams & G.R.W. Arnold fide Arambarri (*Darwiniana* 23: 329, 1981).
- Pleurocatena** G. Arnaud ex Aramb., Gamundí, W. Gams & G.R.W. Arnold (2007), anamorphic *Pyxidiophora*, Hso.0eP.32/33. 1 (fungicolous), Argentina; Europe. See Kwasna & Bateman (*MR* 102: 1487, 1998; UK), Gams & Arnold (*Nova Hedwigia* 84: 381, 2007).
- Pleuroceras** Riess (1854), *Gnomonia*. Anamorphs *Asteroma*, *Cylindrosporella*, *Septogloeum*. 12, widespread (north temperate). See Barr (*Mycol. Mem.* 7, 1978), Monod (*Beih. Sydowia* 9: 1, 1983), Butin & Wulf (*Sydowia* 40: 38, 1988; anamorph), Barr (*Mycotaxon* 41: 287, 1991; N. Am. spp.), Zhang & Blackwell (*Mycol.* 93: 355, 2001; phylogeny).
- Pleurocolla** Petr. (1924), anamorphic *Nectriaceae*, Hsp.0eH.?. 1, Europe. See Kirschner (*Frontiers in Basidiomycote Mycology*: 165, 2004; anam.; type stud.).
- Pleurocollybia** Singer (1947), *Tricholomataceae*. 5, America; Asia. See Singer (*Mycol.* 39: 80, 1947), Pegler (*Kew Bull.* 43: 53, 1988), Baroni (*Mycotaxon* 103: 353, 2008; key).
- Pleurocybe** Müll. Arg. (1884) = *Bunodophoron* fide Wedin (*Pl. Syst. Evol.* 187: 213, 1993).
- Pleurocybella** Singer (1947), *Marasmiaceae*. 1, widespread (north temperate). See Singer (*Mycol.* 39: 80, 1947), Matsumoto *et al.* (*Mycoscience* 46: 370, 2005; ITS sequences).
- Pleurocybomyces** Cif. & Tomas. (1953) = *Bunodophoron*.
- pleurocystidium**, see *cystidium*.
- Pleurocystis** Bonord. (1851) = *Helicostylum*.
- Pleurocytospora** Petr. (1923), anamorphic *Thyridium*, St.0eH.15. 2, Europe; China. See Leuchtmann & Müller (*Bot. Helv.* 96: 283, 1986), Sun *et al.* (*Mycosystema* 22: 12, 2003).
- Pleurodesmospora** Samson, W. Gams & H.C. Evans (1979), anamorphic *Pezizomycotina*, Hso.0eH.16. 1 (on *Insecta*), Sri Lanka; China. See Li & Han (*Acta Mycol. Sin.* 10: 166, 1991; China).
- Pleurodiscula** Höhn. (1926), anamorphic *Pezizomycotina*, St.0eH.?. 1, Europe.
- Pleurodiscus** Petr. (1931), anamorphic *Pezizomycotina*, Cpd.?.?. 1, Austria.
- Pleurodomus** Petr. (1934), anamorphic *Pezizomycotina*, St.0eH.?. 1, Siberia.
- Pleurodon** Qué. ex P. Karst. (1881) = *Auriscalpium*.
- Pleuroflammula** Singer (1946), *Inocybaceae*. 10, America; Asia. See Horak (*Persoonia* 9: 439, 1978; key 10 spp.), Bon & Roux (*Docums Mycol.* 33: 3, 2003; key).
- Pleurogala** Redhead & Norvell (1993) = *Lactarius* fide Miller *et al.* (*Mycol.* 98: 960, 2006).
- pleurogenous**, formed on the side.
- Pleurographium** Goid. (1935) = *Nodulisporium* fide Sutton (*in litt.*), de Hoog & von Arx (*Kavaka* 1: 55, 1973).
- Pleuromylenula** Singer (1974) = *Rimbachia* fide Redhead (*CJB* 62: 865, 1984).
- Pleuonaema** Höhn. (1917) = *Cytospora* fide Gvritishvili (*Mikol. Fitopatol.* 3: 207, 1969).
- Pleuropedium** Marvanová & S.H. Iqbal (1973), anamorphic *Pezizomycotina*, Hso.1bH.?. 3 (aquatic), Europe; N. America. See Marvanová & Bärlocher (*MR* 102: 750, 1998; Canada).
- Pleurophoma** Höhn. (1914), anamorphic *Pezizomycotina*, St.0eH.15. 8, widespread. See Boerema *et al.* (*Phoma Identification Manual* Differentiation of Specific and Infra-Specific Taxa in Culture: 470 pp., 2004).
- Pleurophomella** Höhn. (1914) = *Sirodothis* fide Sutton & Funk (*CJB* 53: 521, 1975).
- Pleurophomopsis** Petr. (1924), anamorphic *Astrosphaeriella*, Cpd.0eH.15. 7, widespread. See Padhye *et al.* (*J. Clin. Microbiol.* 35: 2136, 1997; medical), Padhye *et al.* (*Medical Mycology* 42: 129, 2004; from human), Tanaka & Harada (*Mycoscience* 46: 114, 2005; teleomorph).
- Pleurophragmium** Costantin (1888), anamorphic *Pezizomycotina*, Hso.0eH.10. 21, widespread. See Hughes (*CJB* 36: 796, 1958), Ellis (*Mycol. Pap.* 114: 42, 1968), de Hoog (*Stud. Mycol.* 26: 1, 1985; synonymy with *Dactylaria*), Paulus *et al.* (*Fungal Diversity* 14: 143, 2003).
- Pleuroplaconema** Petr. (1923), anamorphic *Pezizomycotina*, St.0eH.15. 2, Europe; Asia. See Sun & Guo (*Mycosystema* 25: [543], 2006; endophyte).
- Pleuroplacosphaeria** Syd. (1928), anamorphic *Pezizomycotina*, St.0eH.?. 1, Chile.
- Pleuropus** (Pers.) Roussel (1806) nom. rej. = *Panus* fide Kuyper (*in litt.*).
- Pleuropyxis** Corda (1837) nom. conf., anamorphic *Pezizomycotina*. See Hughes (*CJB* 36: 798, 1958).
- Pleurosordaria** Fernier (1954) = *Arnium* fide Lundqvist (*Symb. bot. upsal.* 20 no. 1, 1972).
- pleurosporous**, having spores on the sides, e.g. a basidium of the *Pucciniales*.
- Pleurosticta** Petr. (1931), *Parmeliaceae* (L). 2, Europe. See Esslinger (*Taxon* 29: 692, 1980; synonymy with *Melanelia*), Lumbsch *et al.* (*Mycotaxon* 33: 447, 1988), Mattsson & Wedin (*Lichenologist* 30: 463, 1998; phylogeny, morphology), Wedin *et al.* (*MR* 103: 1152, 1999; phylogeny), Thell *et al.* (*Symb. bot. upsal.* 34 no. 1: 429, 2004; Scandinavia), Blanco *et al.* (*Mol. Phylogen. Evol.* 39: 52, 2006; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Pleurostoma** Tul. & C. Tul. (1863), *Pleurostomataceae*. Anamorph *Pleurostomophora*. 4 (on wood and bark), Europe; N. America. See Barr (*Mycol.* 77: 549,

- 1985), Barr *et al.* (*Mycotaxon* 48: 529, 1993), Réblová *et al.* (*Stud. Mycol.* 50: 533, 2004), Vijaykrishna *et al.* (*Stud. Mycol.* 50: 387, 2004; anamorph), Mostert *et al.* (*Stud. Mycol.* 54: 115 pp., 2006; phylogeny).
- Pleurostomataceae** Réblová, L. Mostert, W. Gams & Crous (2004), Calosphaeriales. 2 gen. (+ 1 syn.), 7 spp.
Lit.: Barr (*Mycol.* 77: 549, 1985), Romero & Minter (*TBMS* 90: 457, 1988), Romero & Samuels (*Beih. Sydowia* 43: 228, 1991), Mostert *et al.* (*Mycol.* 95: 646, 2003), Réblová *et al.* (*Stud. Mycol.* 50: 533, 2004), Vijaykrishna *et al.* (*Stud. Mycol.* 50: 387, 2004).
- Pleurostomophora** Vijaykr., L. Mostert, Jeewon, W. Gams, K.D. Hyde & Crous (2004), anamorphic *Pleurostoma*. 3, widespread. See Vijaykrishna *et al.* (*Stud. Mycol.* 50: 390, 2004), Mostert *et al.* (*Stud. Mycol.* 54: 115 pp., 2006).
- Pleurostromella** Petr. (1922), anamorphic *Gibberidea*, St.0eH.?. 15, Europe.
- Pleurotaceae** Kühner (1980), Agaricales. 6 gen. (+ 10 syn.), 94 spp.
Lit.: Vilgalys (*Fungi and Lichens in the Baltic Region Abstracts*, Twelfth International Conference on Mycology and Lichenology: 133, 1993), Corner (*Gdms' Bull. Singapore* 46: 49, 1994), Corner (*Gdms' Bull. Singapore* 46: 1, 1994), Hibbett & Thorn (*Mycol.* 86: 696, 1994), Liou & Tzean (*Mycol.* 89: 876, 1997), Albertó *et al.* (*Mycol.* 90: 142, 1998), Zervakis (*Mycol.* 90: 1063, 1998), Gonzalez & Labarère (*Microbiology (Reading)* 146: 209, 2000), Thorn *et al.* (*Mycol.* 92: 241, 2000; phylogeny), Fazio & Albertó (*Mycotaxon* 77: 117, 2001), Hibbett & Binder (*Proc. R. Soc. Lond. B. Biol. Sci.* 269: 1963, 2002), Moncalvo *et al.* (*Mol. Phylogen. Evol.* 23: 357, 2002), Capelari & Fungaro (*MR* 107: 1050, 2003), Lechner *et al.* (*Mycol.* 96: 845, 2004), Zervakis *et al.* (*Microbiology (Reading)* 150: 715, 2004), De Gioia *et al.* (*MR* 109: 71, 2005).
- Pleurotellus** Fayod (1889) = *Crepidotus* fide Aime *et al.* (*Am. J. Bot.* 92: 74, 2005).
- Pleurotheciopsis** B. Sutton (1973), anamorphic *Pezizomycotina*, Hso.≡ eH.3. 6, widespread. See Castañeda Ruiz & Iturriaga (*Mycotaxon* 70: 63, 1999), Castañeda Ruiz *et al.* (*Mycotaxon* 77: 1, 2001).
- Pleurothecium** Höhn. (1919), anamorphic *Carpoligna*, Hso.≡ eH-P.10. 4, widespread. See Goos (*Mycol.* 61: 1048, 1970), Hyde & Goh (*MR* 102: 739, 1998), Fernández *et al.* (*Mycol.* 91: 251, 1999; teleomorph).
- Pleurotheliopsis** Zahlbr. (1922) = *Pyrenula* Ach. (1809) fide Singh & Upreti (*Geophytology* 16: 261, 1986; India), Harris (*Mem. N. Y. bot. Gdn* 49, 1989).
- Pleurothelium** Müll. Arg. (1877) = *Pyrenula* Ach. (1814) fide Aptroot (*in litt.*).
- Pleurothelium** Müll. Arg. (1885) = *Pyrenula* Ach. (1809) fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pleurothyriella** Petr. & Syd. (1925), anamorphic *Pezizomycotina*, Cac.0eH.?. 1, Europe.
- Pleurothyrium** Bubák (1916), anamorphic *Pezizomycotina*, St.0fH.10. 1, Europe.
- Pleurotopsis** (Henn.) Earle (1909) = *Resupinatus*. Belongs to *Mycenaceae* or *Marasmiaceae*. See Hughes *et al.* (*Mycol.* 90: 595, 1998; biogeography).
- Pleurotremataceae** Walt. Watson (1929) = *Pyrenulaceae*.
Lit.: Barr (*Mycotaxon* 51: 191, 1994; circumscribed with 5 genera with non-fissitunicate asci (*Daruvedia*, *Melomastia*, *Phomatospora*, *Pleurotrema* and *Saccardoella*)).
- Pleurotrematomyces** Cif. & Tomas. (1957) ≡ *Pleurotrema*.
- Pleurotus** (Fr.) P. Kumm. (1871) nom. cons., *Pleurotaceae*. Anamorph *Antromycopsis*. 20 (esp. on wood), widespread. *P. ostreatus*, the Oyster Cap, and several other species are edible and commercially cultivated. See Hilber (*Biblthca Mycol.* 87: 1, 1982; monogr.), Barron & Thorn (*CJB* 64: 774, 1987; ecology), Thorn *et al.* (*TMSJ* 34: 449, 1993; ecology), Vilgays & Sun (*Proc. natn Acad. Sci. U.S.A.* 91: 4599, 1994; speciation), Zervakis & Balis (*MR* 100: 717, 1996; key Europ. spp.), Zervakis (*Mycol.* 90: 1063, 1998; taxonomy), Albertó *et al.* (*Persoonia* 18: 55, 2002), Li & Yao (*Mycosystema* 23: 345, 2004; phylogeny), Zervakis *et al.* (*Microbiology Reading* 150: 715, 2004; phylogeny, biogeography and speciation), Stajic *et al.* (*Mycotaxon* 93: 247, 2005; genetics).
- Pleurovularia** R. Kirschner & U. Braun (2002), anamorphic *Pezizomycotina*, H??.?. 1, E. Asia. See Kirschner *et al.* (*Mycoscience* 43: 16, 2002).
- Pliariona** A. Massal. (1860) = *Thecaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Plicaria** Fuckel (1870), *Pezizaceae*. Anamorph *Chromelosporium*. c. 10, widespread (temperate). Clusters within *Peziza*, but that genus is itself polyphyletic. See Hirsch (*Agarica* 6: 241, 1985; key 4 Eur. spp.), Egger (*Mycotaxon* 29: 183, 1986), Norman & Egger (*Mycol.* 88: 986, 1996), Norman & Egger (*Mycol.* 91: 820, 1999; phylogeny), Hansen *et al.* (*Mycol.* 93: 958, 2001; phylogeny), Spooner (*Czech Mycol.* 52: 259, 2001), Hansen *et al.* (*Mol. Phylogen. Evol.* 36: 1, 2005; phylogeny).
- Plicariaceae** Velen. (1934) = *Pezizaceae*.
- Plicariella** (Sacc.) Rehm (1894) = *Plicaria* fide Spooner (*Czech Mycol.* 52: 259, 2001).
- plicate**, folded into pleats; **plica**, a pleat.
- Plicatura** Peck (1872), Agaricales. 1, widespread (north temperate). Belongs to *Amylocorticiaceae* or *Tricholomataceae*.
- Plicaturaceae** Jülich (1982) = *Atheliaceae*.
- Plicaturella** Murrill (1910) = *Boletinus* fide Kuyper (*in litt.*).
- Plicaturopsis** D.A. Reid (1964), Agaricales. 2, Europe; New Zealand. Belongs to *Amylocorticiaceae* or *Tricholomataceae*.
- Plistophora**, see *Pleistophora*.
- Plocaria** Nees (1820) nom. rej. prop., Algae.
- Plochmopeltidella** J.M. Mend. (1925) = *Chaetothyria* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Plochmopeltinites** Cookson (1947), Fossil Fungi. 2 (Oligocene, Miocene), India.
- Plochmopeltis** Theiss. (1914), *Schizothyriaceae*. 5, pantropical. See Gómez Acosta & Clavel Calzado (*Rev. Jardín Bot. Nac. Univ. la Habana* 17-18: 137, 1998; Cuba), Reynolds & Gilbert (*Aust. Syst. Bot.* 18: 265, 2005; Australia).
- Plochmothea** Syd. (1939) = *Xenostomella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Ploettnera** Henn. (1899), *Helotiales*. 5, Europe. See Hein (*Willdenowia Beih.* 9, 1976; key), Nauta & Spooner (*Mycologist* 13: 65, 1999; Brit. spp.).

- Ploettnerula** Kirschst. (1924) = *Pirottaea* fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).
- Ploioderma** Darker (1967), Rhytismataceae. Anamorph *Cryocaligula*. 5, India; N. America. See Hou & Liu (*Acta Mycol. Sin.* 12: 99, 1993), Lin & Hou (*Acta Mycol. Sin.* 14: 175, 1995), Hansen & Lewis (*Compendium of Conifer Diseases*, 1997), Jewell (*Forest Pathology* 31: 33, 2001; histopathology).
- Plokamidomyces** Bat., C.A.A. Costa & Cif. (1957), anamorphic *Trichopelthea*, Hso.0eH.15. 1, New Zealand. See Batista *et al.* (*Publções Inst. Micol. Recife* 90: 15, 1957).
- Plowrightia** Sacc. (1883), Dothioraceae. c. 7, widespread. *P. ribesia* (black pustule of gooseberry and currants (*Ribes*)). See Wakefield (*TBMS* 24: 286, 1940), Barr (*Harvard Pap. Bot.* 6: 25, 2001), Winton *et al.* (*Mycol.* 99: 240, 2007; phylogeny).
- Plowrightiella** (Sacc.) Trotter (1926) = *Sydowia* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Pluesia** Nieuwl. (1916) = *Maurya*.
- plug** (in an ascus), see ascus.
- Plunkettomyces** G.F. Orr (1977) = *Arachniotus* fide von Arx (*Persoonia* 9: 393, 1977).
- Pluricellaesporites** Hammen (1954), Fossil Fungi. 30 (Cretaceous, Tertiary), widespread.
- Pluricellulites** Hammen (1954), Fossil Fungi ? Fungi. 1.
- plurilocular** (1) (of ascospores), many-celled; (2) (of stromata), having several locules.
- Pluriporus** F. Stevens & R.W. Ryan (1925) = *Dothidella* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Plurisperma** Sivan. (1970), ? Verrucariales. 1, Pakistan. See Matzer (*Nova Hedwigia* 56: 203, 1993).
- plurivorous**, attacking a number of hosts or substrates; not specialized.
- Pluteaceae** Kotl. & Pouzar (1972), Agaricales. 4 gen. (+ 8 syn.), 364 spp.
Lit.: Miller & Horak (*Mycol.* 84: 64, 1992), Banerjee & Sundberg (*Mycotaxon* 53: 189, 1995), Weiss *et al.* (*CJB* 76: 1170, 1998), Drehmel *et al.* (*Mycol.* 91: 610, 1999), Hibbett *et al.* (*Nature* 407: 506, 2000; as syn. of *Amanitaceae*), Moncalvo *et al.* (*Syst. Biol.* 49: 278, 2000), Grgurinovic (*Aust. Syst. Bot.* 14: 395, 2001), Bougher & Lebel (*Aust. Syst. Bot.* 15: 514, 2002), Moncalvo *et al.* (*Mol. Phylogen. Evol.* 23: 357, 2002), Seok *et al.* (*Mycobiology* 30: 183, 2002), Simmons *et al.* (*Persoonia* 17: 563, 2002), Bhatt & Miller (*Mem. N. Y. bot. Gdn* 89: 33, 2004), Oda *et al.* (*MR* 108: 885, 2004), Zhang *et al.* (*Fungal Diversity* 17: 219, 2004).
- Pluteolus** (Fr.) Gillet (1876) = *Bolbitius* fide Singer (*Agaric. mod. Tax.*, 1951).
- Pluteopsis** Fayod (1889) = *Psathyrella* fide Singer (*Agaric. mod. Tax.*, 1951).
- Pluteus** Fr. (1836), Pluteaceae. c. 300 (esp. on wood), widespread. See Singer (*TBMS* 39: 222, 1956; key), Smith & Stuntz (*Lloydia* 21: 115, 1959; key S. Am. spp.), Singer (*Sydowia* 15: 114, 1962; suppl. S. Am. spp.), Homola (*Mycol.* 64: 1211, 1972; sect. *Celluloderma* N. Am., keys), Horak (*Fl. Illustr. Champ. Afr. Centr.* 6: 107, 1976; key 10 C. Afr. spp.), Pegler (*Kew Bull. Addit. Ser.* 6, 1977; key 6 E. Afr. spp.), Vellinga & Schreurs (*Persoonia* 12: 337, 1985; key W. Eur. spp.), Orton (*British fungus flora* 4: 4, 1986; key Brit. spp.), Contu (*Mycol. helv.* 11: 137, 2001; Sardinia), Pradeep *et al.* (*Mycotaxon* 83: 59, 2002; India), Wartchow *et al.* (*Mycotaxon* 96: 241, 2006; Brazil).
- Pneumatospora** B. Sutton, Kuthub. & Muid (1984) = *Minimedusa* fide Diederich & Lawrey (*Mycol. Progr.* 6: 61, 2007).
- Pneumocystidaceae** O.E. Erikss. (1994), Pneumocystidales. 1 gen., 5 spp.
Lit.: Edman *et al.* (*Nature Lond.* 334: 519, 1988), Eriksson (*SA* 13: 165, 1994), Lu *et al.* (*J. Clin. Microbiol.* 32: 2904, 1994), Eriksson (*SA* 13: 165, 1995), Sugiyama *et al.* in Colwell *et al.* (Eds) (*Microbial Diversity in Time and Space*: 41, 1996), Sjamsuridzal *et al.* (*Mycoscience* 38: 267, 1997; phylogeny), Dei-Cas *et al.* (*J. Mycol. Médic.* 8: 1, 1998), Mazars & Dei-Cas (*FEMS Immunol. Med. Microbiol.* 22: 75, 1998), Stringer (*FEMS Immunol. Med. Microbiol.* 22: 15, 1998), Wakefield *et al.* (*Medical Mycology* 36: 183, 1998), Chin *et al.* (*J. Eukary. Microbiol.* 46: 95S, 1999), Frenkel (*J. Eukary. Microbiol.* 46: 89S, 1999), Palmer *et al.* (*Appl. Environm. Microbiol.* 66: 4954, 2000), Demanche *et al.* (*J. Clin. Microbiol.* 39: 2126, 2001), Norris *et al.* (*Clin. Diagn. Lab. Immunol.* 10: 1037, 2003), Cushion *et al.* (*Mycol.* 96: 429, 2004), Guillot *et al.* (*Mol. Phylogen. Evol.* 31: 988, 2004), Keely *et al.* (*Microbiology (Reading)* 150: 1153, 2004), Robberts *et al.* (*J. Clin. Microbiol.* 42: 1505, 2004), Sugiyama *et al.* (*Mycol.* 98: 996, 2006; phylogeny).
- Pneumocystidales** O.E. Erikss. (1994). Pneumocystidomycetidae. 1 fam., 1 gen., 5 spp. Fam.:
- Pneumocystidaceae**
 For *Lit.* see under fam.
- Pneumocystidomycetes** O.E. Erikss. & Winka (1997). Taphrinomycotina. 1 ord., 1 fam., 1 gen., 5 spp. Clusters within the *Taphrinomycotina* and contains a single genus of obligate mammalian parasites. Ord.:
- Pneumocystidales**
 For *Lit.* see under fam.
- Pneumocystidomycetidae**, see *Pneumocystidomycetes*.
- Pneumocystis** P. Delanoë & Delanoë (1912), Pneumocystidaceae. 5, widespread. *P. carinii* causes pneumonia (PCP) in immunocompromized (esp. AIDS) patients. See Hong *et al.* (*J. Clin. Microbiol.* 28: 1785, 1990; karyotypes), Kovacs *et al.* (*Exp. Parasitol.* 71: 60, 1990; characterization of dihydrofolate reductase), Mackenzie (*Rev. Iberoam. Micol.* 7: 3, 1990; aetiology), Tamburrini *et al.* (*J. Clin. Microbiol.* 31: 2788, 1993; rapid diagnosis by PCR), Wakefield *et al.* (*Mol. Microbiol.* 8: 426, 1993; basidiomycete affinity), Eriksson (*SA* 13: 165, 1995), Stringer (*Clin. Microbiol. Rev.* 9: 489, 1996; review), Dei-Cas *et al.* (*J. Mycol. Médic.* 8: 1, 1998; host specificity), Dei-Cas *et al.* (*FEMS Immunol. Med. Microbiol.* 22: 185, 1998; ultrastr.), Lee *et al.* (*J. Clin. Microbiol.* 36: 734, 1998; ITS), Stringer (*FEMS Immunol. Med. Microbiol.* 22: 15, 1998; genome), Wakefield (*FEMS Immunol. Med. Microbiol.* 22: 5, 1998; genetic diversity), Wakefield *et al.* (*Medical Mycology* 36 Suppl. 1: 183, 1998; host specificity), Rabodonirina *et al.* (*J. Clin. Microbiol.* 37: 127, 1999; nested PCR detection), Baldauf *et al.* (*Science N.Y.* 290 no. 5493: 972, 2000; phylogeny), Denis *et al.* (*Medical Mycology* 38: 289, 2000; genetic diversity), Durand-Joly *et al.* (*Medical Mycology* 38, 2000; from monkey), Palmer *et al.* (*Appl. Environm. Microbiol.* 66: 4954, 2000; population structure in rats), Demanche *et al.* (*J. Clin. Microbiol.* 39: 2126, 2001; phylogeny, coevolution), Kaiser *et al.* (*J. Microbiol. Meth.* 45: 113, 2001; PCR analysis), Pal-

- ladino *et al.* (*Diagn. Microbiol. Infect. Dis.* **39**: 233, 2001; molecular detection), Smulian (*Fungal Genetics Biol.* **34**: 145, 2001; genetic diversity), Guillot *et al.* (*J. Eukary. Microbiol. Suppl.*: 113S, 2001; phylogeny), Stringer *et al.* (*J. Eukary. Microbiol. Suppl.*: 184S, 2001; nomencl., species concepts), Hugot *et al.* (*Syst. Biol.* **52**: 735, 2003; phylogeny), Keely *et al.* (*J. Eukary. Microbiol.* **50** Suppl.: 624, 2003; evolution), Cushion (*J. Eukary. Microbiol.* **51**: 30, 2004; comparative genomics), Cushion *et al.* (*Mycol.* **96**: 429, 2004; from rat), Guillot *et al.* (*Mol. Phylogen. Evol.* **31**: 988, 2004; from monkey), Keely *et al.* (*Microbiology Reading* **150**: 1153, 2004; from mouse), James (*Nature Lond.* **443** no. 7113: 818, 2006; phylogeny), Slaven *et al.* (*J. Eukary. Microbiol.* **53** Suppl. 1: S89, 2006; whole genome), Sugiyama *et al.* (*Mycol.* **98**: 996, 2006; phylogeny).
- pneumomycosis**, see mycosis.
- Pochonia** Bat. & O.M. Fonseca (1965), Clavicipitaceae. See Barron & Onions (*CJB* **44**, 1966; synonym of *Diheterospora*), Gams & Zare (*Nova Hedwigia* **72**: 334, 2001), Zare *et al.* (*Nova Hedwigia* **73**: 51, 2001; revision), Morton *et al.* (*MR* **107**: 198, 2003; genetic diversity), Stadler *et al.* (*Mycol. Progr.* **2**: 95, 2003; chemistry), Sung *et al.* (*Stud. Mycol.* **57**, 2007).
- Pocillaria** P. Browne (1756) = *Lentinus*.
- Pocillopyncis** Dyko & B. Sutton (1979), anamorphic *Pezizomycotina*, St.OffH.10. 1, Sweden. See DiCosmo (*Mycotaxon* **10**: 288, 1980).
- Pocillum** De Not. (1863), Helotiaceae. 2 or 3, Europe; America. See Petrak (*Sydowia* **5**: 345, 1951).
- pocket plums**, plums swollen then 'mummified' by *Taphrina pruni*.
- pocket rot**, localized rotting of trunks of trees or roots by wood-destroying fungi.
- Pocosphaeria** (Sacc.) Berl. (1892) = *Nodulosphaeria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pocsia** Vězda (1975), ? Verrucariales (L). 3, widespread (tropical). See Hafellner & Kalb (*Biblthca Lichenol.* **57**: 161, 1995; posn), McCarthy (*Lichenologist* **31**: 141, 1999; Australia), Herrera-Campos & Lücking (*Lichenologist* **34**: 211, 2002; Mexico).
- Poculinia** Spooner (1987), Sclerotiniaceae. 1 (on *Notofagus*), Tasmania. See Spooner (*Biblthca Mycol.* **116**, 1987).
- Poculopsis** Kirschst. (1935), Helotiaceae. 1, Europe.
- Poculum** Velen. (1934), Rutstroemiaceae. c. 20, widespread. See Holst-Jensen *et al.* (*Mycol.* **89**: 885, 1997; phylogeny).
- Podabrella** Singer (1945) = *Termitomyces* fide Kuyper (*in litt.*).
- Podaleuris** Clem. (1909) = *Peziza* Fr. fide Eckblad (*Nytt Mag. Bot.* **15**: 1, 1968).
- Podaxaceae** Corda (1842) = Agaricaceae.
- Podaxales** = Agaricales.
- Podaxis** Desv. (1809), Agaricaceae. 10, widespread (subtropical dry areas). See Morse (*Mycol.* **25**: 1, 1933), Martinez (*Boln Soc. argent. Bot.* **14**: 73, 1971; Argentina), McKnight & Stransky (*Mycol.* **72**: 195, 1980), McKnight (*Mycol.* **77**: 24, 1985; key small-spored spp.), Hopple & Vilgalys (*Mol. Phylogen. Evol.* **13**: 1, 1999; phylogeny), Dios *et al.* (*Mycotaxon* **80**: 453, 2001; Argentina), Keirle *et al.* (*Fungal Diversity* **15**: 33, 2004; Hawaiian Islands), Vellinga (*MR* **108**: 354, 2004; phylogeny).
- Podaxon**, see *Podaxis*.
- podetium**, lichenized stem-like portion (stipe, or discopodium) bearing the hymenial discs and sometimes conidiomata in a fruticose apothecium (Ahti, *Lichenologist* **14**: 105, 1982), esp. as in *Cladonia*. Cf. pseudopodetium.
- Podisoma** Link (1809) = *Gymnosporangium* fide Saccardo (*Syll. fung.* **7**: 737, 1888).
- Podobactridium** Penz. & Sacc. ex Petch (1916) = *Bactridium* fide Hughes (*N.Z. Jl Bot.* **4**: 522, 1966).
- Podobelonium** (Sacc.) Sacc. & D. Sacc. (1906) = *Crocicreas* fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).
- Podocapsa** Tiegh. (1887), Saccharomycotina. 1, Europe. Position uncertain.
- Podocapsium** Clem. (1909) = *Podocapsa*.
- Podochytrium** Pfitzer (1870), Chytridiaceae. 7 (on diatoms or saprobes), widespread (north temperate). See Canter (*J. Linn. Soc. Bot.* **63**: 47, 1970).
- Podoconis** Boedijn (1933) = *Sporidesmium* fide Ellis (*Mycol. Pap.* **70**, 1958).
- Podocratera** Norman (1861) nom. rej. = *Tholurna*.
- Podocrea** (Sacc.) Lindau (1897) = *Podostroma* fide Rossman *et al.* (*Stud. Mycol.* **42**: 248 pp., 1999), Chamberlain *et al.* (*Karstenia* **44**: 1, 2004).
- Podocrella** Seaver (1928), Clavicipitaceae. Anamorph *Harposporium*. 4 (on rotten wood), widespread (esp. tropical). See Rossman *et al.* (*Stud. Mycol.* **42**: 248 pp., 1999), Chaverri *et al.* (*Mycol.* **97**: 433, 2005), Chaverri *et al.* (*Mycol.* **97**: 1225, 2005).
- Podocystis** Fr. (1849) nom. rej. prop. = *Melampsora* fide Saccardo (*Syll. Fung.* **18**: 812, 1906).
- Pododimeria** E. Müll. (1959), ? Pseudoperisporiaceae. 4, Europe; N. America. See Luttrell & Barr (*Am. J. Bot.* **65**: 251, 1978; key).
- Podofomes** Pouzar (1966), Polyporaceae. 3. See David *et al.* (*BSMF* **99**: 361, 1983).
- Podohydangium** G.W. Beaton, Pegler & T.W.K. Young (1984) = *Laccaria* fide Kropp & Mueller (*Laccaria – Ectomycorrhizal fungi, key genera in profile*, 1999; phylogeny, congeneric with *Laccaria*).
- Podonectria** Petch (1921), Tubeufiaceae. Anamorphs *Peziotrichum*, *Tetracrium*. 11 (on scale insects), widespread (esp. tropical). See Pirozynski (*Kew Bull.* **31**: 595, 1977), Rossman (*Mycotaxon* **7**: 163, 1978; key), Rossman (*Mycol. Pap.* **157**, 1987), Kodsueb *et al.* (*Fungal Diversity* **21**: 105, 2006; review).
- Podonectrioides** Kobayasi & Shimizu (1983) nom. inval. = *Podonectria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Podophacidium** Niessl (1868), Helotiales. 2, Europe; N. America. See Seaver (*Mycol.* **31**: 350, 1939), Raitviir & Järv (*Proc. Est. Acad. Sci. Biol. Ecol.* **46**: 94, 1997), Pärtel & Raitviir (*Mycol. Progr.* **4**: 149, 2005; asci).
- Podoplaconema** Petr. (1921), anamorphic *Omphalospora*, St.0eH.15. 1, Europe.
- Podoporia** P. Karst. (1892) = *Oligoporus* fide Ryvarden (*Syn. Fung.* **5**, 1991).
- Podoscypha** Pat. (1900), Meruliaceae. c. 35, widespread (esp. tropical). See Reid (*Beih. Nova Hedwigia* **18**: 150, 1965; key), Douanla-Meli & Langer (*Mycotaxon* **90**: 323, 2004).
- Podoscyphaceae** D.A. Reid (1965), Polyporales.
- Podoserpula** D.A. Reid (1963), Amylocorticaceae. 1, widespread. See Reid (*Kew Bull.* **16**: 437, 1963).
- Podosordaria** Ellis & Holw. (1897), Xylariaceae. Anamorph *Geniculosporium*-like. 23 (esp. coprophilous), widespread. See Krug & Cain (*CJB* **52**: 589, 1974; key), Rogers *et al.* (*Mycol.* **84**: 166, 1992),

- Krug & Jeng (*CJB* 73: 65, 1995; key 17 spp.), Rogers *et al.* (*Mycotaxon* 67: 61, 1998).
- Podosphaera** Kunze (1823), Erysiphaceae. Anamorph *Oidium* subgen. *Fibroidium*. 73, widespread. *P. leucotricha* (mildew of apple and other pome fruits), *P. clandestina* (hawthorn (*Crataegus*) mildew), *P. macularis* (hop mildew), *P. mors-uvae* (American mildew of currant and gooseberry (*Ribes*)), *P. pannosa* (rose mildew). See Braun (*Beih. Nova Hedwigia* 89, 1987; key), Hirata *et al.* (*CJB* 78: 1521, 2000; ITS, coevolution), Takamatsu (*MR* 104: 1303, 2000), Takamatsu (*Mycoscience* 45: 147, 2004; phylogeny), Cunnington *et al.* (*MR* 109: 357, 2005; on *Prunus*), Leus *et al.* (*J. Phytopath.* 154: 23, 2006; on *Rosaceae*), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Voytyuk *et al.* (*Nova Hedwigia* 85: 277, 2007; Israel).
- Podospora** Ces. (1856) nom. cons., Lasiosphaeriaceae. 94 (coprophilous), widespread. See Mirza & Cain (*CJB* 47: 1999, 1969; key), Lundqvist (*Symb. bot. upsal.* 20 no. 1, 1972), Krug & Khan (*CJB* 67: 1174, 1989; culture, records), Schmidt (*Biblthca Mycol.* 127, 1989; *P. anserina*), Guarro *et al.* (*SA* 10: 79, 1991), Bell & Mahoney (*Mycol.* 87: 375, 1995), Bell & Mahoney (*Mycol.* 88: 163, 1996; development), Bell & Mahoney (*Mycol.* 89: 908, 1997), Wang (*Mycotaxon* 76: 373, 2000; Taiwan), Lorenzo & Havrylenko (*Mycol.* 93: 1221, 2001; Argentina), Huhndorf *et al.* (*Mycol.* 96: 368, 2004; phylogeny), Miller & Huhndorf (*Mol. Phylogen. Evol.* 35: 60, 2005; anatomy, phylogeny), Fitzpatrick *et al.* (*BMC Evolutionary Biology* 6: 99, 2006; whole genome phylogeny), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Podosporiella** Ellis & Everh. (1894), anamorphic *Pezizomycotina*, Hsy.≡ eP.?. 1, N. America; Australia.
- Podosporium** Bonord. (1851) = *Aplosporella* fide Sutton (*Mycol. Pap.* 141, 1977).
- Podosporium** Lév. (1847) = *Melampsora* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- Podosporium** Sacc. & Schulzer (1884) = *Aplosporella* fide Saccardo (*Syll. fung.* 3: 1, 1884).
- Podosporium** Schwein. (1832), anamorphic *Pezizomycotina*, Hsy.≡ eP.24. 15, widespread (esp. tropical). See Ellis (*Dematiaceous Hyphomycetes*: 291, 1971), Ellis (*More Dematiaceous Hyphomycetes*: 303, 1976), Rong (*Phytophylactica* 24: 103, 1992), Chen & Tzean (*MR* 97: 637, 1993; Taiwan).
- Podostictina** Clem. (1909) = *Pseudocyphellaria* fide Galloway (*Bull. Br. Mus. nat. hist. Bot.* 17, 1988).
- Podostroma** P. Karst. (1892), Hypocreaceae. Anamorph *Trichoderma*. 11 (from decaying wood), widespread. See Boedijn (*Annlis mycol.* 36: 314, 1938), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Wang & Liu (*Mycosystema* 21: 156, 2002; China), Chamberlain *et al.* (*Karstenia* 44: 1, 2004).
- Podostrombium** Kunze ex Rchb. (1828) nom. inval., Clavariaceae. See Donk (*Taxon* 6: 110, 1957).
- Podotara** Malcolm & Vězda (1996), Lecanoromycetes (L). 1, New Zealand. See Malcolm & Vězda (*Folia geobot. phytotax.* 31: 263, 1996).
- Podoxyphiomyces** Bat., Valle & Peres (1961) nom. dub., anamorphic *Pezizomycotina*, St.0eH.? (L). 1, Brazil. See Lücking *et al.* (*Lichenologist* 30: 121, 1998).
- Podoxyphium** Speg. (1918) = *Conidiocarpus* fide Hughes (*Mycol.* 68: 693, 1976).
- Poecilosporium**, see *Poikilosporium*.
- Poecylomyces**, see *Paecilomyces*.
- Poelt** (Josef; 1924-1995; Germany). Bavarian; doctorate (1950) then member of academic staff (1950-1965), University of Munich; Professor of Systematic Botany, Free University of Berlin (1965-1972); Professor and Director of the Botanical Garden, University of Graz (1972-1991), where he remained active after retirement. His wide-ranging interests included lichen-forming fungi, rusts and smuts, and oomycetes, as evident in over 320 publications, including pioneering keys to European lichens; he travelled extensively, making important contributions to Himalayan lichens (1966-1977) and Mediterranean (especially Greek) mycotas; renowned for a determination to tackle 'difficult' groups, for insights into lichen biology, phylogeny and structure, and for work on lichenicolous and bryophilous lichens; an inspiring teacher, his PhD students included P. Döbbeler, J. Hafellner, B. Hein, H. Hertel, W. Jülich, H. Mayrhofer and F. Oberwinkler; editor/co-editor of journals including *Herzogia* and *Nova Hedwigia*; also worked with bryophytes. *Publs. Bestimmungsschlüssel Europäischer Flechten* (1969); (A. Vězda) *Ergänzungsheft I-II* (1977, 1981); (with Mayrhofer) *Die saxicolen Arten der Flechtengattung Rinodina in Europa. Bibliotheca Lichen* (1979); (with Hinteregger) *Beiträge zur kenntnis der flechtenflora des Himalaya. VII die gattungen Caloplaca, Fulgensia und Ioplaca (mit englischem bestimmungsschlüssel). Bibliotheca Lichenologica* (1993). *Biogs, obits etc.* De Priest (*Inoculum* 46(3): 3, 1995); Grumann (1974: 36); Hertel (*International Lichenological Newsletter* 26: 25, 1993); Hertel & Oberwinkler (*Bericht der Bayerischen Botanischen Gesellschaft* 66-67: 327, 1996) [bibliography, obituary].
- Poeltia** Petr. (1972) [non *Poeltia* Grolle 1966, *Hepaticae*] = *Poeltiella*.
- Poeltiaria** Hertel (1984), Porpidiaceae (L). 3, S. America; Australasia. See Hertel (*Nova Hedwigia* Beih. 79: 430, 1984).
- Poeltidea** Hertel & Hafellner (1984), Porpidiaceae (L). 1, Kerguelen; Australasia. See Hertel & Hafellner (*Nova Hedwigia* Beih. 79: 462, 1984).
- Poeltiella** Petr. (1974) = *Hyalocrea* fide Rossman (*Mycol. Pap.* 157, 1987).
- Poeltinula** Hafellner (1984), Rhizocarpaceae (L). 2, Europe. See Hawksworth (*SA* 10: 36, 1991; nomencl.).
- Poetschia** Körb. (1861), Patellariaceae. 4, Europe; S. America. See Hafellner (*Beih. Nova Hedwigia* 62, 1979), Kutorga & Hawksworth (*SA* 15: 1, 1997).
- Pogonomyces** Murrill (1904) = *Hexagonia* Fr. fide Pegler (*The polypores [Bull. BMS Suppl.]*, 1973).
- Pogonospora** Petr. (1957) ? = *Endoxylina* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Poikiloderma** Füsting (1868) = *Amphisphaeria* fide Eriksson & Hawksworth (*SA* 7: 80, 1988).
- Poikilosperma** Bat. & J.L. Bezerra (1961), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, Brazil. See Batista & Bezerra (*Publções Inst. Micol. Recife* 340: 22, 1961).
- Poikilosporium** Dietel (1897) = *Thecaphora* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- Poisonous fungi**. Diverse fungi produce toxins (q.v.) which affect humans, animals and plants. For larger fungi poisonous for humans, see **Mycetisms**; microfungi which produce toxins affecting humans and higher animals, see **Mycotoxicoes**, plants, **Phyto-toxic mycotoxins**. See also Bresinsky & Besl (*A col-*

- our atlas of poisonous fungi: a handbook for pharmacists, doctors and biologists, 1989). See also Antibiotics, Hallucinogenic fungi.
- Poisonous lichens**, see Edible fungi.
- Poitrasia** P.M. Kirk (1984), Choanephoraceae. 1, widespread (tropical). See Kirk (*TBMS* 68: 429, 1977; zygospore ultrastr.), Kirk (*Mycol. Pap.* 152: 61 pp., 1984; monogr.), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny).
- polar** (of bacteria, spores, etc.), at the ends or poles.
- Polar and alpine mycology**. Mycotas characteristic for cooler regions have been recognized at least since the description by Greville in 1821 of the mountain top species *Amanita nivalis*. Fungi from all major taxonomic groups are represented in these specialist mycotas: distribution of *Lachnellula pini* seems to be governed by the mean winter temperature (Kurkela & Norokorpi, *Eur. J. Forest Pathol.* 9: 65, 1979); *Phacidium infestans* and various other ascomycetes exploit snow-cover to develop on their hosts. Cold adaptations in arctic and antarctic fungi are discussed by Robinson (*New Phytologist* 151: 341, 2001). Specialist polar marine fungi exist (Pang *et al.*, *Mycol.* 100: 291, 2008). Fungal spores have been recorded during flights over the north pole (Polunin & Kelly, *Nature* 170: 314, 1952). Cryptoendolithic fungi have been extensively investigated in antarctic dry deserts by Friedmann (q.v.) and others, partly as a paradigm for extra-terrestrial life. Hypogeous fungi play a significant role in plant colonization of alpine areas formerly covered by retreating glaciers (Cazares & Trappe, *Mycol.* 86: 507, 1994). Some myxomycetes (known as nivicolous myxomycetes) are specialist colonizers of areas uncovered by snow-melt (see Singer *et al.*, *Cryptogamie Mycologie* 22: 79, 2001). Many of these organisms are likely to be highly susceptible to climate change. See also Laursen *et al.* (Eds) (*Arctic and alpine mycology* 1, 1985; 2, 1987), Gulden *et al.* (*Arctic and alpine fungi* 1, 1985; 2, 1988; 3, 1990; 4, 1992), Longton (*Biology of polar bryophytes and lichens*, 1988), Trappe (*Mycol.* 80: 1, 1988; alpine fungi). See also Climate change, Lichenometry, Space exploration and fungi.
- polar-diblastic**, see polarilocular.
- polaribilocular**, polarilocular (q.v.) with two cells.
- polarilocular** (of ascospores), bicellular and the two cells separated by a central perforated septum; orculiform, polaribilocular, polar-diblastic. See Sheard (*Lichenologist* 3: 328, 1967). (Fig. 22B).
- Polaroscyphus** Huhtinen (1987), Hyaloscyphaceae. 1, Svalbard. See Huhtinen in Laursen *et al.* (Eds) (*Arctic and Alpine Mycology* 2: 123, 1987), Raitviir (*Scripta Mycologica Tartu* 20, 2004).
- poleophilous**, town loving; sometimes used of lichens which thrive in urban areas (e.g. *Lecanora conizaeoides* in Eur.).
- Polhysterium** Speg. (1912) ? = *Hysterographium* fide Clements & Shear (*Gen. Fung.*, 1931).
- Polioma** Arthur (1907), Pucciniaceae. 4 (on *Geraniaceae*, *Lamiaceae*), N. & S. America. See Baxter & Cummins (*Bull. Torrey bot. Club* 78: 51, 1951).
- Poliomella** Syd. (1922) = *Puccinia* fide Laundon (*Mycol. Pap.* 102, 1965).
- Poliomopsis** A.W. Ramaley (1987), ? Uropyxidaceae. 1 (on *Thermopsis* (*Leguminosae*)), USA. See Ramaley (*Mycotaxon* 28: 361, 1987), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003; excluded from *Pucciniales*).
- Poliotelium** Syd. (1922) = *Uromyces* fide Berndt (*in litt.*) See, Mains (*Bull. Torrey bot. Club* 66: 173, 1939).
- Polistophthora** Lebert (1858) = *Cordyceps* fide Tulasne & Tulasne (*Select. fung. carpol.* 3: 4, 1865).
- Polistroma** Clemente (1807), Gyalectaceae (L.). 1, America (tropical). See Frisch (*Biblthca Lichenol.* 92: 1, 2006).
- Pollaccia** E. Bald. & Cif. (1937) = *Fusicladium* fide Funk (*Can. J. Pl. Path.* 11: 353, 1989; *P. borealis*), Wu & Sutton (*MR* 99: 983, 1995; relationships of *P. mandshurica*, key), Schubert *et al.* (*Schlechtendalia* 9, 2003), Beck *et al.* (*Mycol. Progr.* 4: 111, 2005; phylogeny).
- Poloniodiscus** Svrček & Kubička (1967) = *Ameghiniella* fide Zhuang (*Mycotaxon* 31: 261, 1988), Gamundí (*MR* 95: 1131, 1991).
- poly-** (prefix), a great number; many.
- Polyactidaceae** Corda (1838) = *Sclerotiniaceae*.
- Polyactis** Link (1809) = *Botrytis* fide Hennebert (*Per-soonia* 7: 183, 1973).
- Polyadosporites** Hammen (1954), Fossil Fungi. 6 (Cretaceous, Paleocene), Colombia.
- Polyancora** Voglmayr & Yule (2006), Xylariales. 1 (aquatic), Malaysia. See Voglmayr & Yule (*MR* 110: 1247, 2006).
- Polyandromyces** Thaxt. (1920), Laboulbeniaceae. 1, widespread. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- polyandrous** (of oospores), formed when more than one functioning antheridium is present; cf. monandrous.
- Polyangium** Link (1809) nom. dub., Predibacteria.
- Polyascomyces** Thaxt. (1900), Laboulbeniaceae. 1, British Isles. See Tavares (*Mycol.* 65: 929, 1973), Tavares (*Mycol. Mem.* 9: 627 pp., 1985).
- polyascous**, having many asci; esp. having the asci in one hymenium, not separated by sterile bands.
- Polyblastia** A. Massal. (1852) nom. cons., Verrucariaceae (L.). c. 85, widespread. See Servít (*Československé lišejníky čeledi Verrucariaceae*, 1954), Swinscow (*Lichenologist* 5: 92, 1971; Brit. spp.), McCarthy (*Muelleria* 8: 269, 1995; Australia), Ceynowa-Gieldon (*Acta Mycologica Warszawa* 33: 299, 1998; Poland), Roux *et al.* (*Mycotaxon* 84: 1, 2002), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny), Gueidan *et al.* (*MR* 111: 1145, 2007; phylogeny).
- polyblastic** (of conidiogenous cell), producing blastic conidia at several conidiogenous loci, either synchronously or irregularly.
- Polyblastidea** (Zschacke) Tomas. & Cif. (1952) = *Polyblastia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Polyblastiomyces** Cif. & Tomas. (1953) = *Polyblastia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Polyblastiomyces** E.A. Thomas (1939) nom. inval. = *Staurothele* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Polyblastiopsis** Zahlbr. (1903) = *Julella* fide Mayrhofer (*Biblthca Lichenol.* 26, 1987), Aptroot & Boom (*Mycotaxon* 56: 1, 1995).
- Polybulbophiale** Goh & K.D. Hyde (1998), anamorphic *Pezizomycotina*, Hso.???. 1 (on palms), Brunei. See Goh & Hyde (*Mycotaxon* 69: 145, 1998).
- Polycarpella** Theiss. & Syd. (1918) = *Muellerella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

polycarpic (of *Exobasidium* infections), systemic (or circumscribed) and perennial (Nannfeldt, 1981: 15); cf. monocarpic.

Polycarpum Stempel [not traced] nom. dub., Fungi. Protozoa or fungi.

Polycauliona Hue (1908) = *Caloplaca* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Kärnefelt (*Cryptog. Bryol.-Lichénol.* 19: 93, 1998), Arup & Mayrhofer (*Lichenologist* 32: 359, 2000).

Polycellaesporonites A. Chandra, R.K. Saxena & Setty (1984), Fossil Fungi. 1, Arabian Sea.

Polycellaria H.D. Pflug (1965), Fossil Fungi. 1 (Tertiary), USA.

polycentric, having a number of centres of growth and development and more than one reproductive organ, as in the *Cladochytriaceae* (Karling, *Mycol.* 36: 528, 1934); see monocentric; cf. reproductocentric.

Polycephalomyces Kobayasi (1941), anamorphic *Berkelella*, Hs0.0eH.15. 6, widespread. See Seifert (*Stud. Mycol.* 27: 168, 1985; key), Bischoff *et al.* (*Mycotaxon* 86: 433, 2003; phylogeny), Stensrud *et al.* (*MR* 109: 41, 2005; phylogeny).

polycephalous, many-headed.

Polycephalum Kalchbr. & Cooke (1880) nom. dub., Predibacteria. See Seifert (*TBMS* 85: 123, 1985).

Polychaetella Speg. (1918), anamorphic *Capnodium*, Hso.?.?. 3, Europe; N. America. See Sutton (*Mycol. Pap.* 141, 1977).

Polychaeton (Pers.) Lév. (1846) nom. dub., ? Capnodiaceae. 8. See Hughes (*Mycol.* 68: 693, 1976), Sutton (*Mycol. Pap.* 141, 1977; nomencl.), Sharma & Singh (*Acta Bot. Indica* 24: 117, 1997; citrus sooty mould), Manoharachary *et al.* (*Journal of Mycology and Plant Pathology* 33: 212, 2003; India).

Polychidium (Ach.) Gray (1821), Massalongiaceae (L). 6, widespread. See Henssen (*Symb. bot. upsal.* 18 no. 1, 1963), Burgaz & Martínez (*Nova Hedwigia* 73: 381, 2001; Iberian peninsula), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Xiao *et al.* (*Lichenology* 5: 53, 2006; China), Wedin *et al.* (*Lichenologist* 39: 61, 2007; n. fam.).

polychotomous, having an apex dividing simultaneously into more than two branches (Corner, 1950).

Polychytrium Ajello (1942), Cladochytriaceae. 1, USA; Brazil.

Polycladium Ingold (1959), anamorphic *Pezizomycotina*, Hso.1bH.1. 1 (aquatic), British Isles. See Ingold (*TBMS* 42: 114, 1959).

Polyclypeolina Bat. & I.H. Lima (1959), Aulographaceae. 1, Uganda. See Batista & Lima (*Publicações Inst. Micol. Recife* 56: 457, 1959).

Polyclypeolum Theiss. (1914) = *Schizothyrium* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).

Polycoccum Saut. ex Körb. (1865), Dacampiaceae. Anamorph *Cyclothyrium*. c. 49 (on lichens), widespread. See Hawksworth & Diederich (*TBMS* 90: 293, 1988; key 23 spp.), van der Aa (*Stud. Mycol.* 31: 15, 1989; anamorph), Kocourková & Berger (*Czech Mycol.* 51: 171, 1999), Atienza *et al.* (*Lichenologist* 35: 125, 2003; Spain, key).

Polycornum Malcolm & Vězda (1995), Porinaceae (L). 1, New Zealand. See McCarthy & Malcolm (*Lichenologist* 29: 1, 1997), McCarthy (*Bibliotheca Lichenol.* 87, 2003; nomenclator).

Polycyclina Theiss. & Syd. (1915), Parmulariaceae. 1, S. America.

Polycyclinopsis Bat., A.F. Vital & I.H. Lima (1958),

Microthyriaceae. 1, Brazil. See Batista *et al.* (*Revta Biol. Lisb.* 1: 284, 1958).

Polycyclus Höhn. (1909), Parmulariaceae. 2, S. America. See Petrak (*Sydowia* 4: 533, 1950).

Polycystis Lév. (1846) nom. rej. = *Urocystis* fide Vánky (*in litt.*).

Polycytella C.K. Campb. (1987) = *Scedosporium* fide Campbell (*J. Med. Vet. Mycol.* 25: 302, 1987), Borman *et al.* (*Medical Mycology* 44: 33, 2006).

polydactyloid venation, see veins.

Polydesmia Boud. (1885), Hyaloscyphaceae. Anamorph *Brefeldochium*. 7, widespread. See Korf (*Mycotaxon* 7: 457, 1978), Raitviir & Galán (*Mycotaxon* 53: 447, 1995; key), Huhtinen & Santesson (*Lichenologist* 29: 205, 1997), Zhuang (*Mycotaxon* 72: 325, 1999), Zhuang (*Mycol.* 92: 593, 1999), Verkley (*Nova Hedwigia* 80: 503, 2005; anamorph).

Polydesmus Mont. (1845), anamorphic *Pezizomycotina*. 7. See Hernández-Gutiérrez & Sutton (*MR* 101: 201, 1997), Shoemaker & Hambleton (*CJB*: in press, 2001), Shoemaker & Hambleton (*CJB* 79: 592, 2001).

Polydiscidium Wakef. (1934), Helotiaceae. 1, Guyana; Africa. See Dennis (*Bull. Jard. bot. Brux.* 31: 154, 1961).

Polydiscina Syd. (1930), ? Helotiales. 1, Bolivia.

Polydispyrenia E.U. Canning & E.I. Hazard (1982), Microsporidia. 1.

polyenergic, coenocytic.

Polyetron Bat. & Peres (1963), anamorphic *Pezizomycotina*, Cpt.0-1eH-P.?. 1, Brazil. See Batista & Peres (*Publicações Inst. Micol. Recife* 394: 6, 1963).

Polygaster Fr. (1823) nom. dub., ? Agaricales. ? 'gasteromycetes'.

Polyhyphaethyrites R. Srivast. & R.K. Kar (2004), Fossil Fungi, Ascomycota. 1, India. See Srivastava & Kar (*Curr. Sci.* 87: 867, 2004).

Polylagenochromatia Sousa da Câmara (1929) ? = *Polystigmina* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Polylobatispora Matsush. (1996), anamorphic *Pezizomycotina*, Hso.?.?. 2, Malaysia. See Matsushima (*Matsush. Mycol. Mem.* 9: 21, 1996).

Polymarasmius Murrill (1915) = *Marasmius* fide Singer (*Agaric. mod. Tax.*, 1951).

Polymeridium (Müll. Arg.) R.C. Harris (1980), Trypetheliaceae (L). 19, widespread (esp. tropical). See Harris (*Bolm Mus. paraense 'Emílio Goeldi' sér. bot.* 7: 619, 1993; key), Aptroot *et al.* (*Bibliotheca Lichenol.* 97, 2008; Costa Rica).

polymorphic, having different forms; pleomorphic.

polymorphic species, species with a series of intergrading morphological features; e.g. resulting from inbreeding or automictic sexual reproduction.

Polymorphomyces Coupin (1914) = *Geotrichum* fide Kendrick & Carmichael in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 390, 1973).

Polymorphum Chevall. (1822), anamorphic *Ascodichaena*, St.0eH/1eP.1. 1, widespread (temperate). See Hawksworth & Punithalingam (*TBMS* 60: 501, 1973), Hawksworth (*Taxon* 32: 212, 1983; nomencl.).

Polymyces Battarra ex Earle (1909) = *Armillaria*.

Polynema Lév. (1846), anamorphic *Clavicipitaceae*, Ccu.1eH/1eP.15. 8, widespread. See Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993), Vujanovic *et al.* (*Mycol.* 91: 136, 1999; n.sp. from Canada).

Polyopeus A.S. Horne (1920) = *Phoma* Sacc. fide Boerema & Dorenbosch (*Persoonia* 6: 49, 1970), Gruyter *et al.* (*Persoonia* 18: 1, 2002).

Polyorus, see *Polyozus*.

polyoxin antibiotics, inhibit chitin synthesis, e.g. polyoxin D inhibits synthetase formation (Endo *et al.*, *J. Bact.* 104: 189, 1970).

Polyozellus Murrill (1910), Thelephoraceae. 1, USA; Japan. See Imazeki (*Mycol.* 45: 555, 1953), Bigelow (*Mycol.* 70: 707, 1978), Yang (*Zhongguo Shiyongjun* 11: 1 [unnumbered page], 1992; edibility).

Polyozosia A. Massal. (1855) = *Lecania* fide Hafellner (*Beih. Nova Hedwigia* 79: 214, 1984).

Polyozus P. Karst. (1881) = *Tremellodendropsis* fide Donk (*Persoonia* 4: 184, 1966).

Polypaecilum G. Sm. (1961), anamorphic *Thermoascus*, Hso.0eH.19. 3, widespread. See Piontelli *et al.* (*Bol. Micol.* 4: 155, 1989; hyalohyphomycosis caused by *P. insolitum*).

Polypedia Bat. & Peres (1959), Micropeltidaceae. 1, Brazil. See Batista & Peres (*Atti Ist. bot. Univ. Lab. crittog. Pavia sér. 5* 16: 118, 1959).

Polypera Pers. (1818) = *Pisolithus*.

polyphagous, see polyphagy.

Polyphagus Nowak. (1877), Chytridiaceae. c. 9, widespread. See Bartch (*Mycol.* 37: 553, 1945).

polyphagy (adj. **polyphagous**), see monophagy.

polyphialidic (of a conidiogenous cell), having more than one conidiogenous locus at which conidia are produced. Cf. monophialidic.

Polyphlyctis Karling (1968), Chytridiaceae. 1 or 2, widespread. See Karling (*Sydowia* 20: 86, 1966).

polyphyllous (of foliose lichen thalli), having many connected leaf-like lobes.

Polypilus P. Karst. (1881) = *Grifola*.

polyplanetism, sequence of two or more motile flagellate phases with interspersed mobile aplanosporic phases in the zoosporic part of the life history; the aplanosporic phase may be naked or as a walled cyst; motile phases may be monomorphic or dimorphic.

Polyplocium Berk. (1843) = *Gyrophragmium* fide Zeller (*Mycol.* 35: 409, 1943).

polyploidy (in fungi), see Chromosome numbers.

Polyporaceae Fr. ex Corda (1839), Polyporales. 92 gen. (+ 79 syn.), 636 spp.

Lit.: Pilát (*Atlas Champ. Eur. III Polyporaceae* 1, 1936; Europe), Pilát (*Atlas Champ. Eur. III Polyporaceae* 2, 1942; Europe), Donk (*Reinwardtia* 1, 1951; gen. lists), Bondartsev (*Polyporaceae of European Russia and the Caucasus*), 1953; former USSR), Corner (*Ann. Bot. Mem.* [A monograph of *Clavaria* and allied genera, addenda] 17: 152, 1953; construction of polypores), Overholts (*Polyporaceae of the United States, Alaska, & Canada*, 1953; N. America), Nobles (*CJB* 40: 987, 1958; cultural characters), Cooke (*Lloydia* 22: 163, 1959), Lowe & Gilbertson (*J. Elisha Mitchell scient. Soc.* 77: 43, 1961; keys gen., 293 spp. S.E. USA), Teixeira (*Biol. Rev.* 37: 51, 1962; taxon. rev.), Jahn (*Westfäl. Pilzbr.* 4, 1963; C. Eur.), Lowe (*Mycol.* 55: 1, 1963; rev.), Cunningham (*Polyporaceae of New Zealand* [*N.Z. Dep. sci. industr. Res. Bull.* 164], 1965; Trinidad & Tobago), Fidalgo & Fidalgo (*Mycol.* 58: 862, 1967; former USSR), Boquieren (*Mycol.* 63: 937, 1971; as *Epitheliaceae*), Domanski (*Fungi, Polyporaceae* 2 vols, 1972-73; [Engl. transl.]), Ryvarden (*Norw. Jl Bot.* 19: 229, 1972; E. Africa checklist), Pegler (*The polypores* [*Bull. BMS Suppl.*], 1973; key 123 gen., Brit.

spp.), Donk (*Checklist of European polypores* [*Verh. K. ned. Akad. Wet.* 62], 1974; Europe), Nuss (*Bibliotheca Mycol.* 45, 1975; ecology, sporulation), Ryvarden (*The Polyporaceae of North Europe* 1, 1976; Europe), Martin & Gilbertson (*Mycotaxon* 7: 337, 1978; key 99 wood-rotting spp. N. America), Ryvarden (*The Polyporaceae of North Europe* 2, 1978; New Zealand), Ryvarden (*TBMS* 73: 9, 1979; as *Grammotheleaceae*), Nuss (*Hoppea* 39: 127, 1980; structure, taxonomy), Ryvarden & Johansen (*A preliminary polypore flora of East Africa*, 1980; Europe), Corner (*Ad Polyporaceae I* [Beih. Nova Hedwigia] 75, 1983), Corner (*Ad Polyporaceae II* [Beih. Nova Hedwigia] 75, 1983; N. America), Corner (*Ad Polyporaceae III* [Beih. Nova Hedwigia] 78: 92, 1984), Gilbertson & Ryvarden (*N. Amer. Polypores* 2 vol., 1986-7; E. Africa), De (*Int. J. Mycol. Lichenol.* 4: 59, 1989; as *Epitheliaceae*), Pouzar (*Česká Mykol.* 44: 92, 1990; as *Haplopilaceae*), Hibbett & Donoghue (*CJB* 73: S853, 1995; as *Haplopilaceae*), Vampola & Pouzar (*Czech Mycol.* 48: 315, 1996; as *Haplopilaceae*), Quanten (*Op. bot. Belg.* 11: 352 pp., 1997; as *Grammotheleaceae*), Ginns (*Mycol.* 90: 19, 1998; as *Epitheliaceae*), Chang & Chou (*MR* 103: 674, 1999; as *Haplopilaceae*), Ko & Jung (*Antonie van Leeuwenhoek* 75: 191, 1999), Parmasto & Hallenberg (*Karstenia* 40: 129, 2000), Rajchenberg (*Karstenia* 40: 143, 2000; as *Haplopilaceae*), Caranza & Ruiz-Boyer (*Harvard Pap. Bot.* 6: 57, 2001), Hibbett & Donoghue (*Syst. Biol.* 50: 215, 2001), Kim & Jung (*Mycobiology* 29: 73, 2001), Ko *et al.* (*Mycol.* 93: 270, 2001; as *Haplopilaceae*), Loguercio-Leite & Gonçalves (*Mycotaxon* 79: 285, 2001; as *Haplopilaceae*), Binder & Hibbett (*Mol. Phylogen. Evol.* 22: 76, 2002; as *Haplopilaceae*), Dai *et al.* (*Ann. bot. fenn.* 39: 169, 2002), Hong *et al.* (*Mycol.* 94: 823, 2002), Ko & Jung (*Mol. Phylogen. Evol.* 23: 112, 2002), Ko & Jung (*Mycotaxon* 82: 315, 2002), Moncalvo *et al.* (*Mol. Phylogen. Evol.* 23: 357, 2002), Decock & Ryvarden (*MR* 107: 94, 2003), Greslebin & Rajchenberg (*N.Z. Jl Bot.* 41: 437, 2003; as *Epitheliaceae*), Kotlaba & Pouzar (*Czech Mycol.* 55: 7, 2003; as *Grammotheleaceae*), Silveira *et al.* (*MR* 107: 597, 2003), Suhara *et al.* (*Mycotaxon* 86: 335, 2003; as *Haplopilaceae*), Valderrama *et al.* (*Antonie van Leeuwenhoek* 84: 289, 2003), Krüger & Gargas (*Feddes Repert.* 115: 530, 2004), Piątek *et al.* (*Acta Mycologica Warszawa* 39: 25, 2004; as *Haplopilaceae*), Tomšovský & Homolka (*Nova Hedwigia* 79: 425, 2004), Binder *et al.* (*Systematics and Biodiversity* 3: 113, 2005).

Polyporales Gäum. (1926). Agaricomycetes. 13 fam., 216 gen., 1801 spp. Fams:

- (1) **Cystostereaceae**
- (2) **Fomitopsidaceae**
- (3) **Ganodermataceae**
- (4) **Grammotheleaceae**
- (5) **Limnoperdaceae**
- (6) **Meripilaceae**
- (7) **Meruliaceae**
- (8) **Phanerochaetaceae**
- (9) **Polyporaceae**
- (10) **Sparassidaceae**
- (11) **Steccherinaceae**
- (12) **Tubulicrinaceae**
- (13) **Xenasmataceae**

Lit.: Ryvarden (*Genera of polypores* [*Synopsis Fungorum* 5], 1991), Teixeira (*Genera of Polypo-*

- raceae*, an objective approach [Bol. Chácara Bot. Itu 1], 1994), and under fams.
- Polyporasclerotes** Stach & Pickh. (1957), Fossil Fungi. 1 (Carboniferous), Germany.
- polypore**, one of the *Polyporaceae*.
- Polyporellus** P. Karst. (1879) = *Polyporus* P. Micheli ex Adans. fide Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974).
- Polyporisporites** Hammen (1954), Fossil Fungi. 1 (Cretaceous – Paleogene), Colombia.
- Polyporites** Daugherty (1941), Fossil Fungi. 1 (Triassic), USA.
- Polyporites** Lindl. & Hutton (1833), Fossil Fungi. 12 (Carboniferous to Quaternary), Europe; USA.
- Polyporoletus** Snell (1936), Albatrellaceae. 1, N. & S. America. See Gilbertson & Ryvarden (*N. Amer. Polyp.* 2: 636, 1987).
- Polyporus** (Pers.) Gray (1821) = *Laetiporus* fide Donk (*Persoonia* 1: 263, 1960).
- Polyporus** P. Micheli ex Adans. (1763), *Polyporaceae*. 26 (mostly on wood), widespread. The sclerotoid anamorph (*Myliitta australis*) of *P. myliittae* is 'black-fellows' bread of Australia. See Stahl (*Bibliotheca Mycol.* 50, 1970; genetics sporocarp formation *P. ciliatus*), Pouzar (*Česká Mykol.* 26: 82, 1972), Ryvarden (*Polyp. N. Eur.* 2: 378, 1978; key 8 Eur. spp.), Nuss (*Hoppea* 39: 127, 1980), Corner (*Beih. Nova Hedwigia* 78: 12, 1984; key subgen. classif.), Núñez & Ryvarden (*Syn. Fung.* 10: 33, 1995; world monogr.), Ko & Jung (*Mycotaxon* 82: 315, 2002; phylogenetic evaluation of *Polyporus s. str.*), Silveira & Wright (*MR* 106: 1323, 2002; southern S. Am. spp, mating tests), Silveira *et al.* (*MR* 107: 597, 2003; southern S. Am. spp, isoenzyme analysis), Krüger & Gargas (*Feddes Repert.* 115: 530, 2004; phylogeny).
- Polyporus** Pers. (1821) = *Laetiporus*.
- Polypyrenula** D. Hawksw. (1985), Requienellaceae. 1, West Indies. See Aptroot (*Bibliotheca Lichenol.* 44, 1991; posn in *Pyrenulaceae*).
- Polyrhina** Sorokin (1876) = *Harposporium* fide Karling (*Mycol.* 30: 512, 1938).
- Polyrhizium** Giard (1889) ? = *Cladosporium* fide Petch (*TBMS* 19: 190, 1935).
- Polyrhizon** Theiss. & Syd. (1914), ? *Venturiaceae*. 2, India; S. Africa.
- Polysaccopsis** Henn. (1898) = *Urocystis* fide Vánky (*Illustrated genera of smut fungi*, 1987).
- Polysaccum** F. Desp. & DC. (1807) = *Pisolithus* fide Stalpers (*in litt.*).
- Polyschema** H.P. Upadhyay (1966), anamorphic *Pezizomycotina*, Hso. = eP.24/27. 17, widespread. See Ellis (*More Dematiaceous Hyphomycetes*, 1976), Castañeda Ruíz *et al.* (*Mycotaxon* 57: 451, 1996), Castañeda Ruíz *et al.* (*Cryptog. Mycol.* 21: 215, 2000; Cuba).
- Polyschistes** J. Steiner (1898) = *Diploschistes* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Polyscytalina** Arnaud (1954), anamorphic *Pezizomycotina*, Hso.1eP.3. 1, France. *P. pustulans* (syn. *Oospora pustulans*), skin spot of potato tubers. See Ciferri & Caretta (*Mycopathologia* 16: 304, 1962), Holubová-Jechová (*Fol. Geobot. Phyt. Praha* 13: 433, 1976; synonym of *Hormiactella*).
- Polyscytalum** Riess (1853), anamorphic *Pezizomycotina*, Hso.0-1eH.3. 12, widespread. See Sutton & Hodges (*Nova Hedwigia* 28: 487, 1976), Crous *et al.* (*MR* 110: 264, 2006; key), Crous *et al.* (*Stud. Mycol.* 58: 185, 2007; phylogeny).
- polysidia**, specialized dual vegetative propagules in certain *Pyxine* spp. formed in depressions at the tips of coral-like structures (**polysidiangia**) which recall isidia but are not themselves propagules (Kalb, *Bibl. Lich.* 24, 1987).
- Polyspora** Laff. (1921) [non *Polyspora* Sweet ex Don 1831, *Theaceae*] = *Aureobasidium* fide Hermanides-Nijhof (*Stud. Mycol.* 15: 141, 1977).
- Polysporella** Woron. (1916), Fungi. See Voronikhin (*Izvestiya Kavkazskago Muzeya* 10: 7, 1916).
- Polysporidiella** Petr. (1960), Dothideomycetes. 1, Iran. See Petrak (*Sydowia* 14: 355, 1960).
- Polysporidium** Syd. & P. Syd. (1908) = *Guignardia* fide Eriksson (*SA* 5: 197, 1986).
- Polysporina** Vězda (1978) nom. cons., *Acarosporaceae* (L). 9, widespread. See Kantvilas (*Lichenologist* 30: 551, 1998), Lutzoni *et al.* (*Am. J. Bot.* 91: 1446, 2004; phylogeny), Reeb *et al.* (*Mol. Phylogen. Evol.* 32: 1036, 2004; phylogeny), Knudsen (*Opuscula Philolichenum* 2: 17, 2005; USA), Crewe *et al.* (*MR* 110: 521, 2006; phylogeny), Kantvilas & Seppelt (*Lichenologist* 38: 109, 2006; Antarctica), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Polysporinopsis** Vězda (2002) = *Acarospora* fide Vězda (*Lichenes Rariores Exsiccati* 48: 2, 2002), Crewe *et al.* (*MR* 110: 521, 2006).
- polysporous**, many-spored.
- Polystema** Raf. (1815) nom. dub., Fungi. No spp. included.
- Polystictaceae** Rea (1922) = *Hymenochaetaceae*.
- Polystictoides** Lázaro Ibiza (1916) = *Inonotus*.
- Polystictus** Fr. (1851) = *Coltricia*.
- Polystigma** DC. (1815), *Phyllachoraceae*. Anamorph *Rhodosticta*. 24 (living leaves of *Rosaceae*), widespread (temperate). See Hyde & Cannon (*Aust. Syst. Bot.* 5: 415, 1992), Cannon (*MR* 100: 1409, 1996; monogr.), Cannon & Evans (*MR* 103: 577, 1999).
- Polystigmataceae** Höhn. ex Nannf. (1932) = *Phyllachoraceae*.
- Polystigmatales** = *Phyllachorales*.
- Polystigmella** Jacz. & Natalina (1931) = *Polystigma* fide Cannon (*in litt.*), Cannon (*MR* 100: 1409, 1996; monogr.).
- Polystigmina** Sacc. (1884), anamorphic *Polystigma*, St.OffH.10. 2 (on *Rosaceae*), Europe. See Cannon (*MR* 100: 1409, 1996; monogr. teleom.).
- Polystigmites** A. Massal. (1857), Fossil Fungi. 1 (Miocene), Italy.
- Polystoma** Gray (1821) = *Myriostoma*.
- Polystomella** Speg. (1888) = *Dothidella* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962), von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Polystomellaceae** Theiss. & P. Syd. (1915), ? *Dothideomycetes* (inc. sed.). 3 gen. (+ 5 syn.), 9 spp. *Lit.*: Swart (*TBMS* 89: 483, 1987).
- Polystomellina** Bat. & A.F. Vital (1958), ? *Microthyriaceae*. 1, Brazil. See Batista & Vital (*Revta Biol. Lisb.* 1: 280, 1958).
- Polystomellomyces** Bat. (1959), anamorphic *Pezizomycotina*, Cpd.0eH.?. 1, Greece. See Batista (*An. Soc. Biol. Pernambuco* 16: 148, 1959).
- Polystomellopsis** F. Stevens (1923), *Dothideomycetes*. 1, S. America. See Ciferri & Batista (*Ann. Soc. Biol. Pernambuco* 14: 79, 1956).
- Polystratorictus** Matsush. (1993), anamorphic *Pezizomycotina*, Hso. = eP.15. 2, Peru. See Matsushima (*Matsush. Mycol. Mem.* 7: 62, 1993).

- Polystroma** Fée (1824) = *Polistroma*.
- Polysynnema** Constant. & Seifert (1988), anamorphic *Pezizomycotina*, Hsy.0eH.10. 1, Hawaii; Grenada. See Constantinescu & Seifert (*TBMS* 90: 332, 1988).
- Polythecium** Bonord. (1861) = *Fusicoccum* fide Saccardo (*Syll. fung.* 3: 1, 1884).
- Polythelis** Arthur (1906) = *Tranzschelia* fide Arthur (*Manual Rusts US & Canada*, 1934).
- Polythelis** Clem. (1909) = *Polypyrenula*.
- Polythrinciella** Bat. & H. Maia (1960), anamorphic *Pezizomycotina*, Hsp.1eP.?. 1, Brazil. See Batista & Maia (*Publicações Inst. Micol. Recife* 283: 20, 1960).
- Polythrinciopsis** J. Walker (1966), anamorphic *Pezizomycotina*, Hso.1eH.10. 1, Australia.
- Polythricium** Kunze (1817), anamorphic *Mycosphaerella*, Hso.1eP.10. 1 (on *Trifolium*), widespread (temperate).
- Polythyrium** Syd. (1929) = *Neostomella* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Polytolypa** J.A. Scott & Malloch (1993), ? *Ajellomycetaceae*. 1 (coprophilous), Canada. See Scott *et al.* (*Mycol.* 85: 503, 1993), Untereiner *et al.* (*Stud. Mycol.* 47: 25, 2002; phylogeny), Untereiner *et al.* (*Mycol.* 96: 812, 2004).
- polytomous**, dividing into many branches, usually at one node or point.
- polytretic**, see *tretic*.
- Polytretophora** Mercado (1983), anamorphic *Pezizomycotina*, Hso.1eP.27. 2, Cuba; S.E. Asia. See Kutubutheen & Nawawi (*MR* 95: 623, 1991), Whitton *et al.* (*Mycoscience* 42: 555, 2001).
- Polytrichia** Sacc. (1882) = *Pyrenophora* fide von Arx & Müller (*Stud. Mycol.* 9, 1975), Sivanesan (*Mycol. Pap.* 158: 261 pp., 1987).
- Polytrichiella** M.E. Barr (1972) = *Capronia* fide Müller *et al.* (*TBMS* 88: 63, 1987).
- polyxeny**, see *pleioxeny*.
- Pomatomyces** Oerst. (1864) = *Thekopsora* fide Sydow & Sydow (*Monogr. Ured.*, 1915) Anamorph name for (I).
- Pompholyx** Corda (1834) = *Scleroderma* fide Guzmán (*Darwiniana* 16: 270, 1970).
- Pontecorvo** (Guido; 1907-1999; Italy). Undergraduate (1924-1928) then postgraduate student, Pisa University; Agricultural Advisory Service, Tuscany (-1938); left Italy in 1938 anticipating anti-Semitism; PhD, Edinburgh University (c. 1938-1940); Academic staff (1941-1952), then Reader (1952-1955), then Professor of Genetics (1955-1968), Glasgow University; Honorary Director, UK Medical Research Council Unit of Cell Genetics (1966-1968); Royal Society (1955). Noted for his work on genetics, at first with the insect *Drosophila* then, as a pioneer in mycology, with *Emericella nidulans* (anamorph *Aspergillus nidulans*), and finally with human genetics. His review of *Aspergillus* genetics became a handbook for the science, and he proposed the term 'parasexual cycle'. *Publs.* (with Roper, Hemmons, Macdonald & Bufton) *The genetics of Aspergillus nidulans. Advances in Genetics* 5: 141, 1953). *Biogs, obits etc.* Roper (*MR* 104 (10): 1276, 2000).
- Pontogeneia** Kohlm. (1975), *Pezizomycotina*. 7 (marine), widespread. See Kohlmeyer & Kohlmeyer (*Marine Mycology*, 1979), Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 34: 1, 1991).
- Pontomyxa** Topsent (1892), *Hydromyxa*les. q.v.
- Pontoporeia** Kohlm. (1963) = *Zopfia* fide Malloch & Cain (*CJB* 50: 61, 1972).

Population biology. The study of patterns of distribution and variation in space and time within fungal species and the interpretation of these patterns in terms of genetic, developmental and environmental influences on phenotype and modes of proliferation. Some means of distinguishing between individual population components is necessary, and this can cause difficulties in view of the indeterminacy (indefinite growth potential) and capacity of anastomosis of fungal mycelia. However, it is usually possible to determine whether fungal samples have the same or different genetic origins (i.e. arise from the same or different 'genets') on the basis of somatic and/or sexual incompatibility, phenotypic differences (including isoenzyme polymorphism) or DNA polymorphisms. The latter are sometimes regarded as most definitive in that they do not depend on gene expression. However, they can be relatively expensive to detect, and identify differences and similarities at varied levels of resolution which may or may not be correlated with 'biological' entities or groups.

Often a variety of approaches is needed before deciding on which, or which combination, of the above approaches resolves population components at the level most appropriate to the biological question being addressed. Once population components have been located, their distribution can be quantified by mapping their extent and varied content within regional boundaries. The resulting information can help provide meaningful answers to fundamentally important questions concerning where the organisms (and their offspring) are and what they do there, how they arrived, whether they will persist and how they are likely to change in character and/or distribution. It is also vital for assessment of the levels at which population variation should be recognized for taxonomic purposes.

Distributional patterns in fungal populations can be interpreted in terms of resource relationships, modes of development and modes of reproduction. Resource relationships, the ways in which fungi interact with those non-living or living materials (substrata, hosts) which provide them with a source of organic nutrients, are determined both by selective influences and by the mode of fungal arrival (propagules or migratory mycelium) at colonization sites. Genets capable of arriving only as propagules have 'resource-unit-restricted' regional boundaries; those with migratory mycelium are 'non-unit-restricted' and can become very large. At the individual level, the heterogeneity of microenvironmental conditions encountered by a fungal genet may be reflected in the range of developmental modes or alternative phenotypes that it produces, allowing it to vary functional role with circumstances. At the population level, whether reproduction is clonal (non-recombinatorial) or diversifying (recombinatorial) may partly reflect habitat heterogeneity. The abilities of fungi to vary both their developmental pattern and degree of commitment to clonal and recombinatorial modes of reproduction has important implications for understanding gene flow and genetic and epigenetic diversity within and between populations. These abilities are also a crucial consideration when attempting to predict or interpret the evolutionary responses of fungi to environmental change.

In the fungi, work on mathematical modelling of populations has concentrated on attempts to predict

- outbreaks of plant diseases. See Bearchell *et al.* (*Proc. nat. acad. sci.* **102**: 5438, 2005), Gilligan & Kleczkowski (*Philosophical trans.: biol. sci.* **352**: 591, 1997).
- Lit.*: Brasier (*Adv. Pl. Pathol.* **5**: 53, 1986, *Nature* **332**: 438, 1988), Carroll & Wicklow (Eds) (*The fungal community*, edn 2, 1992), Jacobson *et al.* (*PNAS* **90**: 9159, 1993), McDonald *et al.* (*Ann. Rev. Phytopathol.* **27**: 77, 1989), Rayner (*Mycol.* **83**: 48, 1991, *Ann. Rev. Phytopathol.* **29**: 305, 1993), Rayner & Todd (*Adv. Bot. Res.* **7**: 333, 1979), Smith *et al.* (*Nature* **356**: 428, 1992).
- pore** (1) a small opening, as in tretic (q.v.) conidiogenesis; (2) in -fungi (*Polyporaceae* and *Boletaceae*), the mouth of a tube.
- Poria** Adans. (1763) = *Polyporus* P. Micheli ex Adans. fide Decock & Stalpers (*Taxon* **55**: 759, 2006; syn. of *Albatrellus*).
- Poria** P. Browne (1756) = *Polyporus* P. Micheli ex Adans.
- Poria** Pers. (1794) = *Perenniporia* fide Decock & Stalpers (*Taxon* **55**: 227, 759, 2006).
- Poriaceae** Locq. (1957) = *Polyporaceae*.
- Poriales** = *Polyporales*.
- poricidal** (of asci), see ascus.
- poricin**, an antitumour antibiotic from *Poria corticola* (Ruelius *et al.*, *Arch. Biochem. Biophys.* **125**: 126, 1968).
- poriform**, pore-like.
- Porina** Ach. (1809) nom. cons., *Porinaceae*. c. 336, widespread (esp. tropical). See Meylan (*Bulletin de la Société Vaudoise des Sciences Naturelles* **57** no. 228: 359, 1932; Ecuador), Singh (*Revue Bryol. Lichenol.* **37**: 973, 1971; India), Janex-Favre (*Cryptog. Bryol.-Lichénol.* **2**: 253, 1981; ontogeny), McCarthy (*Bibliotheca Lichenol.* **52**, 1993; S. Hemisph. saxicolous spp., S hemisphere), McCarthy (*Nova Hedwigia* **59**: 509, 1994; corticolous spp., Australia), McCarthy (*Nova Hedwigia* **58**: 391, 1994; corticolous spp., Australia), Makhija *et al.* (*J. Econ. Taxon. Bot.* **18**: 521, 1994; India), Malcolm *et al.* (*Mycotaxon* **55**: 353, 1995; Australasia), Lücking (*Bot. Acta* **109**: 248, 1996; *P. rufula* aggr.), McCarthy (*Taxon* **45**: 533, 1996; nomencl.), McCarthy (*Lichenologist* **29**: 229, 1997; Australia), McCarthy & Malcolm (*Lichenologist* **29**: 1, 1997; generic limits), Lücking & Vezda (*Willdenowia* **28**: 181, 1998; *P. epiphylla* aggr.), McCarthy (*Lichenologist* **31**: 239, 1999; Thailand), McCarthy (*Lichenologist* **32**: 1, 2000; key saxicolous spp.), McCarthy (*Bibliotheca Lichenol.* **87**, 2003; checklist), Grube *et al.* (*MR* **108**: 1111, 2004; phylogeny), Lücking (*Bibliotheca Lichenol.* **88**: 409, 2004; key foliicolous spp.), Baloch & Grube (*MR* **110**: 125, 2006; phylogeny), Sérusiaux *et al.* (*Lichenologist* **39**: 15, 2007; Macaronesia, key).
- Porina** Müll. Arg. (1883) = *Pertusaria*.
- Porinaceae** Rchb. (1828), *Ostropales*. 4 gen. (+ 6 syn.), 378 spp.
- Lit.*: McCarthy (*Nova Hedwigia* **59**: 509, 1994), Hafellner & Kalb (*Bibliotheca Lichenol.* **57**: 161, 1995), Lücking (*Bot. Acta* **109**: 248, 1996), McCarthy & Elix (*Lichenologist* **28**: 402, 1996), Aptroot *et al.* (*Bibliotheca Lichenol.* **64**: 220 pp., 1997), Lücking & Ferraro (*Lichenologist* **29**: 217, 1997), McCarthy & Malcolm (*Lichenologist* **29**: 1, 1997), Lücking (*Trop. Bryol.* **15**: 45, 1998), Lücking & Vezda (*Willdenowia* **28**: 181, 1998), Lücking & Cáceres (*Lichenologist* **31**: 349, 1999), McCarthy & Kantvilas (*Lichenologist* **32**: 247, 2000; Tasmania, biogeogr.), McCarthy (*Flora of Australia* **58** A: 242 pp., 2001), Grube *et al.* (*MR* **108**: 1111, 2004), Lücking (*Bibliotheca Lichenol.* **88**: 409, 2004), Lücking & Cáceres (*MR* **108**: 571, 2004), Baloch & Grube (*MR* **110**: 125, 2006).
- Porinella** R. Sant. (2004) = *Caprettia* fide Vězda (*Acta Musei Richnoviensis Sect. Natur.* **11**: 62, 2004), Galloway (*Flora of New Zealand. Lichens* edn 2 **1**, 2007).
- Porinopsis** Malme (1928) = *Aspidothelium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Porinula** (Nyl. ex Hue) Flagey (1896) = *Porina* Müll. Arg. fide Galloway (*Flora of New Zealand. Lichens* edn 2 **1**, 2007).
- Porinula** Vězda (1975) nom. illeg. = *Caprettia* fide Harris in Hafellner & Kalb (*Bibliotheca Lichenol.* **57**: 161, 1995), Sérusiaux & Lücking (*Bibliotheca Lichenol.* **86**: 161, 2003), Galloway (*Flora of New Zealand. Lichens* edn 2 **1**, 2007).
- Poriodontia** Parmasto (1982), *Schizoporaceae*. 1, former USSR. See Parmasto (*Mycotaxon* **14**: 103, 1982).
- Poroauricula** McGinty (1917) = *Favolaschia* fide Donk (*Persoonia* **1**: 173, 1960).
- Porobeltraniella** Gusmão (2004), anamorphic *Pezizomycotina*. 2. See Gusmão (*Mycol.* **96**: 151, 2004).
- Porocladium** Descals (1976), anamorphic *Pezizomycotina*, Hso.1bH.24. 1 (aquatic), British Isles. See Descals (*TBMS* **67**: 211, 1976).
- poroconidium**, see tretic.
- Poroconiochaeta** Udagawa & Furuya (1979) = *Coniochaeta* fide Udagawa & Furuya (*TMSJ* **20**: 5, 1979), Læssøe (*SA* **13**: 43, 1994; posn), García *et al.* (*Mycol.* **95**: 525, 2003; Russia), García *et al.* (*MR* **110**: 1271, 2006; phylogeny), Zhang *et al.* (*Mycol.* **98**: 1076, 2006; phylogeny).
- Porocyphaceae** Körb. (1855) = *Lichinaceae*.
- Porocyphus** Körb. (1855), *Lichinaceae* (L.). 8, widespread. See Henssen (*Symb. bot. upsal.* **18** no. 1, 1963), Schultz & Büdel (*Lichenologist* **34**: 39, 2002; key).
- Porodaedalea** Murrill (1905), *Hymenochaetaceae*. 10, widespread. See Fiasson & Niemalä (*Karstenia* **24**: 14, 1984).
- Porodiscella** Viégas (1944) ? = *Xylaria* Hill ex Schrank fide Læssøe (*SA* **13**: 43, 1994).
- Porodisculaceae** Jülich (1982) = *Polyporaceae*.
- Porodisculus** Murrill (1907), *Fistulinaceae*. 1, USA. See Ginns (*CJB* **75**: 220, 1997; systematics, cultural characters *Porodisculus pendulus*), Bodensteiner *et al.* (*Mol. Phylogen. Evol.* **33**: 501, 2004).
- Porodiscus** Lloyd (1919), *Pezizomycotina*. 1, Brazil.
- Porodiscus** Murrill (1903) [non *Porodiscus* Grev. 1863, *Algae*] = *Porodisculus*.
- Porodothion** Fr. (1825) = *Porothelium*.
- Porogramme** (Pat.) Pat. (1900), *Polyporaceae*. 3, widespread (tropical). See Lowe (*Pap. Mich. Acad. Sci.* **49**: 33, 1964; key), Ryvarden (*TBMS* **73**: 9, 1979), Ryvarden & Johansen (*Prelim. Polyp. Fl. E. Afr.*: 34, 1980; key).
- poroid**, of a form resembling *Polyporus*; specifically, with a pore-like hymenium.
- Poroidea** Göttinger ex G. Winter (1884) = *Craterocolla* fide Donk (*Persoonia* **4**: 165, 1966).
- Poroisariopsis** M. Morelet (1971), anamorphic *Pezizomycotina*, Hso. = eP.24. 2, N. America. See Morelet (*Bulletin de la Société des Sciences naturelles et*

- d'Archéologie de Toulon et du Var* 195: 7, 1971).
- Porolaschia** Pat. (1900) = *Favolaschia* fide Singer (*Farlowia* 2: 223, 1945).
- Poroleprieuria** M.C. González, Hanlin, Ulloa & E. Aguirre (2004), Xylariaceae. 1, Mexico. See González *et al.* (*Mycol.* 96: 676, 2004).
- Poromarasmius** Binder *et al.* (2006) nom. nud., Marasmiaceae. 1. See Binder *et al.* (*Amer. J. Bot.* 93: 547, 2006).
- Poromycena** Overeem (1926) = *Mycena* fide Singer (*Agaric. mod. Tax.*, 1951).
- Poronea** Raf. (1815) nom. dub., Fungi. No spp. included.
- Poronia** Willd. (1787), Xylariaceae. Anamorph *Lindquistia*. 4 (mostly coprophilous), widespread. See Jong & Rogers (*Mycol.* 61: 853, 1969), Paden (*CJB* 56: 1774, 1976; culture, anamorph), Lohmeyer & Benkert (*Z. Mykol.* 54: 93, 1988), Rogers & Læssøe (*Mycotaxon* 44: 435, 1992; as *Podosordaria*), San Martín & Rogers (*Mycotaxon* 48: 179, 1993; Mexico), Rogers *et al.* (*Mycotaxon* 67: 61, 1998; delimitation), Winka & Eriksson (*Mycoscience* 41: 97, 2000; DNA), Ju & Rogers (*MR* 105: 1134, 2001).
- Poronidulus** Murrill (1904), Polyporaceae. 1, N. America. See Gilbertson & Ryvarden (*N. Amer. Polyp.* 2: 773, 1987; relationship with *Trametes*).
- Poroniopsis** Speg. (1922) = *Hypocreodendron* fide Lindquist & Wright (*Darwiniana* 11: 598, 1959).
- Poropeltis** Henn. (1904), anamorphic *Pezizomycotina*, Cpt.0eP.?. 1, S. America.
- Porophilomyces** U. Braun (2000), anamorphic *Pezizomycotina*. 1. See Braun (*Schlechtendalia* 5: 42, 2000).
- Porophora** G. Mey. (1825) ≡ *Ascidium* Fée fide Hafellner & Kalb (*Biblthca Lichenol.* 57: 161, 1995).
- Porophora** Zenker ex Göbele (1827) = *Trypethelium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Porophoromyces** Thaxt. (1926), Laboulbeniaceae. 1, Africa. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- Poroptycha** Beck (1888) ? = *Perenniporia* fide Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974).
- Porosphaera** Dumort. (1822) nom. dub., *Pezizomycotina*.
- Porosphaerella** E. Müll. & Samuels (1982), ? Coniochaetales. Anamorphs *Cordana*, *Pseudobotrytis*. 1 (on rotten wood), widespread. See Müller & Samuels (*Sydowia* 35: 150, 1982), Réblová *et al.* (*Sydowia* 51: 49, 1999), Réblová & Winka (*Mycol.* 92: 939, 2000; phylogeny), Fernández & Huhndorf (*Fungal Diversity* 17: 11, 2004), Réblová & Seifert (*MR* 111: 287, 2007; phylogeny).
- Porosphaerellopsis** Samuels & E. Müll. (1982), Hypocreomycetidae. Anamorph *Sporoschismopsis*. 1, Brazil. See Müller & Samuels (*Sydowia* 35: 150, 1982), Réblová *et al.* (*Sydowia* 51: 49, 1999), Huhndorf *et al.* (*Mycol.* 96: 368, 2004; phylogeny).
- Porosphaeria** Samuels & E. Müll. (1979) ≡ *Porosphaerellopsis*.
- porospore**, see tretic.
- Porostereum** Pilát (1936), Phanerochaetaceae. 15, widespread. See Hjortstam & Ryvarden (*Syn. Fung.* 4: 25, 1990; key), Ryvarden (*Syn. Fung.* 18: 76, 2004).
- Porostigme** Syd. & P. Syd. (1917) = *Phaeostigme* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Porosubramania** Hol.-Jech. (1985), anamorphic *Pezizomycotina*, Hso.1eP.27. 2, former Czechoslovakia; India. See Holubová-Jechová (*Proc. Indian Acad. Sci. Pl. Sci.* 94: 253, 1985).
- Porotenus** Viégas (1960), Uropyxidaceae. 4 (on *Memora* (*Bignoniaceae*)), C. America; Brazil. See Viégas (*Bragantia* 19: xcvi, 1960).
- Porotheleaceae** Murrill (1916) = *Meripilaceae*.
- Porothelium** Fr. (1818) = *Hydnopolyporus* fide Kirk (*in litt.*).
- Porothelium** Eschw. (1824), ? Pyrenulales (L). 4, widespread (tropical).
- Porphyrellus** E.-J. Gilbert (1931) = *Tylopilus* fide Singer (*Agaric. mod. Tax.* edn 2, 1962) but see Smith & Thiers (*The Boletes of Michigan*, 1971), Wolfe & Petersen (*Mycotaxon* 7: 152, 1978; nomencl. suprasp. taxa).
- Porphyriospora** A. Massal. (1852) = *Polyblastia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Porphyrosoma** Pat. (1927), ? Hypocreales. 1 (on *Amphisphaeria*), Madagascar. See Rossman (*Stud. Mycol.* 42, 1999; type material lost).
- Porpidia** Körb. (1855), Porpidiaceae (L). 27, widespread (temperate). See Hertel (*Beih. Nova Hedwigia* 79: 399, 1984; Antarct.), Hertel & Knoph (*Mitt. bot. StSamml., München* 20: 467, 1984), Gowan (*Bryologist* 92: 25, 1989; key 21 spp. N. Am.), Gowan & Ahti (*Ann. bot. fenn.* 30: 53, 1993; key 15 spp. Scand.), Buschbom & Mueller (*Mol. Phylogen. Evol.* 32: 66, 2004; phylogeny), Fryday (*Lichenologist* 37: 1, 2005; Europe), Buschbom & Mueller (*Mol. Biol. Evol.* 23: 574, 2006; evolution), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Porpidiaceae** Hertel & Hafellner (1984), Lecideales (L). 16 gen. (+ 6 syn.), 58 spp.
Lit.: Brodo & Hertel (*Herzogia* 7: 493, 1987), Gowan (*Syst. Bot.* 14: 77, 1989; chemistry), Gowan (*Bryologist* 92: 25, 1989), Hafellner (*Herzogia* 8: 53, 1989), Rambold (*Biblthca Lichenol.* 34: 345 pp., 1989), Hertel (*Mitt. bot. StSamml. Münch.* 28: 211, 1990), Pietschmann (*Nova Hedwigia* 51: 521, 1990), Brodo (*Bryologist* 98: 609, 1995), Rambold & Hagedorn (*Lichenologist* 30: 473, 1998), Reeb *et al.* (*Mol. Phylogen. Evol.* 32: 1036, 2004), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny).
- Porpoloma** Singer (1952), Tricholomataceae. c. 12 (esp. under *Nothofagus*), S. America. See Singer (*Sydowia* 6: 198, 1952), Desjardin & Hemmes (*Harvard Pap. Bot.* 6: 85, 2001; Hawaiian Islands), Laskibar *et al.* (*Docums Mycol.* 30 no. 120: 47, 2001).
- Porpomyces** Jülich (1982), Hydnodontaceae. 5, widespread. See Spirin & Zmitrovich (*Karstenia* 43: 80, 2003).
- Porrectotheca** Matsush. (1996), anamorphic *Pezizomycotina*, Cpd.???. 1, Japan. See Matsushima (*Matsush. Mycol. Mem.* 9: 21, 1996).
- Portalia** V. González, Vánky & Platas (2007), ? Anthracoideaceae. 1 (in flowers of *Scirpus*, *Cyperaceae*), Europe; Asia. See González *et al.* (*Fungal Diversity* 27: 45, 2007).
- Portalites** Hemer & Nygreen (1967), Fossil Fungi. 1 (Carboniferous), Libya.
- porter**, ale (q.v.) produced by fermenting malt that has been charred by heat.
- Porterula** Speg. (1920) = *Asteromella* fide Clements & Shear (*Gen. Fung.*, 1931).

Posadasia Cantón (1898) = *Coccidioides* fide Dodge (*Medical Mycology*, 1935).

posterior (1) at or in the direction of the back; (2) (of a lamella), the end at or near the stipe.

Postia Fr. (1874), *Fomitopsidaceae*. 30, widespread. See Yao *et al.* (*FEMS Microbiol. Lett.* **242**: 109, 2005; *Postia caesia* complex).

Potamomyces K.D. Hyde (1995), *Dothideomycetes*. 1, Australia. See Hyde (*Nova Hedwigia* **61**: 132, 1995).

Potebnia (Andrei Aleksandrovich; 1870-1919; Ukraine). Student, Kharkiv University (1890-1894); military service (1894-1896); Assistant to the Phylloxera Committee, Department of Agriculture, Besarabia [now Moldova] (1896-1897); student in Berlin, Bern and Paris (1897-1898); Botanist, Nikita Botanic Garden, Yalta (1898-1903); Lecturer, Kharkiv University (1903-1912) [with interruptions when drafted for military service in the Russian-Japan war (1904-1905) and for a sabbatical in Hamburg Botanical Institute (1907)]; Head, Department of Plant Pathology, Kharkiv Regional Agricultural Experimental Station (1913). Carried out early explorations of Ukraine's fungal diversity; developed and spread in the Russian speaking world ideas about linking conidial and ascomycetous fungi. *Publs.* [*Gribnye Parazity Vysshikh Rasteniy Khar'kovskoy i Smezhnykh Guberniyi. I. Bakterii, Amebovidnye Organizmy i Nizshye Griby*] (1915) [in Russian]; *Gribnye Parazity Vysshikh Rasteniy. II. Golosumchatye, Muchnistorsianye i Discomitsety* (1916) [in Russian]. *Biogs, obits etc.* Tatarenko ([*Mikologiya i Fitopatologiya*] **4**: 493, 1970) [in Russian].

Potebniomyces Smerlis (1962), *Bulgariaceae*. Anamorph *Phacidiopycnis*. 1, Europe; N. America. *P. discolor* (apple bark canker). See Hahn (*Mycol.* **49**: 226, 1957), Xiao *et al.* (*Mycol.* **97**: 464, 2005; USA), Wang *et al.* (*Mycol.* **98**: 1065, 2006; phylogeny, reln with *Phacidium*).

Potoromyces Müll. bis ex Hollós (1902) = *Mesophellia* fide Stalpers (*in litt.*).

Potridiscus Döbbeler & Triebel (2000), *Leotiaceae*. 1, Australia. See Döbbeler & Triebel (*Hoppea* **61**: 72, 2000).

Potriphila Döbbeler (1996), *Odontotremataceae*. 3, Austria. See Döbbeler (*Hausknechtia* Beih. **9**: 79, 1999).

Pouzarella Mazzer (1976) ≡ *Pouzaromyces*.

Pouzaromyces Pilát (1953) = *Entoloma* fide Kuyper (*in litt.*).

Pouzaroporia Vampola (1992), *Meruliaceae*. 1, N. America. See Vampola (*Česká Mykol.* **46**: 59, 1992).

Powellia Bat. & Peres (1964), anamorphic *Pezizomycotina*. 1, Jamaica. See Batista & Peres (*Publicações Inst. Micol. Recife* **398**: 4, 1964).

Powellomyces Longcore, D.J.S. Barr & Désauln. (1995), *Spizellomycetaceae*. 2, Canada. See Longcore *et al.* (*CJB* **73**: 1389, 1995).

ppb, parts per billion; a measure of concentration.

ppm, parts per million; a measure of concentration.

Prachtflorella Matr. (1903) ≡ *Gonatobotrys*.

praemorse (of the stipe base), as if broken off; truncate.

Pragmoparopsis Höhn. (1917) = *Colpoma* fide Holm & Holm (*Symb. bot. ups. 21* no. 3, 1977).

Pragmopora A. Massal. (1855), *Helotiaceae*. Anamorphs *Pragmopycnis*, *Hormonema*-like. 6, Europe; N. America. See Groves (*CJB* **45**: 169, 1967; key), de Hoog & McGinnis (*Stud. Mycol.* **30**: 187, 1987;

anamorph).

Pragmopycnis B. Sutton & A. Funk (1975), anamorphic *Pragmopora*, St.0eH.16. 1, Canada. See Sutton & Funk (*CJB* **53**: 522, 1975).

Prasiola Menegh. (1838), *Algae*. *Algae*.

Prataprajella Hosag. (1992), *Meliolaceae*. 2 (from leaves), India; Taiwan. See Hosagoudar (*Nova Hedwigia* **55**: 223, 1992), Song *et al.* (*Jour. Shandong Agric. Univ.* **30**: 49, 1999).

Pratella (Pers.) Gray (1821) ≡ *Agaricus* L.

Prathigada Subram. (1956), anamorphic *Pezizomycotina*, Hso. ≡ eP.10. 7, Asia. See Subramanian (*Journal of Madras Univ. B* **26**: 366, 1956), Furlanetto & Dianese (*MR* **103**: 1203, 1999; Brazil), Crous & Braun (*CBS Diversity Ser.* **1**: 571 pp., 2003).

Prathoda Subram. (1956) = *Alternaria* fide Cejp & Deighton (*Mycol. Pap.* **117**, 1969).

precipitative vesicle, sporangial vesicle, the membrane of which is formed after extrusion of naked sporangial protoplasm, whether partially cleaved into planonts or not, possibly as a precipitation reaction between periprotoplasmic colloids and the environment; amorphous or fibrillar, c.f. homohylic vesicle, plasmamembranic vesicle.

precipitin, see antigen.

Predacious fungi. The ability to trap and then parasitize or kill amoebae, nematodes, rotifers and other small terrestrial or aquatic animals has evolved several times in various unrelated groups of fungi, with >200 + spp. involved. The most important are *Zoopagales* (q.v.); others are hyphomycetes (*Arthrobotrys*, *Harposporium*, *Monacrosporium*, *Rotiferophthora*, *Verticillium*), anamorphic basidiomycetes (*Nematoctonus*) or members of the *Saprolegniales* (*Sommerstorffia*). Study of these fungi is particularly associated with the mycologist Drechsler who produced a long series of beautifully illustrated accounts of them, mostly in *Mycologia*. Various types of trap are produced, including adhesive hyphal nets or pegs to which the prey become stuck, and special hyphal rings in which individual cells suddenly expand in response to touch, thereby constricting their prey. Comandon & de Fonbrune (see Lloyd & Madison, *Discovery* **7**: 303, 1946) studied the trapping mechanism of *Arthrobotrys*, etc. by cinemicrography.

Lit.: Barron (*The nematode-destroying fungi*, 1977), Barron (*CJB* **63**: 211, 1985, *CJB* **69**: 494, 1991; rotifer endoparasites), Carris & Glawe (*Fungi colonizing cysts of Heterodera glycines*, 1990), Castner (*CJB* **46**: 764, 1966; key to 14 nematode-destroying spp. with constricting rings), Cooke & Godfrey (*TBMS* **47**: 61, 1964; key to nematode-destroying fungi), Dayal (*Predaceous fungi*, 2000), Dix & Webster (*Fungal ecology*, 1995), Dolfus (*Parasites. des helminthes*, 1946), Duddington (*Bot. Rev.* **21**: 377, 1955, (& Wyborn) *Bot. Rev.* **38**: 545, 1972, *Biol. Rev.* **31**: 152, 1956; *TBMS* **38**: 97, 1955; technique, *Friendly fungi*, 1956), Dürschner (*Mitt. biol. Bundes. Land-Forstw.* **217**, 1983; nematode endoparasites), Gams (*Neth. J. Plant Pathol.* **94**: 123, 1988; nematophagous species of *Verticillium*), Gray (*Biol. Rev.* **62**: 245, 1987; review), Ilyaletdinov *et al.* (*Griby Gifomitsety Regulatory Chislennosti Paraziticheskikh Nematod*, 1990, in Russian), Oorschot (*Stud. Mycol.* **26**: 61, 1985), Poinar & Jansson (Ed.) (*Diseases of nematodes* **2**, 1988; 150+ fungi known), Soprunov (*Predacious hyphomycetes and their application to the control of pathogenic nematodes*, 1966

- [transl. 1958, Russ. edn]), Verona & Lepidi (*Agric. ital. A*, 71: 204, 1971; identif., review), Newell *et al.* (*Bull. mar. Sci.* 17: 177, 1977; keys to marine nematode-destroying spp.).
- Predaldinia** P. Briot, Lar.-Coll. & Locq. (1983), Fossil Fungi. 1, Australia.
- PREM**, National Collection of Fungi of the Republic of South Africa (Pretoria, South Africa); founded 1908; a government institute; genetic resource collection **PPRI**; see Baxter (*S. Afr. J. Sci.* 82: 348, 1986).
- Premyomyces** Locq. (1979), Fossil Fungi. 1, France.
- Preservation**. To keep alive, retaining quality and condition, preventing deterioration (*ex situ* conservation). See Genetic resource collections, Reference collections.
- Preservatives**. *General preservative for reference specimens*: 5% formaldehyde (40%) in water; or 25 ml formaldehyde (40%) and 150 ml alcohol (95%) in 1000 ml water.
- Preuss** (Carl Gottlieb Traugott; 1795-1855; Germany). Apotheker and Sanitätsrath of Hoyerswerda (1834-1855); died of apoplexy. Between 1843 and 1855 described 344 new species (including approximately 40 new genera) from central Germany. *Publs. Die Pilze Deutschlands*. In J. Sturm, *Deutschlands Flora Abth.* 3 (1848-1862) [part published posthumously]; Uebersicht untersuchter Pilze, besonders aus der Umgegend von Hoyerswerda. *Linnaea* (1851-1855) [a series of papers in vols 24-26]. *Biogs, obits etc.* Jülich (*Willdenowia* 7: 261, 1974) [list of collections]; Meyer (*Willdenowia* 1: 573, 1956); Stafleu & Cowan (*TL-2* 4: 396, 1983).
- Preussia** Fuckel (1867), Sporormiaceae. 51 (coprophilous, soil etc.), widespread. See Cain (*CJB* 39: 1633, 1961; key), Valldosera & Guarro (*Boln Soc. Micol. Madrid* 14: 81, 1990; key 20 spp. inc. *Sporormiella*), Guarro *et al.* (*Nova Hedwigia* 64: 177, 1997; Iraq), Arenal *et al.* (*Fungal Diversity* 20: 1, 2005), Kruys *et al.* (*MR* 110: 527, 2006; phylogeny), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Preussiaster** Kuntze (1891) $\equiv$ Cordana fide Ellis (*Dematiaceous Hyphomycetes*, 1971).
- Preussiella** Lodha (1978) [non *Preussiella* Gilg 1897, *Spermatophyta*] = Pycnidiophora fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Prévost** (Isaac-Bénédict; 1755-1819; France). Professor of Philosophy, Faculté de Théologie Protestante, Montauban, Département du Lot (1810 onwards). An amateur scientist; through his experiments on wheat bunt (*Tilletia caries*), he was the first to demonstrate pathogenicity of a fungus. *Publs. Mémoire sur la Cause Immédiate de la Carie ou Charbon des Blés* (1807) [English translation *Phytopathological Classics* 6, 1939, biography]. *Biogs, obits etc.* Keitt (*Phytopathology* 46: 1, 1956); Stafleu & Cowan (*TL-2* 4: 398, 1983).
- Priapus** Raf. (1808) ? = Lycoperdon Pers. fide Donk (*Taxon* 5: 109, 1956).
- Prillieuxia** Sacc. & P. Syd. (1899) = Tomentella Pat. fide Donk (*Persoonia* 3: 199, 1964).
- Prillieuxina** G. Arnaud (1918), Asterinaceae. Anamorph *Leprieurina*. 44, widespread (esp. tropical). See Doidge (*Bothalia* 4: 273, 1942).
- primary**, first; first-formed; - **homothallism**, see homothallism; - **mycelium** (of basidiomycetes), the haploid mycelium from a basidiospore; - **septum**, see septum; - **squamules**, the first formed squamules of *Cladonia* from which the podetia arise; - **universal veil**, see protoblem; - **uredo** (uredium, uredinium), see *Pucciniales*.
- primordial**, first in order of appearance; pertaining to the earliest stages of development; - **covering** or **cuticle** = blematogen; - **hypha**, intensely coloured hyphae of the epicutis in *Russula* (Melzer, 1934); - **shaft**, the monaxial basidioma initial, as in *Clavariaceae* (Corner, 1950); - **tissue**, undifferentiated tissue of a basidioma initial; cf. lipsanenchyma; - **veil**, protoblem; **primordium**, the earliest stage of development of an organ.
- primospore**, a spore very like a cell of the thallus (MacMillan).
- Pringsheimia** Schulzer (1866), Dothideales. 1, widespread. See Holm (*in litt.*), Yurlova *et al.* (*Stud. Mycol.* 43: 63, 1999; phylogeny).
- Pringsheimiella** Couch (1939) [non *Pringsheimiella* Höhn. 1920, *Algae*] $\equiv$ Dictyomorpha.
- priorable**, see legitimate.
- Prismaria** Preuss (1851), anamorphic *Pezizomycotina*, Hso.1bH.?. 2, Europe.
- Pritzeliella** Henn. (1903) = *Penicillium* Link fide Seifert & Samson in Samson & Pitt (Eds) (*Advances in Penicillium and Aspergillus systematics* 102: 143, 1985).
- Proabsidia** Vuill. (1903) = *Absidia* fide Hesseltine (*Mycol.* 47: 344, 1955).
- Proactinomyces** (K. Lehm. & Haag) H.L. Jensen (1934) = *Nocardia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- probasidium**, see basidium.
- Probilimbia** Vain. (1899) $\equiv$ *Mycobilimbia*.
- Proboscispora** Punith. (1984), anamorphic *Pezizomycotina*, Cpd.1eH.10. 1, Malaysia. See Punithalingam (*Nova Hedwigia* 39: 63, 1984).
- Proboscispora** S.W. Wong & K.D. Hyde (1999) nom. illegit. $\equiv$ *Pseudoproboscispora*.
- Procandida** E.K. Novák & Zsolt (1961) = *Syringospora* fide von Arx *et al.* (*Stud. Mycol.* 14: 1, 1977).
- Proceropycnis** M. Villarreal, Arenal, V. Rubio, Bege-row, R. Bauer, R. Kirschner & Oberw. (2006), Phleogenaceae. 1, Spain; E. Asia. See Villarreal *et al.* (*Mycol.* 98: 641, 2006), Hausner *et al.* (*Mycotaxon* 103: 279, 2008).
- pro-diploidization hypha**, a hypha which may be diploidized, cf. flexuous hypha.
- progametangium** (of *Mucorales*), a hyphal branch forming a gametangium and suspensor cell (Fig. 27C).
- progamones**, a group of sex hormones of zygomycetes (Reschke & Plempel, *Z. Pflanzenphysiol.* 67: 343, 1972).
- prohybrid**, a mycelium having additional nuclei from hyphal fusions (after Dodge, *Mycol.* 28: 407, 1936).
- Prokaryota**. See *Eukaryota*.
- prokaryote** (adj. -otic), an organism lacking membrane-limited nuclei and not exhibiting mitosis, e.g. bacteria; cf. eukaryote.
- prolate** (of a spore, sporocarp, etc.), elongated in the direction of the poles; - **spheroidal**, only slightly so. See subglobose.
- proliferation**, successive development of new parts, esp. of new sporangia within the old wall in *Oomycota*, or of new wall material in conidiogenous cells.
- proliferin**, an anti-tubercle bacillus antibiotic from *Aspergillus proliferans* (Gupta & Viswanathan, *Antibiot. & Chemotherapy* 5: 496, 1955).
- Proliferobasidium** J.L. Cunn. (1976), Brachybasidi-

- aceae. 1 (on *Heliconia*), West Indies. See Begerow *et al.* (*Mycol. Progr.* 1: 187, 2002).
- Proliferodiscus** J.H. Haines & Dumont (1983), Hyaloscyphaceae. 7, widespread. See Spooner (*Bibliotheca Mycol.* 116, 1987; 4 spp. Australasia), Cantrell & Hanlin (*Mycol.* 89: 745, 1997; DNA).
- Prolisea** Clem. (1931) = *Cercidospora* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Prolixandromyces** R.K. Benj. (1970), Laboulbeniaceae. 6, C. America; Europe. See Benjamin (*Aliso* 7: 174, 1970), Tavares (*Mycol. Mem.* 9: 627 pp., 1985), Santamaria (*Mycotaxon* 32: 433, 1988).
- Promicromonospora** Krassiln., Kalakout. & Kirillova (1961), Actinobacteria. q.v.
- promitosis**, the special type of nuclear division during the growth stage in *Plasmodiophoraceae*; cruciform division.
- promycelium**, Tulasne's term for the germ tube of the teliospore (*Pucciniales*) or ustilospore (*Ustilaginales*) from which **promycelial spores** (Plowright) (sporidia) are produced. The teliospore has been interpreted as a probasidium, the - as a metabasidium (after septation a phragmobasidium) and the ballistisporous promycelial spores basidiospores, as have the non-ballistisporic smut sporidia (see Donk, *K. ned. Akad. Wet. C* 76: 109, 1973).
- Promycetes**. See *Pucciniales* and *Ustilaginales* (Clements & Shear, 1931).
- Pronectria** Clem. (1931), Bionectriaceae. Anamorph *Acremonium*-like. 19 (lichenicolous and algicolous), widespread. See Lowen (*Mycotaxon* 39: 461, 1990), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- proper exciple (margin)**, see excipulum (proprium).
- prophialide**, see metula; primary sterigma.
- Prophytroma** Sorokīn (1877), anamorphic *Pezizomycotina*, Hsy.0eP.?. 1, former USSR.
- Propolidium** Sacc. (1884), ? Rhytismatales. 2, Africa; N. America. See Sherwood (*Mycotaxon* 5: 1, 1977).
- Propolina** Sacc. (1884), ? Dothideales. 1, Europe.
- Propoliopsis** Rehm (1914), ? Stictidaceae. 1, Asia; N. America. See Sherwood (*Mycotaxon* 5: 1, 1977).
- Propolis** Fr. (1849), ? Rhytismataceae. c. 14, widespread. See Sherwood (*Mycotaxon* 5: 320, 1977; key), Johnston (*N.Z. Jl Bot.* 24: 84, 1986; key 4 NZ spp.), Spooner (*Kew Bull.* 45: 451, 1990), Minter (*Mycotaxon* 87: 43, 2003).
- Propolomyces** Sherwood (1977) = *Propolis*.
- Proprioscypha** Spooner (1987), Hyaloscyphaceae. 1 (on *Eucalyptus*), Australia. See Spooner (*Bibliotheca Mycol.* 116, 1987).
- Propyrium** M.K. Elias ex Janson. & Hills (1979), Fossil Fungi, Oomycota. 1 (Carboniferous), USA.
- Prosaccharomyces** E.K. Novák & Zsolt (1961) = *Saccharomycopsis* Schiønning fide von Arx *et al.* (*Stud. Mycol.* 14: 1, 1977).
- prosenchyma**, see plectenchyma.
- Prosopidicola** Crous & C.L. Lennox (2004), anamorphic *Cryphonectriaceae*. 1, Mexico; USA. See Lennox *et al.* (*Stud. Mycol.* 50: '187' [191], 2004).
- prosoplectenchyma**, see plectenchyma.
- prosorus** (of *Chytridiales*), a cell giving a group of sporangia (the sorus).
- Prospodium** Arthur (1907), Uropyxidaceae. c. 85 (on *Bignoniaceae*, some on *Verbenaceae*), America (tropical & subtropical); India. See Cummins (*Annls mycol.* 35: 15, 1937; morphology), Cummins (*Lloydia* 3: 1, 1940; key), Hernández & Hennen (*Mycol.* 95: 728, 2003).
- prosporangium** (in *Oomycota*), a sporangium-like body which puts out a vesicle (sporangium) in which zoospores may undergo development and from which they are freed; presporangium.
- Prosporobolomyces** E.K. Novák & Zsolt (1961) = *Sporobolomyces* fide Lodder (*Yeasts, a taxonomic study* 2nd edn, 1970).
- Prosthecium** Fresen. (1852), Diaporthales. Anamorph *Stilbospora*. 12 (from bark), Europe; N. America. See Merezko (*Ukr. Bot. Zh.* 45: 57, 1988), Jaklitsch & Voglmayr (*Stud. Mycol.* 50: 229, 2004; phylogeny).
- Prosthemella** Sacc. (1881), anamorphic *Pezizomycotina*, Cac.1bH.?. 3, widespread.
- Prosthemia** Kunze (1817), anamorphic *Pleomasaria*, *Splanchnonema*, Cac.0bP.1. 6, widespread (temperate). See Hantula *et al.* (*MR* 102: 1509, 1998; teleomorph), Paavolainen *et al.* (*Mycol.* 92: 253, 2000; cryptic spp.), Tanaka *et al.* (*Mycoscience* 46: 248, 2005; Japan).
- Prostratus** Sivan., W.H. Hsieh & Chi Y. Chen (1993), Diaporthales. 1 (from leaves), Taiwan. See Sivanesan *et al.* (*MR* 97: 1179, 1993).
- Protascus** Wolk (1913) = *Wolkia*.
- Protasia** Racib. (1900) nom. nud., ? Fungi.
- Protendomycopsis** Windisch (1965) = *Trichosporon* fide Carmo-Sousa in Lodder (Ed.) (*Yeasts, a taxonomic study* 2nd edn, 1970).
- proteoglycan**, an antitumour metabolite from *Coriolus pubescens* active against sarcoma-180.
- Proteomyces** Moses & Vianna (1913) = *Trichosporon* fide Diddens & Lodder (*Die anaskosporogenen Hefen* 2, 1942).
- Proteophiala** Cif. (1958), anamorphic *Melanospora*, Hso.0eH.15. 3, widespread. See Ciferri (*Sydowia* 11: 289, 1957).
- proteophilous fungi**, fungi associated with ammonia-rich (e.g. urea affected) soils (Sagara, *Trans. mycol. Soc. Japan* 14: 41, 1973).
- proterospore**, a spore formed at the start of the sporulation period in *Ganoderma* and able to germinate easily without passing through the gut of a fly larva (Nuss, *Pl. Syst. Evol.* 141: 53, 1982).
- prothallus**, see hypothallus.
- prothecium**, a primitive or rudimentary perithecium, as in the *Gymnoascaceae*.
- Protista**. See *Protoctista*.
- proto-** (prefix), primitive; primordial.
- Protoabsidia** Naumov (1935) = *Absidia* fide Hesseltine (*Mycol.* 47: 344, 1955).
- protoaecium**, a haploid structure which, after diploidization, becomes a fruiting structure.
- Protoascon** L.R. Batra, Segal & R.W. Baxter (1964), Fossil Fungi ? Mucorales. 1 (Carboniferous), USA. See Baxter (*Paleont. Contrib. Univ. Kansas* 77, 1975), Pirozynski (*Ann. Rev. Phytopath.* 14: 237, 1976).
- Protobagliettoa** Servit (1955) = *Verrucaria* Schrad. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- protobasidium**, see basidium.
- Protoblastenia** (Zahlbr.) J. Steiner (1911), Psoraceae (L). 14, widespread. See Pant (*J. Bombay nat. Hist. Soc.* 85: 658, 1988; India), Kainz & Rambold (*Bibliotheca Lichenol.* 88: 267, 2004; phylogeny, Europe), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- protoblem**, a loose flocculent mycelial layer covering the universal veil, as in *Amanita*; primordial veil.

- Protocalicium** Woron. (1927) = *Chaenothecopsis* fide Titov (*Folia cryptog. Estonica* 32: 127, 1998).
- Protocolletotrichum** R.K. Kar, Neeta Sharma & U.K. Verma (2004), Fossil Fungi. 1.
- protoconidium**, see hemispore.
- Protocoronis** Clem. & Shear (1931) = *Aureobasidium* fide Sutton (*in litt.*).
- Protocoronospora** G.F. Atk. & Edgerton (1907) = *Aureobasidium* fide Hermanides-Nijhof (*Stud. Mycol.* 15: 141, 1977).
- Protocrea** Petch (1937), Hypocreaceae. Anamorphs *Acremonium*-like, *Verticillium*. 4 (on decaying wood and old basidiomycetes), widespread (temperate). See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Pöldmaa (*Stud. Mycol.* 45: 83, 2000).
- Protocreopsis** Yoshim. Doi (1977), Bionectriaceae. Anamorph *Acremonium*-like. 9 (from decaying plant material), widespread (tropical). See Doi (*Bull. natn. Sci. Mus. Tokyo*, B 4: 113, 1978), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Protoctista** (Protista), kingdom of eukaryotic microorganisms exclusive of the Kingdoms *Animalia*, *Fungi*, and *Plantae*, but including *Myxomycota* and *Oomycota* and related groups (Margulis *et al.* (Eds), *Handbook of Protoctista*, 1991). Molecular data has shown the 'kingdom' to be exceptionally heterogenous and recent authors accept *Chromista* and *Protozoa* instead. See *Chromista*, Kingdoms of fungi, *Protozoa*.
- Protocucurbitaria** Naumov (1951), Pleosporales. 1, former USSR. See Naumov (*Bot. Mater. Otd. Sporov. Rast. Bot. Inst. Komarova Akad. Nauk S.S.S.R.* 7: 110, 1951).
- Protodaedalea** Imazeki (1955) = *Elmerina*.
- Protodontia** Höhn. (1907) = *Stypella* fide Roberts (*Mycotaxon* 69: 209, 1998).
- Protoerysiphe** N. Sharma, R.K. Kar, A. Agarwal & R. Kar (2005), Fossil Fungi, Erysiphales. See Sharma *et al.* (*Micropaleontology* 51: 73, 2005).
- Protogaster** Thaxt. (1934), Protogastraceae. 1 (on roots of *Viola*), USA.
- Protogastraceae** Zeller (1934), ? Boletales. 1 gen., 1 spp.
Lit.: Zeller (*Ann. Mo. bot. Gdn* 21: 231, 1934), Zeller & Walker (*Mycol.* 27: 573, 1935), Reijnders (*MR* 104: 900, 2000).
- Protogautieria** A.H. Sm. (1965), Gomphaceae. 2, N. America. See Smith (*Mycopath. Mycol. appl.* 26: 393, 1965).
- Protogenea** Kobayasi (1964) = *Hydnocystis* fide Trappe (*TBMS* 65: 496, 1975), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Protoglossum** Masee (1891), Cortinariaceae. 8, widespread. See May (*Muelleria* 8: 287, 1995), Vidal (*Revista Catalana de Micologia* 24: 287, 2002).
- protogonidium**, the first of a series of gonidia (obsol.).
- Protograndinia** Rick (1933) = *Patouillardina* Bres. fide Rogers (*Mycol.* 31: 513, 1939).
- Protohydnum** Möller (1895), Auriculariales. 3, widespread. See Martin (*Lloydia* 4: 262, 1941), Roberts & Spooner (*Kew Bull.* 53: 631, 1998; Brunei Darussalam).
- protohymenial**, having a primitive hymenium (Maire).
- protologue**, everything associated with a name on its first publication, i.e. diagnosis, description, references, synonymy, geographical data, citation of specimens, discussion, comments, illustrations (see Stearn, *in* Linnaeus, *Species plantarum* [Reprint] 1: 126, 1957). See also Nomenclature.
- Protomarasmusius** Overeem (1927) ? = *Marasmusius* fide Kuyper (*in litt.*).
- Protomerulius** Möller (1895), Auriculariales. c. 4, widespread. See Ryvarden (*Synopsis Fungorum* 5, 1991).
- Protomicarea** Hafellner (2001), Psoraceae (L). 1, Europe. See Hafellner & Türk (*Stapfia* 76: 156, 2001).
- Protomycena** Hibbett, D. Grimaldi & Donoghue (1997) nom. inval., Fossil Fungi. 1, Dominican Republic. See Hibbett *et al.* (*Am. J. Bot.* 84: 984, 1997).
- Protomyces** Unger (1832), Protomycetaceae. c. 10 (biotrophic on plants), widespread. See Reddy & Kramer (*Mycotaxon* 3: 1, 1975; key), Sjamsuridzal *et al.* (*Mycoscience* 38: 267, 1997; phylogeny), Nishida *et al.* (*J. Mol. Evol.* 46: 442, 1998; introns), Sugiyama (*Mycoscience* 39: 487, 1998; phylogeny), Schweigkofler *et al.* (*Organ. Divers. Evol.* 2: 1, 2002; phylogeny), Lopandic *et al.* (*Mycol. Progr.* 4: 205, 2005; phylogeny), Sugiyama *et al.* (*Mycol.* 98: 996, 2006; phylogeny).
- Protomycetaceae** Gray (1821), Taphrinales. 6 gen., 22 spp.
Lit.: Reddy & Kramer (*Mycotaxon* 3: 1, 1975), Blanz & Unseld (*Stud. Mycol.* 30: 247, 1987), Nishida & Sugiyama (*Mol. Biol. Evol.* 10: 431, 1993), Döbbeler (*Nova Hedwigia* 60: 171, 1995), Sugiyama *et al.* (*Microbial Diversity in Time and Space Proceedings of the International Symposium*, October 24-26, 1994, Tokyo, Japan: 41, 1996), Sjamsuridzal *et al.* (*Mycoscience* 38: 267, 1997; phylogeny), Ahearn *et al.* *in* Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 600, 1998), Kurtzman *in* Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 353, 1998), Kurtzman & Blanz *in* Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 69, 1998), Sugiyama (*Mycoscience* 39: 487, 1998; phylogeny).
- Protomycetales** Luttr. ex D. Hawksw. & O.E. Erikss. (1986) = Taphrinales.
- Protomycites** Mesch. (1892), Fossil Fungi. 1 (Carboniferous), British Isles.
- Protomycocladus** Schipper & Samson (1994), Syncephalastraceae. 1, Pakistan. See Schipper & Samson (*Mycotaxon* 50: 487, 1994), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny).
- Protomycopsis** Magnus (1905), Protomycetaceae. 5 (from living plants), widespread. See Reddy & Kramer (*Mycotaxon* 3: 1, 1975; key), Haware & Pavgi (*Caryologia* 30: 313, 1977; development), Piepenbring & Bauer (*Mycol.* 89: 924, 1997; excl. spp.).
- protonym** (in nomenclature), a name effectively but not validly published after the starting point for the group (Donk, *Persoonia* 1: 175, 1960).
- Protopannaria** (Gyeln.) P.M. Jørg. & S. Ekman (2000), Pannariaceae (L). 5, widespread. See Jørgensen (*Bryologist* 103: 699, 2000), Jørgensen (*Cryptog. Mycol.* 22: 67, 2001; Antarctic), Ekman & Jørgensen (*CJB* 80: 625, 2002; phylogeny), Wiklund & Wedin (*Cladistics* 19: 419, 2003; phylogeny), Wedin & Wiklund (*Symb. bot. upsal.* 34 no. 1: 469, 2004; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Protoparmelia** M. Choisy (1929), Parmeliaceae (L). 20, widespread. See Sancho & Crespo (*Actas Simp. Nac. bot. Crypt.* 6: 441, 1987; 3 spp. Spain), Miyawaki (*Hikobia* 11: 29, 1991), Poelt & Leuckert

- (*Nova Hedwigia* 52: 39, 1991; key 6 spp., mostly on lichens), Hafellner *et al.* in Hawksworth (Ed.) (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. 269 269: 379, 1994; posn), Crespo *et al.* (*Taxon* 50: 807, 2001; phylogeny), Grube *et al.* (*MR* 108: 506, 2004), Brodo & Aptroot (*CJB* 83: 1075, 2005; corticolous spp., N America), Barbero *et al.* (*Mycotaxon* 97: 299, 2006; Spain), Arup *et al.* (*Mycol.* 99: 42, 2007; sister group relations with *Parmeliaceae*).
- Protoparmeliopsis** M. Choisy (1929) = *Lecanora* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Grube *et al.* (*MR* 108: 506, 2004).
- Protopeltis** Syd. (1927) = *Myriangiella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- protoperithecium**, a young but walled perithecium before ascus formation (Ellis, *Mycol.* 51: 416, 1960).
- Protophallaceae** Zeller (1939) = *Phallaceae*.
- Protophallus** Murrill (1910) = *Protuberia* fide Furtado & Dring (*TBMS* 50: 500, 1967).
- protophyte**, see antithetic.
- Protopistillaria** Rick (1933) = *Eocronartium* fide Martin (*Lloydia* 5: 158, 1942).
- Protoplacodium** Motyka (1995) nom. inval. = *Lobothallia* fide Aptroot (*in litt.*).
- protoplasmodium**, see plasmodium.
- protoplast**, traditionally the totality of the living cell constituents, whether walled or not, but now frequently used for the cell protoplasm after experimental removal of the cell wall, a usage to which Brenner *et al.* (*Nature* 181: 1713, 1958) proposed to restrict the term. Fungal protoplasts are proving to have value in the study of cell organelles, biochemistry, genetics; they also have potential applications in biotechnology, esp. since protoplasts from different strains or even species can be fused (first achieved in 1975) into an aggregate protoplast and produce a heterokaryon with changed properties. See Villanueva (*in* Ainsworth & Sussman (Eds), *The Fungi* 2: 3, 1966), Perberdy (*Sci. Progr.* 60: 73, 1972; review methods), Villanueva *et al.* (Eds) (*Yeast, mould and protoplasts*, 1973), Perberdy *et al.* (Eds) (*Microbial and plant protoplasts*, 1976), Peberdy & Ferenczy (Eds) (*Fungal protoplasts. Applications in biochemistry and genetics*, 1985), Peberdy (*Microbiol. Sci.* 4: 108, 1987; review). **sphaeroplast** a - enclosed by a modified or fragmentary cell wall. [**gymnoplast** was used by Küster (1935) for plant cells without a cell wall and Frey-Wyssling (*Nature* 216: 516, 1967) preferred **semi-gymnoplast** to sphaeroplast.].
- Protoradulum** Rick (1933), ? *Auriculariales*. 1, Brazil. See Rick (*Egatea* 18: 348, 1933).
- Protorocella** L.M. Sánchez-Pinto & M. Schulz (2001) = *Protorocella* Follmann fide Grube (*Bryologist* 101: 377, 1998).
- Protorocella** Follmann (2001), *Roccellaceae* (L.). 2, Chile. See Follmann (*J. Hattori bot. Lab.* 90: 261, 2001).
- Protoschistes** M. Choisy (1928) = *Diploschistes* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Protoscypha** Syd. (1925), *Protoscyphaceae*. 1, widespread (tropical). See Petrak (*Annls mycol.* 32: 317, 1934), Kutorga & Hawksworth (*SA* 15: 1, 1997).
- Protoscyphaceae** Kutorga & D. Hawksw. (1997), ? *Dothideomycetes* (inc. sed.). 1 gen. (+ 1 syn.), 1 spp.
Lit.: Kutorga & Hawksworth (*SA* 15: 1, 1997), Magnes (*Biblthca Mycol.* 165: 177 pp., 1997).
- protosexual** (of yeasts or other organisms), having diploid or dikaryotic cells which produce haploid or unisexual cells in the absence of fructifications or sexual spores; in contrast to parasexual (q.v.), which is redefined to cover organisms having both protosexual and sexual cycles, and **neo-sexual**, for organisms having a sexual but not a protosexual cycle (Wickerham, *Mycol.* 56: 254, 1964, cf. 57: 134, 1965, 58: 943, 1967).
- protospore** (1) the multinucleated mass of cytoplasm cut out by primary cleavage planes, to be followed by further cleavage to form the uninucleate spores of *Phycomyces* and other *Mucorales* (Harper), and the sporangiospores of *Coccidioides*; (2) (of *Synchytriaceae*), a 1-nucleate portion of protoplasm which becomes the sporangium.
- Protostegia** Cooke (1880), anamorphic *Pezizomycotina*, Cpd.0fH.1. 1, S. Africa. See Dyko *et al.* (*Mycol.* 71: 918, 1979).
- Protostegiomyces** Bat. & A.F. Vital (1955), anamorphic *Pezizomycotina*, Ccu.0fH.?. 1 (on *Lembosia*), Brazil. See Batista & Vital (*An. Soc. Biol. Pernambuco* 13: 94, 1955).
- protosterigma**, see basidium.
- Protostroma** Bat. (1957), anamorphic *Pezizomycotina*, St.0eH.?. 1, USA. See Batista (*Revta Biol. Lisb.* 1: 109, 1957).
- Prototaxaceae** Hueber (2001), *Fungi* (inc. sed.). See Fossil fungi.
- Prototaxites** Dawson (1859), Fossil Fungi. 2 (Silurian-Devonian). See Boyce *et al.* (*Geology* 35: 399, 2007; carbon isotopic range), Kibby (*Field Mycology* 9: 48, 2008).
- Prototheca** W. Krüger (1894) nom. dub., *Algae*. ? Achloric algae. See Arnold & Ahearn (*Mycol.* 64: 265, 1972; key), Smith (*Mycopath.* 71: 95, 1980), Capriotti (*Arch. Microbiol.* 42: 409, 1962; in fish). Associated with disease in humans (**protothecosis**), bovine mastitis, etc.; see Sudman (*Am. J. clin. Path.* 61: 10, 1974). *P. richardsii* has been transferred to a new genus, *Aneurofecia*, in the *Ichthyosporea* (DRIPs clade), see Baker *et al.* [*Microbiology* 145: 1777, 1999].
- protothecium**, an incompletely differentiated ascoma containing neither asci nor ascospores (Shoemaker, *CJB* 34: 641, 1955).
- Protothelenella** Räsänen (1943), *Protothelenellaceae* ($\pm$ L). 10 (on lichens and *Musci*), Europe; N. America. See Mayrhofer (*Herzogia* 7: 313, 1987; key), Fryday (*Bryologist* 107: 231, 2004; USA), Schmitt *et al.* (*Mycol.* 97: 362, 2005; phylogeny).
- Protothelenellaceae** Vězda, H. Mayrhofer & Poelt (1985), *Ostropomycetidae* (inc. sed.) ($\pm$ L). 2 gen. (+ 2 syn.), 11 spp.
Lit.: Sherwood-Pike & Boise (*Brittonia* 38: 35, 1986), David (*SA* 6: 217, 1987), Mayrhofer (*Herzogia* 7: 313, 1987), Schmitt *et al.* (*Mycol.* 97: 362, 2005), Lumbsch *et al.* (*MR* 111: 257, 2007; phylogeny).
- Protothyrium** G. Arnaud (1917), *Parmulariaceae*. 4, widespread (tropical).
- Prototrema** M. Choisy (1928) ? = *Thelotrema* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Prototremella** Pat. (1888) = *Tulasnella* fide Rogers (*Annls mycol.* 31: 183, 1933).
- prototroph**, see wild type.
- prototunicate** (of asci), basically unitunicate, but with

- the wall lysing at or before maturity and lacking differentiated apical structures (e.g. *Saccharomycetales*); such asci may develop in an hymenium or be distributed randomly in the interior of the ascoma. See ascus.
- Prototylum** M. Choisy (1929) ? = *Pseudopyrenula* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Protounguicularia** Raitv. & R. Galán (1986), *Hyaloscyphaceae*. 5, Europe. See Huhtinen (*Mycotaxon* 30: 9, 1987), Baral (*SA* 13: 113, 1994; ? synonymy with *Olla*).
- protouredinium**, see *protoaecium*.
- Protousnea** (Motyka) Krog (1976), *Parmeliaceae* (L). 7, S. America. See Kärnefelt *et al.* (*Nova Hedwigia* 67: 71, 1998), Calvelo *et al.* (*Mycotaxon* 85: 277, 2003; Argentina), Calvelo *et al.* (*Bryologist* 108: 1, 2005; revision), Czeuczuga *et al.* (*Feddes Repert.* 116: 195, 2005; carotenoids).
- Protoventuria** Berl. & Sacc. (1887), *Venturiaceae*. Anamorph *Fusicladium*-like. 1, widespread. See Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962), Barr (*Prodr. Cl. Loculoasc.*, 1987), Richiteanu & Bontea (*Rev. Roum. Biol. biol. vég.* 32: 15, 1987; nomencl., on *Ericaceae*), Barr (*Sydowia* 41: 25, 1989; key 23 N. Am. spp.), Pascoe & Sutton (*Aust. Syst. Bot.* 3: 281, 1990; Australia), Carris & Poole (*Mycol.* 85: 93, 1993; USA), Winton *et al.* (*Mycol.* 99: 240, 2007; phylogeny).
- Protuber** Möller (1895), *Phallogastraceae*. 13, widespread (tropical; subtropical). See Furtado & Dring (*TBMS* 50: 500, 1967), Castellano & Beever (*N.Z. J Bot.* 32: 305, 1994; NZ spp.).
- protuberate** (of conidia), having short projections.
- Protuberella** S. Imai & A. Kawam. (1958), *Phallaceae*. 1, Japan. See Malloch (*Mycotaxon* 34: 133, 1989).
- pruinose**, having a frost-like or flour-like surface covering of **pruina**. Often caused by calcium oxalate hydrates on lichen thalli; see Wadsten & Moberg (*Lichenologist* 17: 239, 1985).
- Prunulus** Gray (1821) = *Mycena* fide Donk (*Beih. Nova Hedwigia* 5, 1962).
- PSA**, see *Media*.
- Psalidosperma** Syd. & P. Syd. (1914) = *Ypsilonia* fide Clements & Shear (*Gen. Fung.*, 1931).
- Psaliota**, see *Psalliota*.
- Psalliota** (Fr.) P. Kumm. (1871) = *Agaricus* L.
- Psalliotina** Velen. (1939) = *Psathyrella* fide Pilát (*Agaricalium Europaeorum Clavis Dichotomica*, 1951).
- Psamma** Sacc. & M. Rousseau ex E. Bommer & M. Rousseau (1891), anamorphic *Pezizomycotina*, *Cac.0bP.1* ($\pm$ L). 8 (mostly lichenicolous or algicolous), Europe. See Earland-Bennett & Hawksworth (*Lichenologist* 31: 579, 1999), Earland-Bennett & Hawksworth (*Lichenologist* 37: 191, 2005; key).
- Psammocoparius** Delile ex De Seynes (1863) nom. inval. = *Psathyrella* fide Kuyper (*in litt.*).
- Psammomyces** Lebedeva (1932) = *Galeropsis* fide Zeller (*Mycol.* 35: 409, 1943).
- Psammospora** Fayod (1893) nom. rej. = *Melaleuca*.
- Psathyra** (Fr.) P. Kumm. (1871) [non *Psathyra* Spreng. 1818, *Rubiaceae*] = *Psathyrella* fide Singer (*Agaric. mod. Tax.*, 1951).
- Psathyrella** (Fr.) Quél. (1872), *Psathyrellaceae*. c. 400, widespread. See Smith (*Mem. N. Y. bot. Gdn* 24, 1972; 414 N. Am. spp.), Pegler (*Kew Bull. Addit. Ser.* 6, 1977; E. Afr.), Kits van Waveren (*Persoonia Suppl.* 2: 1, 1985; monogr. Dutch, French, Br. spp.), Enderle & Hübner (*Beitr. Kenntn. Pilze Mitteleur.* 14: 53, 2005), Vašutová (*Czech Mycol.* 58: 1, 2006; Czech Republic, Slovakia), Padamsee *et al.* (*Mol. Phylog. Evol.* 46: 415, 2008; phylogeny), Vašutová *et al.* (*MR* 112: in press, 2008; phylogeny).
- Psathyrellaceae** Vilgalys, Moncalvo & Redhead (2001), *Agaricales*. 12 gen. (+ 14 syn.), 746 spp. Generic delimitation in the *Psathyrellaceae* is in need of revision considering the extensive polyphyly in *Psathyrella* and the redistribution of coprinoid species to it.
- Lit.*: Smith (*Mem. N. Y. bot. Gdn* 24: 633 pp., 1972), Bogart (*Mycotaxon* 10: 155, 1979), Kits van Waveren (*Persoonia Suppl.* 2: 300 pp., 1985), Enderle & Bender (*Z. Mykol.* 56: 19, 1990), Moncalvo *et al.* (*Syst. Biol.* 49: 278, 2000), Redhead *et al.* (*Taxon* 50: 203, 2001; redistribution of coprinoid species), Adamsee *et al.* (*Mol. Phyl. Evol.* 46: 415, 2008; phylogeny), Vašutová *et al.* (*MR* 112: in press, 2008).
- Psathyrodon** Maas Geest. (1977) = *Beenakia* fide Parmasto & Ryvarden (*Windahlia* 18: 39, 1990).
- Psathyromyces** Bat. & Peres (1964) = *Tricharia* Fée fide Lücking *et al.* (*Lichenologist* 30: 121, 1998).
- Psathyrophlyctis** Brusse (1987), *Phlyctidaceae* (L). 1, S. Africa. See Brusse (*Bothalia* 17: 182, 1987).
- Psecadia** Fr. (1849) = *Cytospora* fide Sutton (*Mycol. Pap.* 141, 1977).
- Pselaphidomyces** Speg. (1917), *Laboulbeniaceae*. 1, N. America. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- Pselliophora** P. Karst. (1879) nom. rej. = *Coprinus* fide Redhead *et al.* (*Mycotaxon* 50: 203, 2001).
- Pseudacoliomyces** Cif. & Tomas. (1953) = *Pseudacolium*.
- Pseudacolium** Stizenb. ex Clem. (1909) = *Cyphelium* Ach. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Tibell (*MR* 107: 1403, 2003).
- Pseudaegerita** J.L. Crane & Schokn. (1981), anamorphic *Hyaloscypha*, *Hsp.0eP.3*. 10, widespread. See Crane & Schoknecht (*Mycol.* 73: 78, 1981), Abdullah *et al.* (*MR* 109: 590, 2005).
- Pseudaleuria** Lusk (1987), *Pyronemataceae*. 1, USA. See Lusk (*Mycotaxon* 30: 417, 1987), Moravec (*Acta Musei Moraviae Scientiae Biologicae* 88: 37, 2003), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Pseudallescheria** Negr. & I. Fisch. (1944), *Microascaeae*. Anamorphs *Graphium*, *Scedosporium*. 8, widespread. *P. boydii* complex on humans (white grain mycetoma). See Campbell & Smith (*Mycopathologia* 78: 145, 1982; conidiogenesis), McGinnis *et al.* (*Mycotaxon* 14: 94, 1982), von Arx *et al.* (*Beih. Nova Hedwigia* 94, 1988), Issakainen *et al.* (*J. Med. Vet. Mycol.* 35: 389, 1997; DNA), Wedde *et al.* (*Medical Mycology* 36: 61, 1998; PCR-based identification), Issakainen *et al.* (*MR* 103: 1179, 1999; DNA), Okada *et al.* (*CJB* 76: 1495, 1999; DNA), Paul & Masih (*FEMS Microbiol. Lett.* 189: 61, 2000; molecular variation), Issakainen *et al.* (*Medical Mycology* 41: 31, 2003; phylogeny), Riddell *et al.* (*Mycoses* 47: 442, 2004; disseminated infection), Gilgado *et al.* (*J. Clin. Microbiol.* 43: 4930, 2005; phylogeny), Guarro *et al.* (*Medical Mycology* 44: 295, 2006; review), Rainer & Hoog (*MR* 110: 151, 2006; phylogeny), Zeng *et al.* (*Medical Mycology* 45: 547, 2007; infraspecific variation), Rainer *et al.* (*Antonie van Leeuwenhoek* 93: 315, 2008; selective isolation).
- Pseudapiospora** Petr. (1928) = *Pseudomassaria* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2,

- 1962).
- Pseudarctomia** Gyeln. (1939), ? Lichinaceae (L). 1, France. See Moreno & Egea (*Acta Bot. Barcinon.* 41: 1, 1992).
- Pseudarthopyrenia** Keissl. (1935) = *Pyrenocollema* fide Harris (*Lichenogr. Thomsoniana*: 133, 1998).
- Pseudascozonus** Brumm. (1985), Thelebolaceae. 1 (coprophilous), France. See Brummelen (*Proc. Indian Acad. Sci. Pl. Sci.* 94: 363, 1985), Brummelin (*Persoonia* 16: 425, 1998; ultrastr.), Hoog *et al.* (*Stud. Mycol.* 51: 33, 2005).
- Pseudasterodon** Rick (1959) nom. dub., Agaricomycetes. See Donk (*Persoonia* 3: 199, 1964).
- Pseudephebe** M. Choisy (1930), Parmeliaceae (L). 2, widespread (montane-arctic; bipolar). See Brodo & Hawksworth (*Op. bot. Soc. bot. Lund* 42, 1977), Kantvilas (*Flora of Australia* 55: 162, 1994), Crespo *et al.* (*Taxon* 50: 807, 2001; phylogeny), Thell *et al.* (*Mycol. Progr.* 1: 335, 2002; phylogeny), Thell *et al.* (*Mycol. Progr.* 3: 297, 2004; phylogeny).
- Pseuderiospora** Keissl. (1924) = *Eriosporella* fide Sutton (*Mycol. Pap.* 141, 1977).
- Pseuderiospora** Petr. (1959) = *Suttoniella*.
- Pseudeurotiaceae** Malloch & Cain (1970), Leotiomyces (inc. sed.). 6 gen. (+ 1 syn.), 26 spp.
Lit.: Booth (*Mycol. Pap.* 83, 1961), Malloch & Cain (*CJB* 48: 1815, 1970; genera), Lodha in Subramanian (Ed.) (*Taxonomy of fungi* 1: 241, 1978), von Arx *et al.* (*Beih. Nova Hedwigia* 94: 104 pp., 1988), Suh & Blackwell (*Mycol.* 91: 836, 1999; phylogeny), Sogonov *et al.* (*Mycol.* 97: 695, 2005), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Stchigel & Guarro (*MR* 111: 1100, 2007).
- Pseudeurotium** J.F.H. Beyma (1937), Pseudeurotiaceae. Anamorph *Teberdinia*. 5 (on rotten wood etc.), widespread. See Booth (*Mycol. Pap.* 83, 1961; key), Suh & Blackwell (*Mycol.* 91: 836, 1999; phylogeny), Sogonov *et al.* (*Mycol.* 97: 695, 2005; anamorph), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Pseudevernia** Zopf (1903), Parmeliaceae (L). 5 or 6, widespread. See Hale (*Bryologist* 71: 1, 1968), Legaz *et al.* (*Cryptog. Bryol.-Lichénol.* 6: 343, 1985; anatomy), López Redondo & Manrique Reol (*An. Jard. bot. Madr.* 46: 295, 1989; chemical races, Spain), Strobl *et al.* (*Biblthca Lichenol.* 53: 251, 1993; protein composition), Czezug & Christensen (*Feddes Repert.* 105: 473, 1994; carotenoids), Kärnefelt *et al.* (*Nova Hedwigia* 67: 71, 1998; anatomy), Crespo *et al.* (*Lichenologist* 31: 451, 1999; anatomy, chemistry, phylogeny), Crespo *et al.* (*Taxon* 50: 807, 2001; phylogeny), Wei & Abbas (*Mycosystema* 22: 26, 2003; China), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Honegger & Zippler (*MR* 111: 424, 2007; mating systems).
- Pseudhaplosporella** Speg. (1920) = *Botryodiplodia* fide Petrak & Sydow (*Feddes Repert.* 42: 1, 1927).
- Pseudhydnotrya** E. Fisch. (1897) = *Geopora* fide Fischer (*Nat. Pflanzenfam.* 5b: viii, 1938).
- pseudo-** (prefix), false; spurious.
- Pseudoabsidia** Bainier (1903) = *Absidia* fide Hesse (*Mycol.* 47: 344, 1955).
- Pseudoacrodictys** W.A. Baker & Morgan-Jones (2003), anamorphic *Pezizomycotina*. 8, widespread. See Baker & Morgan-Jones (*Mycotaxon* 85: 373, 2003), Somrithipol & Jones (*Sydowia* 55: 365, 2003; Thailand).
- pseudoaethium** (of *Mycetozoa*), a group of separate sporangia looking like an aethalium.
- Pseudoamauroascus** Cano, M. Solé & Guarro (2002), Onygenaceae. 1, Australia. See Cano *et al.* (*Stud. Mycol.* 47: 175, 2002).
- pseudoamyloid**, see dextrinoid.
- pseudoangiocarpous** (of a basidioma), hymenial surface at first exposed but later covered by an incurving pileus margin and/or excrescences from the stipe (Singer, 1975: 26).
- Pseudoanguillospora** S.H. Iqbal (1974), anamorphic *Pezizomycotina*, Hso.0fH.1/10. 2, Europe. See Iqbal (*Biologia Lahore* 20: 11, 1974), Marvanová (*Czech Mycol.* 49: 7, 1996).
- Pseudoarachniotus** Kuehn (1957) = *Gymnascella* fide von Arx (*Gen. Fungi Sporul. Cult.* Edn 3, 1981), Currah (*Mycotaxon* 24: 1, 1985).
- Pseudoaristastoma** Suj. Singh (1979), anamorphic *Pezizomycotina*, Cpd.≡ eH.?. 1, India. See Singh (*Sydowia* 31: 238, 1978).
- Pseudoarmillariella** (Singer) Singer (1956), Agaricales. 2, N. America; C. America. Belongs to *Hygrophoraceae* or *Tricholomataceae*. See Singer (*Mycol.* 48: 725, 1956), Redhead *et al.* (*Mycotaxon* 83: 19, 2002).
- Pseudoarthonia** Marchand (1896) = *Arthonia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pseudoasperisporium** U. Braun (2000), anamorphic *Pezizomycotina*. 2. See Braun (*Schlechtendalia* 5: 72, 2000), Schubert & Braun (*Fungal Diversity* 20: 187, 2005).
- Pseudoauricularia** Kobayasi (1982), Agaricaceae. 1, Papua New Guinea. See Kobayasi (*TMSJ* 22: 421, 1981).
- Pseudobaeomyces** M. Satô (1940), Icmadophilaceae (L). 1, Asia. See Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998; DNA), Stenroos *et al.* (*Mycol. Progr.* 1: 267, 2002).
- Pseudobaeospora** Singer (1942), Tricholomataceae. c. 20, widespread. See Singer (*Mycol.* 60: 13, 1963), Horak (*Revue Mycol. Paris* 29: 72, 1964; key), Bas (*Persoonia* 18: 115, 2002; Europe), Bas (*Persoonia* 18: 163, 2003).
- Pseudobalsamia** E. Fisch. (1907) = *Balsamia* fide Trappe (*TBMS* 65: 496, 1975), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Pseudobasidiospora** Dyko & B. Sutton (1978), anamorphic *Pezizomycotina*, Cpd.0eH.1. 1 (aquatic), Australia; USA. See Dyko & Sutton (*Nova Hedwigia* 29: 168, 1977).
- Pseudobasidium** Tengwall (1924) = *Arthrimum* fide Ellis (*Mycol. Pap.* 103, 1965).
- Pseudobeltrania** Henn. (1902), anamorphic *Pezizomycotina*, Hso.0eP.10. 7, widespread (esp. tropical). See Sutton (*TBMS* 55: 506, 1970), Zucconi (*MR* 95: 1017, 1991).
- Pseudoboletus** Šutara (1991), Boletaceae. 2 (in parasitic association with *Scleroderma* and *Pisolithus*), north temperate. See Šutara (*Česká Mykol.* 45: 1, 1991), Šutara (*Czech Mycol.* 57: 1, 2005; anatomical characters).
- Pseudobotrytis** Krzemien. & Badura (1954), anamorphic *Porosphaerella*, Hso.1eP.10. 1, widespread. See Mel'nik (*Mikol. Fitopatol.* 32: 32, 1998), Fernández & Huhndorf (*Fungal Diversity* 17: 11, 2004; teleomorph), Yamaguchi *et al.* (*Mycoscience* 45: 9, 2004; chemistry).
- Pseudobuellia** B. de Lesd. (1907) = *Rinodina* fide

- Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pseudocalicium** Marchand (1896) = *Chaenothecopsis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pseudocalopadia** Lücking (1999), *Ectolechiaceae* (L). 1, Costa Rica. See Lücking (*Phyton Horn* 39: 142, 1999).
- Pseudocampitum** Gonz. Frag. & Cif. (1925) = *Melanographium* fide Ellis (*Mycol. Pap.* 93, 1963).
- Pseudocanalisorium** R.F. Castañeda & W.B. Kendr. (1991), anamorphic *Pezizomycotina*, Hsp.#eP.1. 1, Cuba. See Castañeda Ruiz & Kendrick (*Univ. Waterloo Biol. Ser.* 35: 89, 1991).
- pseudocapillitium** (of *Mycetozoa*), a sterile structure in the fruit-body which has had no connexion with the sporogenous protoplasm.
- Pseudocenangium** A. Knapp (1924) = *Ascocoryne* fide Dennis (*Mycol. Pap.* 62, 1956).
- Pseudocenangium** P. Karst. (1886), anamorphic *Pezizomycotina*, Ccu.0fH.19. 2, Europe; N. America. See Dyko & Sutton (*CJB* 57: 370, 1979), Mel'nik *et al.* (*Mikol. Fitopctol.* 40: 510, 2006).
- Pseudocercophora** Subram. & Sekar (1986), *Lasiosphaeriaceae*. Anamorph *Mammaria*. 1, India. See Subramanian & Sekar (*Journal of the Singapore National Academy of Science* 15: 58, 1986).
- Pseudocercospora** Speg. (1910) nom. cons. prop., anamorphic *Mycosphaerella*, Hso.0fP.10. c. 1124, widespread (esp. tropical). See Deighton (*Mycol. Pap.* 140, 1976), Deighton (*TBMS* 88: 365, 1987), Guo & Liu (*Mycosystema* 2: 225, 1989; China), Anon. (*Progr. Rep. Asian Veg. Res. Develop. Centre*, 1990: 150, 1991; in vitro data on *P. fuligena*), Guo & Hsieh (*The genus Pseudocercospora in China*, 1995), Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 2: 397, 1998; relat. to *Cercostigmina* and *Uwebraunia*, key to sections), Stewart *et al.* (*MR* 103: 1491, 1999; phylogeny), Crous *et al.* (*Stud. Mycol.* 45: 107, 2000; review), Gonzalez & Pons (*MR* 104: 1507, 2000; ontogeny), Crous *et al.* (*Mycol.* 93: 1081, 2001; phylogeny), Crous *et al.* (*MR* 105: 425, 2001; on *Myrtaceae*), Beilharz *et al.* (*Mycotaxon* 82: 397, 2002; on *Kennedia*), Braun & Dick (*N.Z. J. For. Sci.* 32: 221, 2002; on *Eucalyptus*), Crous & Mourichon (*Sydowia* 54: 35, 2002; on *Musa*), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003; nomenclator), Taylor *et al.* (*MR* 107: 653, 2003; on *Proteaceae*), Crous *et al.* (*Stud. Mycol.* 50: 457, 2004; on *Acacia*), Ávila *et al.* (*MR* 109: 881, 2005; on *Olea*), Braun & Crous (*Taxon* 55: 803, 2006; nomencl.), Hunter *et al.* (*Stud. Mycol.* 55: 147, 2006; on *Eucalyptus*).
- Pseudocercospora** Deighton (1973), anamorphic *Mycosphaerella*, Hso.0fH.10. 119, widespread. See Inman *et al.* (*MR* 95: 1334, 1991; *Mycosphaerella* teleomorph of *P. capsellae*), Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 1: 129, 1995; monogr., keys), Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 2: 405, 1998), Braun (*Schlechtendalia* 1: 41, 1998), Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 2, 1998), Braun *et al.* (*Mycol. Progr.* 2: 197, 2003), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003; nomenclator), Hunter *et al.* (*Stud. Mycol.* 55: 147, 2006; on *Eucalyptus*).
- Pseudocercosporidium** Deighton (1973), anamorphic *Mycosphaerellaceae*, Hso.0fP.10. 1, Venezuela. See Deighton (*Mycol. Pap.* 133: 55, 1973), Crous *et al.* (*Mycol.* 93: 1081, 2001), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003).
- Pseudochaete** T. Wagner & M. Fisch. (2002), *Hymenochaetaceae*. 1, widespread. See Wagner & Fischer (*Mycol. Progr.* 1: 100, 2002).
- Pseudochaetosphaeronema** Punith. (1979), anamorphic *Pleosporales*, Cpd.0eH.15. 1 (from humans), Venezuela. See Punithalingam (*Nova Hedwigia* 31: 126, 1979), Hoog *et al.* (*Mycoses* 47: 121, 2004; phylogeny).
- Pseudochuppia** Kamal, A.N. Rai & Morgan-Jones (1984), anamorphic *Pezizomycotina*, Hso.#eP.1/10. 1, India. See Kamal *et al.* (*Mycol.* 76: 163, 1984).
- Pseudociboria** Kanouse (1944), *Sclerotiniaceae*. 1, widespread. See Dumont (*Mycol.* 66: 706, 1974), Schumacher (*Mycotaxon* 38: 233, 1990).
- Pseudocladosporium** U. Braun (1998) = *Fusicladium* fide Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 2: 392, 1998), Braun *et al.* (*Mycol. Progr.* 2: 3, 2003; phylogeny), Schubert *et al.* (*Schlechtendalia* 9, 2003), Beck *et al.* (*Mycol. Progr.* 4: 111, 2005; phylogeny), Crous *et al.* (*Stud. Mycol.* 58: 185, 2007; phylogeny).
- Pseudoclathrosphaerina** Voglmayr (1997), anamorphic *Pezizomycotina*, Hso.?.?. 1, USA. See Voglmayr & Krisai-Greilhuber (*Mycol.* 89: 943, 1997).
- Pseudoclathrus** B. Liu & Y.S. Bau (1980), *Phallaceae*. 1, China. See Liu & Bau (*Mycotaxon* 10: 293, 1980).
- pseudocleistothecium**, see discrete body.
- Pseudoclitocybe** (Singer) Singer (1956), *Tricholomataceae*. 10, widespread (north temperate; S. America). See Singer (*Mycol.* 48: 725, 1956), Watling & Turnbull (*British Fungus Flora*, 1998; UK).
- Pseudococcidioides** O.M. Fonseca (1928) = *Coccidioides* fide Dodge (*Medical Mycology*, 1935).
- Pseudocochliobolus** Tsuda, Ueyama & Nishih. (1978) = *Cochliobolus* fide Alcorn (*Mycotaxon* 16: 353, 1983), Sivanesan (*Mycol. Pap.* 158: 261 pp., 1987).
- Pseudocoelomomyces** E.A. Nam & Dubitskiĭ (1977) = *Tabanomyces*.
- Pseudocollema** Kanouse & A.H. Sm. (1940) = *Byssonectria* fide Sivertsen (*SA* 9: 23, 1990), Pfister (*Mycol.* 85: 952, 1993).
- pseudocolumella** (of *Physaraceae*), lime-knots massed like a columella at the centre of the sporangium.
- Pseudocolus** Lloyd (1907), *Phallaceae*. 2, widespread (tropical; subtropical introduced). See Dring (*Kew Bull.* 35: 1, 1980).
- Pseudoconiocybe** Marchand (1896) = *Coniocybe* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pseudoconium** Petr. (1969), anamorphic *Pezizomycotina*, Cpd.0eP.?. 1, Europe. See Petrak (*Sydowia* 22: 385, 1968).
- Pseudoconocybe** Hongo (1967) = *Conocybe* fide Watling (*Kew Bull.* 31: 593, 1977).
- Pseudocoprinus** Kühner (1928) = *Coprinellus* fide Redhead *et al.* (*Mycotaxon* 50: 203, 2001).
- Pseudocordyceps** Hauman (1936), anamorphic *Penicillioptosis*, Hsy.0eH.?. 1, Taiwan; Zaire. See Hsieh & Ju (*Mycol.* 94: 539, 2002; teleomorph).
- Pseudocornicularia** Gyeln. (1933) = *Coelocaulon* fide Kärnefelt (*Op. Bot.* 86, 1986).
- pseudocortex** (of lichen thalli), a false cortex, used for the outer layer of the pseudopodetia in *Pycnothelia papillaria*.

- Pseudocraterellus** Corner (1958) = *Craterellus* fide Peterson (*Česká Mykol.* 29: 199, 1975).
- Pseudocryptosporella** J. Reid & C. Booth (1969), Diaporthales. 1, Venezuela. See Reid & Booth (*CJB* 47: 1058, 1969).
- pseudocyphella** (pl. -e), an opening in the cortex of lichens where the medulla is exposed to the open air but lacking specialized cells surrounding the cavity; they provide valuable taxonomic characters in e.g. *Alectoria*, *Bryoria*, *Pseudocyphellaria*.
- Pseudocyphellaria** Vain. (1890) nom. cons., Lobariaceae (L). c. 170, widespread (esp. south temperate). See Coppins & James (*Lichenologist* 11: 139, 1979; key Eur. spp.), Galloway & James (*Lichenologist* 12: 291, 1980; NZ), Galloway *et al.* (*Lichenologist* 15: 135, 1983; NZ), Kondratyuk & Galloway (*Biblthca Lichenol.* 57: 327, 1985; lichenicolous spp.), Galloway (*Lichenologist* 18: 105, 1986; S. Am. non-glabrous spp.), Galloway & James (*Nova Hedwigia* 42: 423, 1986; Delise's spp.), Galloway (*Bull. Br. Mus. nat. hist. Bot.* 17: 1, 1988; key 48 spp.), Galloway & Laundon (*Taxon* 37: 48, 1988; gen. nomencl.), Galloway & James (*Biblthca Lichenol.* 46, 1992; 53 S. Am. spp.), Czeuczuga *et al.* (*J. Hattori bot. Lab.* 87: 277, 1999; carotenoids), Kantvilas & Elix (*Muelleria* 12: 217, 1999; Tasmania), Thomas *et al.* (*Biblthca Lichenol.* 82: 123, 2001; phylogeny, New Zealand), Summerfield *et al.* (*New Phytol.* 155: 121, 2002; photobionts), Wiklund & Wedin (*Cladistics* 19: 419, 2003; phylogeny), Miadlikowska & Lutzoni (*Am. J. Bot.* 91: 449, 2004; phylogeny), Wedin & Wiklund (*Symb. bot. upsal.* 34 no. 1: 469, 2004; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Summerfield & Eaton-Rye (*New Phytol.* 170: 597, 2006; N and S hemisphere spp. synonymous).
- pseudocystidium** (1) (in agarics), see cystidium; (2) (of *Entomophthora*), the organ penetrating the insect cuticle allowing conidiophores to emerge.
- Pseudocytoplacosphaeria** Punith. & Spooner (2002), anamorphic *Pezizomycotina*. 1, British Isles. See Punithalingam & Spooner (*Kew Bull.* 57: 534, 2002).
- Pseudocytospora** Petr. (1923), anamorphic *Pezizomycotina*, St.0eH.?. 1, Europe.
- Pseudodasyscypha** Velen. (1939) = *Merismodes* fide Kuyper (*in litt.*).
- Pseudodeconica** Overeem (1927) nom. nud. = *Agrocybe* fide Singer (*Agaric. mod. Tax.*, 1951).
- Pseudodelitschia** J.N. Kapoor, Bahl & S.P. Lal (1976) = *Neotestudina* fide Hawksworth (*CJB* 57: 91, 1979).
- Pseudodermatosorus** Vánky (1999), Doassansiaceae. 2 (on *Alismataceae*), Venezuela. See Vánky (*Mycotaxon* 71: 213, 1999).
- Pseudodescolea** Raithelh. (1980) = *Descolea* fide Bougher (*MR* 94: 287, 1990).
- Pseudodiaporthe** Speg. (1909) = *Massarina* fide Bose (*Phytopath. Z.* 41, 1961), Aptroot (*Nova Hedwigia* 66: 89, 1998).
- pseudodiblastic** (of ascospores), having oil-drops at the poles so that they superficially resemble polarilocular spores (q.v.).
- Pseudodichomera** Höhn. (1918), anamorphic *Pezizomycotina*, St.#eP.?. 3, Europe. See Arnold & Russell (*Mycol.* 52: 509, 1960).
- Pseudodictya** Tehon & G.L. Stout (1929) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Pseudodictyosporium** Matsush. (1971), anamorphic *Massarinaceae*, Hso.#eP.24. 2, Papua New Guinea. See Matsushima (*Bull. natn. Sci. Mus. Tokyo*, B 14: 473, 1971), Tsui *et al.* (*Fungal Diversity* 21: 157, 2006; phylogeny), Cai *et al.* (*Persoonia* 20: 53, 2008; phylogeny).
- Pseudodidymaria** U. Braun (1993), anamorphic *Pezizomycotina*, Hsp.1eP.10/12. 2, USA; Japan. See Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 2, 1998), Ono & Kobayashi (*Mycoscience* 46: 352, 2005).
- Pseudodidymella** C.Z. Wei, Y. Harada & Katum. (1997), Pleosporales. Anamorph *Pycnopleiospora*. 1 (on *Fagus*), Japan. See Wei *et al.* (*Mycol.* 89: 494, 1997).
- Pseudodidymium** R. Michel, Walochnik & Aspöck (2003), Didymiaceae. 1. See Michel *et al.* (*Acta Protozool.* 42: 331, 2003).
- Pseudodimerium** Petr. (1924) = *Phaeostigme* fide Hansford (*Mycol. Pap.* 15, 1946).
- Pseudodiplodia** (P. Karst.) Sacc. (1884), anamorphic *Pezizomycotina*, Cpd.1eP.15. c. 45, widespread. See Buchanan (*Mycol. Pap.* 156, 1987), Dianese & Furlanetto (*Fitopatol. Brasil* 18 (Supl.): 344, 1993; Brazil).
- Pseudodiplodia** Speg. (1920) [non *Pseudodiplodia* (P. Karst) Sacc. 1884] = *Botryodiplodia* fide Petrak & Sydow (*Feddes Repert.* 42: 1, 1927).
- Pseudodiplodiella** Bender (1932) = *Botryodiplodia* fide Sutton (*Mycol. Pap.* 141, 1977).
- Pseudodiscinella** Dennis (1956) = *Ciliatula*.
- Pseudodiscosia** Hösterm. & Laubert (1921) = *Heteropatella* fide Sutton (*Mycol. Pap.* 141, 1977), Leuchtmann (*Mycotaxon* 28: 261, 1987).
- Pseudodiscula** Laubert (1911), anamorphic *Pezizomycotina*, St.0eH.?. 2, Europe. See Sutton (*Mycol. Pap.* 141, 1977).
- Pseudodiscus** Arx & E. Müll. (1959), Saccardiaceae. 1, Europe. See von Arx & Müller (*Sydowia* 13: 64, 1959).
- Pseudodoassansia** (Setch.) Vánky (1981), Doassansiaceae. 2 (on *Hydrocleys*, *Sagittaria*), N. & S. America. See Vánky (*Mycotaxon* 78: 265, 2001).
- Pseudoecteinomyces** W. Rossi (1977), Euceratomycetaceae. 1, Africa; Asia. See Rossi (*Mycol.* 69: 1075, 1977), Tavares (*Mycol. Mem.* 9: 627 pp., 1985).
- Pseudoendococcus** Marchand (1896) = *Endococcus* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pseudoepicoccum** M.B. Ellis (1971), anamorphic *Pezizomycotina*, Hsp.0eP.10. 1, widespread (tropical). See Ellis (*Dematiaceous Hyphomycetes*: 270, 1971).
- pseudoepithecium**, an amorphous or granular layer overlying paraphyses in an apothecium and in which their tips are immersed, but not forming a separate tissue.
- Pseudofarinaceus** Battarra ex Kuntze (1891) = *Amanitopsis*.
- Pseudofarinaceus** Earle (1909) = *Volvariella* fide Kuyper (*in litt.*).
- Pseudofavolus** Pat. (1900), Polyporaceae. 4, widespread (pantropical). See Núñez & Ryvarden (*Syn. Fung.* 10: 68, 1995).
- pseudofissitunicate** (of asci), see ascus.
- Pseudofistulina** O. Fidalgo & M. Fidalgo (1963), Fistulinaceae. 1, Brazil. See Gilbertson & Ryvarden (*N. Amer. Polyp.*: 261, 1987; syn. of *Fistulina*).
- Pseudofomes** Lázaro Ibiza (1916) = *Phellinus* fide

- Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974).
- Pseudofumago** Briosi & Farneti (1906) nom. dub., anamorphic *Pezizomycotina*. See de Hoog & Hermanides-Nijhof (*Stud. Mycol.* 15: 186, 1977).
- Pseudofungi**. A subdivision in the *Chromista*; including the fungi treated as belonging to the oomycetes in a broad sense, and as *Oomycota*, *Hyphochytriomycota*, *Labyrinthulales* and *Thraustochytriales* in this edition of the *Dictionary*; see Cavalier-Smith (*Progr. Phycol. Res.* 4: 309, 1986), *Pseudomycotina*.
- Pseudofusarium** Matsush. (1971) = *Fusarium* fide Booth & Sutton (*in litt.*).
- Pseudofuscophialis** Sivan. & H.S. Chang (1995), anamorphic *Pezizomycotina*, Hso.≡ eP.15. 1, Taiwan. See Sivanesan & Chang (*MR* 99: 711, 1995).
- Pseudofusicoccum** Mohali, Slippers & M.J. Wingf. (2006), anamorphic *Botryosphaeriaceae*. 1, Venezuela. See Mohali *et al.* (*Stud. Mycol.* 55: 249, 2006).
- Pseudofusidium** Deighton (1969) = *Acremonium* fide Gams (*Cephalosporium-artige Schimmelpilze*, 1971).
- Pseudogaster** Höhn. (1907), anamorphic *Pezizomycotina*, Hsy.0eP.?. 1 (on bark), Brazil. See Seifert (*TBMS* 85: 123, 1985).
- Pseudogenea** Buchholz (1901) = *Genabea* fide Trappe (*TBMS* 65: 496, 1975), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Pseudogibellula** Samson & H.C. Evans (1973), anamorphic *Cordycipitaceae*, Hsy.0eH.32/33. 1, Ghana. See Samson & Evans (*Acta Bot. Neerl.* 22: 524, 1973), Evans (*Trichomycetes and Other Fungal Groups* Robert W. Lichwardt Commemoration Volume: 119, 2001; review).
- Pseudogliomastix** W. Gams (1985), anamorphic *Wallrothiella*, Hso.0eP.15. 1, Italy. See Gams (*Proc. Indian Acad. Sci. Pl. Sci.* 94: 279, 1985), Gams (*Stud. Mycol.* 45: 187, 2000), Mostert *et al.* (*Stud. Mycol.* 54: 115 pp., 2006; key).
- Pseudogliophragma** Phadke & V.G. Rao (1980), anamorphic *Pezizomycotina*, Hsy.0eH.10. 1, India. See Phadke & Rao (*Norw. Jl Bot.* 27: 127, 1980).
- Pseudogloeosporium** Jacz. (1917) = *Kabatia* fide Sutton (*Mycol. Pap.* 141, 1977).
- Pseudogomphus** R. Heim (1970), Gomphaceae. 1, Gabon. See Heim (*Revue Mycol. Paris* 34: 344, 1969).
- Pseudographiella** E.F. Morris (1966), anamorphic *Pezizomycotina*, Hsy.1eH.?. 3, widespread. See Morris (*Mycopath. Mycol. appl.* 28: 97, 1966), Illman *et al.* (*Mycol.* 77: 662, 1985).
- Pseudographis** Nyl. (1855) nom. cons., Tribliidiaceae. 3, widespread (temperate). See Magnes (*Biblthca Mycol.* 165, 1997).
- Pseudographium** Höhn. (1915), anamorphic *Pezizomycotina*, Hsy.?.?. 1, USA. See Sutton (*Mycol. Pap.* 141, 1977).
- Pseudographium** Jacz. (1898) = *Sphaerographium* fide Sutton (*Mycol. Pap.* 141, 1977).
- Pseudoguignardia** Gutner (1927) = *Physalospora* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Pseudogyalecta** Vězda (1975) nom. rej. = *Badimia* fide Lücking & Vězda (*Taxon* 44: 227, 1995).
- Pseudogymnoascus** Raillo (1929), *Pseudeurotiaceae*. Anamorph *Geomyces*. 7, widespread. See Samson (*Acta Bot. Neerl.* 21: 517, 1972), Orr (*Mycotaxon* 8: 165, 1979), Ito & Yokoyama (*IFO Res. Comm.* 13: 83, 1987), Sogonov *et al.* (*Mycol.* 97: 695, 2005; phylogeny), Jiang & Yao (*Mycotaxon* 94: 55, 2005; phylogeny, ontogeny), Rice & Currah (*Mycol.* 98: 307, 2006; phylogeny), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Pseudogymnopilus** Raithelh. (1974), ? *Strophariaceae*. 1, S. America. See Raithelhuber (*Hong. Argentin.* 1: 148, 1974).
- Pseudogyrodon** Heinem. & Rammeloo (1983) = *Gyrodon* fide Kuyper (*in litt.*).
- Pseudohalonectria** Minoura & T. Muroi (1978), *Magnaporthaceae*. 9 (on wood, freshwater), widespread. See Shearer (*CJB* 67: 194, 1989; key, posn), Chen *et al.* (*Mycol.* 91: 84, 1999; phylogeny), Promputtha *et al.* (*Cryptog. Mycol.* 25: 43, 2004; Thailand), Shenoy *et al.* (*Cryptog. Mycol.* 26: 123, 2005).
- Pseudohansenula** E.K. Novák & Zsolt (1961) nom. dub., Fungi. See Lodder (*Yeasts, a taxonomic study* 2nd edn: 236, 1970).
- Pseudohansenula** Mogi (1939) nom. dub., Fungi.
- Pseudohansfordia** G.R.W. Arnold (1970), anamorphic *Pezizomycotina*, Hso.1≡ eH.10. 15 (on fungi), widespread. See de Hoog (*Persoonia* 10: 57, 1978), Eicker *et al.* (*Bot. Bull. Acad. Sin.* 31: 205, 1990; disease of *Auricularia mesenterica*).
- Pseudohansfordia** S.M. Reddy & Bilgrami (1975), anamorphic *Pezizomycotina*, Hso.0eH.?. 2, India. See de Hoog (*Persoonia* 10: 58, 1978).
- Pseudohaplis** Clem. & Shear (1931) = *Botryodiplodia* fide Sutton (*Mycol. Pap.* 141, 1977).
- Pseudohaplosporella**, see *Pseudhaplosporella*.
- Pseudoharpella** Ferrington, M.M. White & Lichtw. (2003), *Harpellales*. 1, USA. See Ferrington *et al.* (*Aquatic Insects* 25: 86, 2003), White (*MR* 110: 1011, 2006; phylogeny).
- Pseudohelicomyces** Garnica & E. Valenz. (2000), anamorphic *Pezizomycotina*. 2, Chile. See Valenzuela & Garnica (*MR* 104: 739, 2000).
- Pseudohelotium** Fuckel (1870), *Helotiaceae*. c. 50, Europe. See Arendholz (*Mycotaxon* 36: 283, 1989; nomencl.).
- Pseudohendersonia** Crous & M.E. Palm (1999), anamorphic *Pezizomycotina*, Cpd.?.?. 1, S. Africa. See Crous & Palm (*MR* 103: 1302, 1999), Crous *et al.* (*CBS Diversity Ser.* 2, 2004).
- Pseudohepatica** P.M. Jørg. (1993), *Pezizomycotina* (L). 1 (ascomata unknown), Venezuela. See Jørgensen (*Bryologist* 96: 435, 1993), Marcano *et al.* (*Trop. Bryol.* 18: 203, 2000).
- Pseudoheppia** Zahlbr. (1903), ? *Lichinaceae* (L). 1, Europe.
- pseudoheterothallism**, see heterothallism.
- Pseudohiatula** (Singer) Singer (1938), *Tricholomataceae*. c. 5, widespread (tropical). See Singer (*Persoonia* 2: 407, 1962).
- Pseudohiatulaceae** Grgur. (2000) = *Tricholomataceae*.
- Pseudohydnotrya** E. Fisch. (1897) = *Geopora* fide Fischer (*Nat. Pflanzenfam.* 5b: viii, 1938), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Pseudohydnum** P. Karst. (1868), *Auriculariales*. 1, widespread. See Donk (*Persoonia* 3: 199, 1964), Hjortstam *et al.* (*Kew Bull.* 45: 319, 1990), Roberts & Spooner (*Kew Bull.* 53: 631, 1998; Brunei Darussalam).
- Pseudohydnum** Rick (1904) = *Hydnodon* fide Donk (*Taxon* 5: 69, 1956).
- Pseudohygrocybe** (Bon) Kovalenko (1988) = *Hygrocybe* fide Kuyper (*in litt.*).
- Pseudohygrophorus** Velen. (1939) nom. dub.,

- Tricholomataceae. 1, Europe.
- Pseudohypocrea** Yoshim. Doi (1972), Hypocreaceae. Anamorph *Acremonium*-like. 1 (on decaying wood and bark), N. America. See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- pseudoidia**, separated hyphal cells able to be germinated (Bensaude).
- Pseudoidium** Y.S. Paul & J.N. Kapoor (1986) = *Oidium* Link (1824) fide Sutton (*in litt.*), Takamatsu (*Mycoscience* 45: 147, 2004).
- Pseudoinonotus** T. Wagner & M. Fisch. (2001), Hymenochaetaceae. 4, widespread. See Wagner & Fischer (*MR* 105: 773, 2001).
- pseudoisidium** (pl. -ia), (1) an outgrowth from the surface of a lichen thallus resembling an isidium (e.g. *Gyalideopsis*; see Vězda, *Folia geobot. phytotax.* 14: 48, 1979); (2) isidium without photosynthetic cells in *Pseudocyphellaria* (see Galloway, *Bull. Br. Mus. nat. Hist., Bot.* 17: 1, 1988).
- Pseudokarschia** Velen. (1934) = *Dactylospora* fide Hafellner (*Beih. Nova Hedwigia* 62, 1979).
- Pseudolachnea** Ranoj. (1910), anamorphic *Pezizomycotina*, Cac/Ccu.1 = eH.15. 5, widespread. See Sutton (*The Coelomycetes*, 1980).
- Pseudolachnea** Velen. (1934) [non *Pseudolachnea* Ranoj. 1910] ? = *Hyalopeziza* fide Eckblad (*Nytt Mag. Bot.* 15: 174, 1978), Huhtinen (*Öst. Z. Pilzk.* 10: 1, 2001; redispositions).
- Pseudolachnella** Teng (1936) = *Pseudolachnea* Ranoj. fide Sutton (*Mycol. Pap.* 141, 1977).
- Pseudolachnum** Velen. (1934), ? Helotiales. 1, former Czechoslovakia.
- Pseudolagarobasidium** J.C. Jang & T. Chen (1985), Phanerochaetaceae. 2, widespread. See Stalpers (*Folia Cryptog. Estonica* 33: 133, 1998).
- Pseudolasiobolus** Agerer (1983), Tricholomataceae. 1, tropical. See Agerer (*Mitt. bot. StSamml. Münch.* 19: 279, 1983).
- Pseudolecanactis** Zahlbr. (1907), ? Roccellaceae (L). 1, Samoa.
- Pseudolecidea** Clauzade & Cl. Roux (1984) = *Claurouxia*.
- Pseudolecidea** Marchand (1896) = *Abrothallus* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pseudolembosia** Theiss. (1913), Parmulariaceae. 2, Australia; C. America. See Petrak (*Sydowia* 8: 297, 1954), Inácio & Cannon (*MR* 107: 82, 2003), Inácio *et al.* (*Mycol. Progr.* 4: 133, 2005).
- Pseudoleptogium** Jatta (1900) = *Polychidium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pseudoleptogium** Müll. Arg. (1885) = *Leptogium* fide Degelius (*Svensk bot. Tidskr.* 37: 65, 1943).
- Pseudolignicola** Chatmala & E.B.G. Jones (2006), Halosphaeriaceae. Anamorph *Humicola*-like. 1 (marine), Thailand. See Chatmala & Jones (*Nova Hedwigia* 83: 225, 2006).
- Pseudolizonia** Pirotta (1889) = *Lizonia* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Pseudoloma** J.L. Matthews, A.M.V. Brown, K. Larison, J.K. Bishop-Stewart, P. Rogers & M.L. Kent (2001), Microsporidia. 1. See Matthews *et al.* (*J. Eukary. Microbiol.* 48: 227, 2001).
- Pseudolycoperdon** Velen. (1947) = *Bovista* fide Kreisel (*Beih. Nova Hedwigia* 25: 63, 1967).
- Pseudolyophyllum** (Singer) Raithelh. (1979) = *Clitocybe* fide Kuyper (*in litt.*).
- Pseudomassaria** Jacz. (1894), Hyponectriaceae. Anamorph *Beltraniella*. 20 (from dead plant tissues), widespread. See Barr (*Mycol.* 56: 841, 1964; keys), Barr (*Mycol.* 68: 611, 1976; nomencl.), Hyde *et al.* (*Sydowia* 50: 21, 1998), Wang & Hyde (*Fungal Diversity* 3: 159, 1999).
- Pseudomassariella** Petr. (1955) = *Leiosphaerella* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Pseudombrophila** Boud. (1885), Pyronemataceae. 28 (esp. coprophilous), widespread. See van Brummelen (*Libri Botanici* 14, 1995; monogr., key), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Hansen *et al.* (*Mycol.* 97: 1023, 2005; phylogeny), Yao & Spooner (*Fungal Diversity* 22: 267, 2006), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Pseudomelasmia** Henn. (1902) = *Phyllachora* Nitschke ex Fuckel (1870) fide Höhnelt (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt. 1* 119: 54, 1910).
- Pseudomeliola** Speg. (1889), ? Parodiellaceae. 4, America (tropical). Poorly known and heterogenous. See von Arx (*Acta Bot. Neerl.* 7: 503, 1958), Cannon (*Mycol. Pap.* 163: 302 pp., 1991).
- Pseudomeria** G.L. Barron (1980), anamorphic *Clavicipitaceae*, Hso.0eH.10. 1 (on nematodes), Canada. See Barron (*CJB* 58: 443, 1980).
- Pseudomerulius** Jülich (1979), Tapinellaceae. 3, widespread. See Jülich (*Persoonia* 10: 350, 1979).
- Pseudomicrocera** Petch (1921) = *Fusarium* fide Wollenweber & Reinking (*Die Fusarien*: 7, 1935).
- Pseudomicrodochium** B. Sutton (1975), anamorphic *Hypocreales*, Hso.1 = eH.15. 9, widespread. See Sutton *et al.* (*Mycopathologia* 114: 159, 1991; from humans), Castañeda Ruiz *et al.* (*Mycotaxon* 68: 23, 1998), Decock *et al.* (*Antonie van Leeuwenhoek* 84: 209, 2003; phylogeny).
- Pseudomitrla** Gamundí (1980), Helotiaceae. 1, S. America. See Gamundí (*Fl. criptog. Tierra del Fuego* 10, 1987).
- pseudomixis** (-gamy), the type of fertilization in which the copulating elements are not special sexual cells.
- Pseudomonilia** A. Geiger (1910) nom. rej. = *Candida* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pseudomorfea** Punith. (1981), Dothideomycetes. Anamorph *Chaetasbolisia*. 1, India; Argentina. See Venedikian (*Boln Soc. argent. Bot.* 25: 495, 1988).
- pseudomorph**, a stroma made up of plant parts kept together by plectenchyma.
- pseudomycelium** (of *Candida*, etc.), loosely united, catenulate groups of cells (see Zobl, *RAM* 23: 177, 1944).
- Pseudomycena** Cejp (1929) = *Mycena* fide Smith (*North American Species of Mycena*, 1947).
- Pseudomycoderma** H. Will (1916), anamorphic *Saccharomycetales*, Hso.0eH.?. 1, Europe.
- Pseudomycoporon** Marchand (1896) ? = *Mycoporum* Flot. ex Nyl. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- pseudomycorrhiza**, see mycorrhiza.
- Pseudomycotina**, see mycorrhiza.
- Pseudonaevia** Dennis & Spooner (1993), Helotiales. 1, British Isles. See Dennis & Spooner (*Persoonia* 15: 177, 1993).
- Pseudonectria** Seaver (1909), Nectriaceae. Anamorph *Volutella*. 5 (on leaves and twigs), Europe; America. See Rossman *et al.* (*Mycol.* 85: 685, 1993; key), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).

- Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Pseudonectriella** Petr. (1959) = *Catabotrys* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Pseudoneottiospora** Faurel & Schotter (1965), anamorphic *Pezizomycotina*, Cpd.1bH.19. 2 (coprophilous), Algeria; Italy. See Faurel & Schotter (*Revue Mycol. Paris* 29: 278, 1964).
- Pseudoneurospora** Dania García, Stchigel & Guarro (2004), Sordariaceae. 1, Thailand. See García *et al.* (*MR* 108: 1139, 2004).
- Pseudoniptera** Velen. (1947) = *Hymenoscyphus* fide Gminder (*Czech Mycol.* 58: 125, 2006).
- Pseudonitschkia** Coppins & S.Y. Kondr. (1995), ? Dacampiaceae. 1 (on *Parmotrema*), widespread. See Coppins & Kondratyuk (*Edinb. J. Bot.* 52: 229, 1995).
- Pseudonocardia** Henssen (1957), Actinobacteria. q.v.
- Pseudonosema** E.U. Canninga, D. Refardt, C.R. Vossbrinck, B. Okamurad & A. Curry (2002), Microsporidia. 1. See Canninga *et al.* (*Eur. J. Protist.* 38: 247, 2002).
- Pseudooolla** Velen. (1934) = *Olla* fide Baral (*SA* 13: 113, 1994).
- Pseudoomphalina** (Singer) Singer (1956), Tricholomataceae. c. 5, widespread (north temperate). See Singer (*Mycol.* 48: 725, 1956), Watling & Turnbull (*British Fungus Flora*, 1998; UK), Contu (*Micologia e Vegetazione Mediterranea* 18: 61, 2003; Sardinia).
- pseudoperculate** (of asci), ones which are essentially unitunicate in structure and with a thickened apical cap which splits completely away at discharge (e.g. *Odontotrema*); see ascus.
- Pseudopannaria** (B. de Lesd.) Zahlbr. (1924), ? Lecideaceae (L). 1, France.
- Pseudopapulaspora** N.D. Sharma (1977), anamorphic *Pezizomycotina*, Hso.#eP.1. 1, India. See Sharma (*J. Indian bot. Soc.* 56: 100, 1977).
- pseudoparaphyses** (of ascomycetes), see hamathecium; (of basidiomycetes), see hyphidium.
- pseudoparenchyma**, see plectenchyma.
- Pseudoparmelia** Lynge (1914), Parmeliaceae (L). 27, pantropical. See Hale (*Smithson. Contr. bot.* 31, 1976), Hale (*Mycotaxon* 25: 603, 1986), Elix & Nash (*Bryologist* 100: 482, 1998).
- Pseudoparodia** Theiss. & Syd. (1917), Venturiaceae. 1 (on *Vaccinium*), S. America. See Petrak (*Sydowia* 1: 169, 1947).
- Pseudoparodiella** F. Stevens (1927), Venturiaceae. Anamorph *Spilodochium*. 1, Costa Rica. See Sivanesan (*TBMS* 86: 187, 1986).
- Pseudopatella** Sacc. (1884) = *Cystotricha* fide Höhnelt (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt. 1* 119: 617, 1910).
- Pseudopatella** Speg. (1891) = *Botryodiplodia* fide Petrak & Sydow (*Feddes Repert.* 42: 1, 1927).
- Pseudopatellina** Höhn. (1908), anamorphic *Pezizomycotina*, St.0eH.?. 1, Europe.
- Pseudopaulia** M. Schultz (2002), Lichinaceae. 1, Socotra. See Schultz (*Mycotaxon* 82: 446, 2002), Schultz & Büdel (*Lichenologist* 35: 151, 2003; phylogeny).
- Pseudopeltis** L. Holm & K. Holm (1978), ? Helotiales. 1 (on *Dryopteris*), Sweden. See Holm & Holm (*Bot. Notiser* 131: 97, 1978).
- Pseudopeltistroma** Katum. (1975), anamorphic *Pezizomycotina*, Cpt.0eP.?. 1, Japan. See Katumoto (*Bulletin of the Faculty of Agriculture, Yamaguchi University* 26: 99, 1975).
- Pseudopeltula** Henssen (1995), Gloeophepiaceae (L). 3, Mexico; Caribbean. See Henssen (*Lichenologist* 27: 261, 1995), Schultz (*Bryologist* 110: 286, 2007; USA).
- pseudoperidium**, a false peridium; covering membrane of the aecium in the *Pucciniales*.
- Pseudoperis** Clem. & Shear (1931) = *Pseudoperisporium*.
- Pseudoperisporiaceae** Toro (1926), ? Dothideomycetes (inc. sed.). 25 gen. (+ 39 syn.), 228 spp.
Lit.: Farr (*Mycol.* 55: 226, 1963; on *Pinaceae*), Farr (*Mycol.* 58: 221, 1966; on *Gramineae*), Farr (*Mycol.* 71: 243, 1979; on *Asteraceae*), Farr (*Mycol.* 76: 793, 1984; on *Rubiaceae*), Farr (*Sydowia* 38: 65, 1985), Döbbeler (*Arctic and Alpine Mycology II*: 87, 1987), Sivanesan (*SA* 6: 201, 1987), Barr (*Mycotaxon* 64: 149, 1997), Döbbeler (*Biodiv. Cons.* 6: 721, 1997), Valinsky *et al.* (*Appl. Environm. Microbiol.* 68: 5999, 2002), Lumbsch *et al.* (*Mol. Phylogen. Evol.* 34: 512, 2005).
- Pseudoperisporium** Toro (1926) = *Lasiostemma* fide Farr (*Mycol.* 71: 250, 1979).
- Pseudoperitheca** Elenkin (1922), *Pezizomycotina* (L). 1, former USSR.
- pseudoperithecium** (of *Laboulbeniales*), a perithecium-like structure in which the asci and spores become free.
- Pseudopestalotia** Elenkin & Ohl (1912) = *Truncatella* fide Steyaert (*Bull. Jard. Bot. État* 19: 285, 1949), Sutton (*Mycol. Pap.* 141, 1977).
- Pseudopetrakia** M.B. Ellis (1971), anamorphic *Pezizomycotina*, Hsy.#eP.10. 1, India. See Ellis (*Mycol. Pap.* 125: 3, 1971), Sutton & Alcorn (*Proc. R. Soc. Qd.* 95: 41, 1984).
- Pseudopezicula** Korf (1986), Helotiaceae. Anamorph *Phialophora*-like. 2, Europe; N. America. See Korf *et al.* (*Mycotaxon* 26: 457, 1986), Pearson *et al.* (*Pl. Dis.* 72: 796, 1988; disease), Reiss & Zinkernagel (*Z. PflKrankh. PflPath. PflSchutz* 101: 212, 1994; heterothallism), Verkley (*Stud. Mycol.* 44: 180 pp., 1999).
- Pseudopeziza** Fuckel (1870), ? Dermateaceae. Anamorph *Gloeosporidiella*. 3, widespread. *P. trifolii* (clover leaf spot). See Schüepp (*Phytopath. Z.* 36: 224, 1959; key), Thite & Nagaraja (*Geophytology* 20: 17, 1990; ontogeny), Reiss & Zinkernagel (*Z. PflKrankh. PflPath. PflSchutz* 101: 212, 1994; heterothallism), Nauta & Spooner (*Mycologist* 14: 65, 2000; key British spp.).
- Pseudopezizites** Fiore (1932), Fossil Fungi. 1 (Eocene), Italy.
- Pseudophacidiaceae** Rehm (1887) ? = *Ascodichaenaceae*.
- Pseudophacidium** P. Karst. (1885), ? *Ascodichaenaceae*. 5, widespread. See Minter in Capretti *et al.* (Eds) (*Shoot and Foliage Diseases in Forest Trees*: 65, 1995), Yuan *et al.* (*Australas. Pl. Path.* 29: 215, 2000).
- Pseudophaeolus** Ryvarden (1975) = *Laetiporus* fide Westhuizen (*Bothalia* 11: 143, 1973), Ofosu-Asiedu (*TBMS* 65: 285, 1975), Ryvarden (*Gen. Polyp.*: 135, 1991) See.
- Pseudophaeoramularia** U. Braun (1997) = *Pseudocercospora* fide Braun & Melnik (*Trudy Botanicheskogo Instituta im. V.L. Komarova* 20: 18, 1997), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003).
- Pseudophaeotrichum** Aue, E. Müll. & C. Stoll (1969) = *Neotestudina* fide Hawksworth (*CJB* 57: 91, 1979).
- pseudophialide**, a cell bearing a sporangium in the

Kickxellaceae.

Pseudophloeospora U. Braun (1993), anamorphic *Pezizomycotina*, Cac.≡ eH.10. 1, Japan. See Braun (*Cryptog. bot.* 4: 110, 1993).

Pseudophoma Höhn. (1916) = *Chaetosphaeronema* fide Petrak (*Annl. mycol.* 42: 58, 1944).

Pseudophomopsis Höhn. (1926) = *Phomopsis* (Sacc.) Bubák. fide Clements & Shear (*Gen. Fung.*, 1931).

Pseudophragmotrichum W.P. Wu, B. Sutton & Gange (1998), anamorphic *Pezizomycotina*, Cpd.?? 1, Cuba. See Wu *et al.* (*MR* 102: 179, 1998).

Pseudophyllachora Speg. (1919) nom. dub., Fungi. See Petrak (*Sydowia* 5: 350, 1951).

Pseudophysalospora Höhn. (1918) = *Physalospora* fide Barr (*Mycol.* 68, 1976).

Pseudophyscia Müll. Arg. (1894) = *Heterodermia*.

Pseudophysciaceae Tomas. (1949) = *Physciaceae*.

pseudophyse, see *cystidium*.

pseudophysis, see *hyphidium*.

Pseudopileum Canter (1963), *Chytridiaceae*. 1 (on *Mallomonas*), British Isles. See Canter (*TBMS* 46: 309, 1963).

pseudopionnotes, see *sporodochium*.

Pseudopiptoporus Ryvarden (1980), *Polyporaceae*. 2, E. Africa; India. See Ryvarden & Johansen (*Prelim. Polyp. Fl. E. Afr.*: 523, 1980), Decock & Ryvarden (*Nova Hedwigia* 77: 199, 2003).

Pseudopithyella Seaver (1928), *Sarcoscyphaceae*. 2, widespread. See Dissing & Raitviir (*Eesti NSV Tead. Akad. Toim. Biol. seer* 23: 104, 1974), Donadini *et al.* (*Cryptog. Mycol.* 10: 283, 1989; asci), Harrington *et al.* (*Mycol.* 91: 41, 1999; phylogeny), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny).

Pseudoplacodium Motyka (1996) nom. inval. = *Protoparmelia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

pseudoplasmodium, see *plasmodium*.

Pseudoplea Höhn. (1918) = *Leptosphaerulina* fide Barr (*Contr. Univ. Mich. Herb.* 9, 1972).

Pseudoplectania Fuckel (1870), *Sarcosomataceae*. 3 or 4, Europe; N. America. See Donadini (*Mycol. Helv.* 2: 217, 1987; 4 spp.), Li & Kimbrough (*CJB* 73: 1761, 1995; ultrastr.), Landvik *et al.* (*Nordic J. Bot.* 17: 403, 1997; DNA), Harrington *et al.* (*Mycol.* 91: 41, 1999; phylogeny), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).

Pseudopleistophora Sprague (1977), *Microsporidia*. 1.

Pseudopleospora Petr. (1920), *Dothideomycetes*. 3, Europe. See Crivelli (*Über die heterogene Ascomycetengattung Pleospora Rbh.*, 1983; key).

pseudopodetium, a lichenized podetium-like structure of vegetative origin, ascogonia arising on this not on the pre-formed granular or squamulose thallus initials (e.g. *Cladia*, *Stereocaulon*).

pseudopodium (of *Mycetozoa*), a protoplasmic process from a myxamoeba or plasmodium.

Pseudopolyporus Hollick (1910), Fossil Fungi ? *Basidiomycota*. 1 (Carboniferous), USA.

Pseudopolystigmina Murashk. (1928), anamorphic *Pezizomycotina*, St.0eH.?. 1, Russia.

Pseudoproboscispora Punith. (1999), *Annulatascaeae*. 1 (on submerged wood), widespread. See Wong & Hyde (*MR* 103: 81, 1999), Campbell *et al.* (*Mycol.* 95: 41, 2003; phylogeny).

Pseudoprotomyces Gibelli (1874) = *Phloeconis* fide Saccardo (*Syll. fung.* 14: 1197, 1899).

Pseudopuccinia Höhn. (1925) = *Stigmina* fide Laun-

don (*Mycol. Pap.* 99: 14, 1965).

pseudopycnidium (obsol.), a pycnidium-like structure of hyphal tissue, as in certain anamorphic fungi.

Pseudopyrenula Müll. Arg. (1883), *Trypetheliaceae* (±L). 10, widespread (tropical). See Riedl (*Sydowia* 16: 215, 1963), Aptroot (*Nova Hedwigia* 66: 89, 1998), Aptroot (*Trop. Bryol.* 14: 25, 1998), Harris (*Lichenogr. Thomsoniana*: 133, 1998), Prado *et al.* (*MR* 110: 511, 2006; phylogeny), Aptroot *et al.* (*Biblthca Lichenol.* 97, 2008; Costa Rica).

Pseudopythium Sideris (1930) nom. nud., Fungi. See Merlich (*Mycol.* 24: 453, 1932).

Pseudoramonia Kantvilas & Vězda (2000), *Thelotrema* *taceae*. 2, Australia; Venezuela. See Kantvilas & Vězda (*Lichenologist* 32: 343, 2000).

Pseudoramularia Matsush. (1983), anamorphic *Pezizomycotina*, Hso.≡ eH.3. 2, Uganda; Pacific islands. See Matsushima (*Matsush. Mycol. Mem.* 3: 13, 1983).

Pseudorbilia Ying Zhang, Z.F. Yu, Baral & K.Q. Zhang (2007), *Orbiliaceae*. 1, China. See Zhang *et al.* (*Fungal Diversity* 26: 305, 2007).

pseudorhiza, a rooting base, as in *Collybia radicata* (Buller, 4).

Pseudorhizina Jacz. (1913), *Discinaceae*. 2, N. America. See Harmaja (*Karstenia* 13: 48, 1973), Abbott & Currah (*Mycotaxon* 62: 1, 1997; N. Am.), O'Donnell *et al.* (*Mycol.* 89: 48, 1997; phylogeny), Holec & Beran (*Czech Mycol.* 59: 51, 2007; Europe).

Pseudorhizinaceae Harmaja (1974) = *Discinaceae*.

Pseudorhizopogon Kobayasi (1983), anamorphic *Pezizomycotina*, Cpd.0eH.23. 1, Japan. See Kobayasi (*J. Jap. Bot.* 58: 175, 1983).

Pseudorhynchia Höhn. (1909) = *Trichosphaeria* fide Samuels & Barr (*CJB* 75: 2165, 1998), Dulymamode *et al.* (*MR* 105: 247, 2001).

Pseudorhytisma Juel (1895), *Rhytismataceae*. 1, widespread. See Schüepp (*Phytopath. Z.* 36: 262, 1959).

Pseudorobillarda M. Morelet (1968), anamorphic *Pezizomycotina*, Cpd.≡ eH.15. 11, widespread. See Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993), Bianchinotti (*MR* 101: 1233, 1997), Vujanovic & St-Arnaud (*Mycol.* 95: 955, 2003; key), Plaingam *et al.* (*Nova Hedwigia* 80: 335, 2005; Thailand).

Pseudorobillarda Nag Raj, Morgan-Jones & W.B. Kendr. (1972) = *Pseudorobillarda* M. Morelet fide Nag Raj *et al.* (*CJB* 51: 688, 1973).

Pseudosaccharomyces Briosi & Farneti (1906), anamorphic *Pezizomycotina*, HSo.0eH.?. c. 20, Italy.

Pseudosaccharomyces Klöcker (1912) [non *Pseudosaccharomyces* Briosi & Farneti 1906] = *Kloeckera* fide Cadez *et al.* (*FEMS Yeast Res.* 1: 279, 2002).

Pseudosagedia (Müll. Arg.) M. Choisy (1949), *Porinaceae* (L). 1, widespread. See Hafellner & Kalb (*Biblthca Lichenol.* 57: 161, 1995; status), McCarthy & Malcolm (*Lichenologist* 29: 1, 1997), Harris (*Opuscula Philolichenum* 2: 15, 2005; N America).

Pseudosarcophoma Urries (1952) ? = *Selenophoma* fide Sutton (*Mycol. Pap.* 141, 1977).

Pseudoschizothyra Punith. (1980), anamorphic *Pezizomycotina*, Cpt.1eH.15. 1, Myanmar. See Punithalingam (*Nova Hedwigia* 31: 890, 1979).

Pseudosclerophoma Petr. (1923) = *Phoma* Sacc. fide Sutton (*Mycol. Pap.* 141, 1977).

pseudosclerotium, a compacted mass of intermixed substratum (soil, stones, etc.) held together by mycelium, as in *Polyporus tuberaster* (see stone-fungus;

- also zone lines).
- Pseudoscypha** J. Reid & Piroz. (1966), ? Hysteriaceae. 1 (on *Abies*), Canada. See Reid & Pirozynski (*CJB* 44: 351, 1966).
- Pseudoseptoria** Speg. (1910), anamorphic *Pezizomycotina*, Cpd.0eH.19. 7 (on *Poaceae*), widespread (temperate). See Sutton (*The Coelomycetes*, 1980).
- pseudoseptum** (1) (obsol.) a protoplasmic or vacuolar membrane looking like a septum (= distoseptum, distoseptate) as in *Corynespora*; (2) (of *Blastocladiella*), a septum having pores.
- pseudosetae** (false setae), the upturned free-ends of context hyphae in the hymenium of *Duportella*.
- Pseudosigmoidea** K. Ando & N. Nakam. (2000), anamorphic *Pezizomycotina*. 1, USA. See Ando & Nakamura (*J. gen. appl. Microbiol.* Tokyo 46: 55, 2000).
- Pseudosolidum** Lloyd (1923), Ascoporiaceae. Anamorph *Plectophomella*-like. 1, S. America. See Samuels & Romero (*Bol. Mus. Paraense Emilio Goeldi ser. bot.* 7: 263, 1991; as *Ascoporia*), Kutorga & Hawksworth (*SA* 15: 1, 1997; as *Ascoporia*), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Pseudosphaerella** Höhn. (1911) = *Microcyclus* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Pseudosphaeria** Höhn. (1907) = *Wettsteinina* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962), Shoemaker & Babcock (*CJB* 65: 373, 1987).
- Pseudosphaeriales** = Pleosporales.
- Pseudosphaerialites** Venkatach. & R.K. Kar (1969), Fossil Fungi ? Ascomycota. 1 (Tertiary), India.
- Pseudosphaerophorus** M. Satô (1968) = *Bunodophoron* fide Wedin (*Pl. Syst. Evol.* 187: 213, 1993).
- Pseudospiropes** M.B. Ellis (1971), anamorphic *Strossmayeria*, Hso.≡ eP.10. 26, widespread. See Ellis (*Dematiaceous Hyphomycetes*, 1971), Ellis (*More Dematiaceous Hyphomycetes*, 1976), Hyde & Goh (*MR* 102: 739, 1998).
- Pseudospora** Schiffn. (1931), Algae.
- pseudospore** (1) (of *Acrasiales*), an encysted myxamoeba; (2) (of *Ustilaginales*), a basidiospore (obsol.); (3) a chlamydospore, as in *Rhizoctonia rubi*.
- Pseudostegia** Bubák (1906), anamorphic *Pezizomycotina*, Cac.0eH.15. 1, N. America.
- pseudostem** (of gasteromycete basidiomata), spongy tissue in which hyphae are not orientated parallel to the stipe axis (Dring, 1973).
- Pseudostemphylium** (Wiltshire) Subram. (1961) = *Ulocladium* fide Simmons (*Mycol.* 59: 80, 1967).
- Pseudostictis** Lambotte (1887) = *Cryptodiscus* fide Sherwood (*Mycotaxon* 6: 215, 1977).
- Pseudostilbella** Munt.-Cvetk. & Gómez-Bolea (1995), anamorphic *Pezizomycotina*. 1, Morocco. See Muntañola-Cvetkovic & Gómez-Bolea (*CJB* 73: 591, 1995).
- Pseudostracoderma** A.E. Martinez & Godeas (1997), anamorphic *Pezizomycotina*, Hso.???. 1. See Martinez & Godeas (*Mycotaxon* 65: 455, 1997).
- pseudostroma**, a stroma formed of thalline tissue and remnants of host tissue (see Eriksson, *Opera bot.* 60: 14, 1981), an aggregation of perithecial ascomata into a pustule some partly of bark cells altered by the fungus (see Johnson, *Ann. Mo bot. Gdn* 27: 31, 1940), a coelomycetous conidioma of fungal and host tissue (see Sutton, *The Coelomycetes*, 1980), Fig. 10S). cf. substroma.
- Pseudostypella** McNabb (1969), Auriculariaceae. 1, New Zealand. See McNabb (*N.Z. Jl Bot.* 7: 259, 1969).
- Pseudotaeniolina** J.L. Crane & Schokn. (1986), anamorphic *Capnodiales*, Hso.0-1eP.3. 1, Iran. See Crane & Schoknecht (*Mycol.* 78: 88, 1986), De Leo *et al.* (*Antonie van Leeuwenhoek* 83: 351, 2003), Kurzai *et al.* (*Mycoses* 46: 141, 2003), Selbmann *et al.* (*Stud. Mycol.* 51: 1, 2005; phylogeny).
- Pseudotapesia** Velen. (1939), ? Helotiales. 1, former Czechoslovakia.
- pseudothecium** (1) an ascostromatic ascoma having asci in numerous unwallled locules, as in loculoascomycetes; cf. euthecium; (2) a protoperithecium.
- Pseudothephora** Lloyd (1919) = *Thelephora* fide Donk (*Taxon* 6: 17, 1957).
- Pseudothiella** Petr. (1928), Phyllachoraceae. Anamorph *Pseudothiopsella*. 1 (from living leaves), Brazil. See Hyde (*TMSJ* 32: 265, 1991).
- Pseudothiopsella** Petr. (1928), anamorphic *Pseudothiella*, St.0eH.?. 1, Brazil.
- Pseudothis** Theiss. & Syd. (1914), Diaporthales. 1, America (tropical). See Cannon (*Fungal Diversity* 7: 17, 2001).
- Pseudothyridaria** Petr. (1925) = *Valsaria* fide Clements & Shear (*Gen. Fung.*, 1931), Ju *et al.* (*Mycotaxon* 58: 419, 1996).
- Pseudothyrium** Höhn. (1927), anamorphic *Pezizomycotina*, St.0eH.15. 1, Europe.
- Pseudotis** (Boud.) Boud. (1907) = *Otidea* fide Eckblad (*Nytt Mag. Bot.* 15: 1, 1968).
- Pseudotomentella** Svrček (1958), Thelephoraceae. 12, widespread. See Larsen (*Mycol.* 66: 167, 1974; key), Stalpers (*Stud. Mycol.* 35: 49, 1993; key), Kõljalg (*Syn. Fung.* 9: 41, 1996; key eurasian spp.), Martini & Hentic (*BSMF* 119: 19, 2003; France).
- Pseudotorula** Subram. (1958), anamorphic *Pezizomycotina*, Hso.≡ fP.3. 1, India. See Subramanian (*J. Indian bot. Soc.* 37: 58, 1958).
- Pseudotracya** Vánky (1999), Doassansiaceae. 1 (on *Ottelia* (*Hydrocharatiaceae*)), Australia. See Vánky (*Mycotaxon* 71: 216, 1999).
- Pseudotracylla** B. Sutton & Hodges (1976), anamorphic *Pezizomycotina*, Cpt.0eH.15. 2, Brazil; USA. See Carris (*Mycol.* 84: 534, 1992), Carris (*Mycotaxon* 50: 93, 1994).
- Pseudotrametes** Bondartsev & Singer (1944) = *Trametes* fide Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974).
- Pseudotremellodendron** D.A. Reid (1957) = *Tremelodendropsis* fide Corner (*TBMS* 49: 205, 1966).
- Pseudotrichia** Kirschst. (1939), Pleosporales. 6, widespread (north temperate). See Barr (*Mycotaxon* 20: 1, 1984), Huhndorf (*Mycol.* 86: 134, 1994; key 4 spp. neotropics), Liew *et al.* (*Mol. Phylogen. Evol.* 16: 392, 2000; phylogeny), Câmara *et al.* (*MR* 107: 516, 2003; phylogeny).
- Pseudotrichoconis** W.A. Baker & Morgan-Jones (2001), anamorphic *Pezizomycotina*. 1, Europe. See Baker *et al.* (*Mycotaxon* 79: 367, 2001).
- Pseudotrochila** Höhn. (1917), ? Rhytismatales. 1, Java.
- Pseudotryblidium** Rehm (1890), Helotiales. 1, Europe.
- Pseudotrype** Henn. (1900) = *Eutypella* fide Höhnelt (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt.* 1 119: 926, 1910).
- Pseudotthia** Henn. (1900) = *Gibbera* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Pseudotulasnella** Lowy (1964), Tulasnellaceae. 1, Guatemala. See Lowy (*Mycol.* 56: 696, 1964).
- Pseudotulostoma** O.K. Mill. & T. Henkel (2001),

- Elaphomycetaceae. 2, Japan; Guyana. See Miller *et al.* (*MR* 105: 1269, 2001), Asai *et al.* (*Bull. natn. Sci. Mus. Tokyo*, B 30: 1, 2004), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny), Henkel *et al.* (*Mycorrhiza* 16: 241, 2006; mycorrhiza).
- Pseudotyphula** Corner (1953), Marasmiaceae. 1, N. America. See Berthier (*Bibliotheca Mycol.* 98: 89, 1985).
- Pseudovalsa** Ces. & De Not. (1863), Pseudovalsaceae. Anamorph *Coryneum*. 4, widespread (north temperate). See Wehmeyer (*Revision of Melanconis*, 1941), Barr (*Mycol. Mem.* 7, 1978).
- Pseudovalsaceae** M.E. Barr (1978), Diaporthales. 3 gen. (+ 2 syn.), 26 spp. Much reduced in diversity compared with its traditional circumscription. See Wehmeyer (*Revision of Melanconis*, 1941), Barr (*Mycol. Mem.* 7, 1978), Castlebury *et al.* (*Mycol.* 94: 1017, 2002), Rossman *et al.* (*Mycoscience* 48: 135, 2007; phylogeny).
- Pseudovalsaria** Spooner (1986), Boliniaceae. 4, Europe; China. See Spooner (*TBMS* 86: 401, 1986), Barr (*Mycotaxon* 46: 45, 1993), Barr (*Mycotaxon* 51: 191, 1994; posn), Andersson *et al.* (*SA* 14: 1, 1995; posn), Kang *et al.* (*Mycoscience* 40: 151, 1999; posn).
- Pseudovalsella** Höhn. (1918), Pseudovalsaceae. Anamorph *Hendersonula*. 1 (from bark), widespread. See Barr (*Mycol. Mem.* 7, 1978).
- Pseudovirgaria** H.D. Shin, U. Braun, Arzanlou & Crous (2007), ? Capnodiales. 1 (on rusts), Korea. See Arzanlou *et al.* (*Stud. Mycol.* 58: 57, 2007).
- Pseudovularia** Speg. (1910) = *Ramularia* Unger fide Deighton (*TBMS* 59: 419, 1972).
- Pseudoxenasma** K.H. Larss. & Hjortstam (1976), Russulaceae. 1, Europe. See Larsson & Hjortstam (*Mycotaxon* 4: 307, 1976), Larsson & Larsson (*Mycol.* 95: 1037, 2003; phylogeny).
- Pseudoxylaria** Boedijn (1959) = *Xylaria* Hill ex Schrank fide Læssøe (*SA* 13: 43, 1994).
- Pseudoyuconia** Lar.N. Vassiljeva (1983), Pleosporaceae. 1, Germany. See Ahn & Shearer (*CJB* 73: 573, 1995; as *Barrella*).
- Pseudozyma** Bandoni (1985), anamorphic *Ustilaginaceae*. 9, Canada; China. See Hajlaoui *et al.* (*Phytopathology* 82: 583, 1992; biocontrol, as *Stephanoascus*), Boekhout (*J. gen. appl. Microbiol.* Tokyo 41: 359, 1995; taxonomy), Hoegh *et al.* (*CJB* 73: 869, 1995; lipases), Dik *et al.* (*Eur. J. Pl. Path.* 104: 413, 1998; biocontrol), Kurtzman & Fell (*Yeasts, a taxonomic study* 4th edn, 1998), Fell *et al.* in McLaughlin *et al.* (Eds) (*The Mycota A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research* 7B: 3, 2001; China), Wang *et al.* (*Int. J. Syst. Evol. Microbiol.* 56: 289, 2006; China).
- Pseudozythia** Höhn. (1902), anamorphic *Pezizomycotina*, Cpd.0eH.?. 1, Europe.
- Psiammopomopiospora** Locq. & Sal.-Cheb. (1980), Fossil Fungi. 3, Cameroon.
- Psiamspora** Locq. & Sal.-Cheb. (1980), Fossil Fungi. 1, Cameroon.
- Psidimobipiospora** Locq. & Sal.-Cheb. (1980), Fossil Fungi. 4, Cameroon.
- Psilachnum** Höhn. (1926), Hyaloscyphaceae. 27, widespread. See Dennis (*Persoonia* 2: 171, 1962), Raitviir (*Scripta Mycol.* 1: 1, 1970; key), Sharma (*Nova Hedwigia* 46: 369, 1988; 4 spp. on *Pteridophyta*), Galán & Raitviir (*Mycotaxon* 72: 163, 1999), Raitviir (*Scripta Mycol.* 20, 2004).
- Psilainaperturites** Y.K. Mathur (1966), Fossil Fungi. 1, India.
- Psiloboletinus** Singer (1945), Suillaceae. 1, Asia (temperate). See Smith (*Mycol.* 58: 332, 1966).
- Psilobotrys** Sacc. (1879) = *Chloridium* fide Hughes (*CJB* 36: 727, 1958).
- psilocin**, a hallucinatory indole derivative from *Psilocybe mexicana* (Hoffman *et al.*, *Experientia* 14: 11, 397, 1958). See also psilocybin, hallucinogenic fungi.
- Psilocistella** Svrček (1977), Hyaloscyphaceae. 10, Europe. See Huhtinen (*Karstenia* 29: 45, 1990), Raitviir (*Scripta Mycol.* 20, 2004).
- Psilocybe** (Fr.) P. Kumm. (1871), Strophariaceae. c. 300, widespread. Several species of subgen. *Psilocybe* hallucinogenic, producing psilocybin, psilocin and baeocystin (Stamets, *Psilocybin mushrooms of the world*, 1996; Guzmán, *International Journal of Medicinal Mushrooms* 7: 410, 2005); the edible *P. rugoso-annulata* ('strophaire') cultivated in Eur. In the present edition the genus is very widely circumscribed (Smith, *Taxon* 28: 19, 1979; Kühner, *Les Hyménomycètes agaricoïdes*: 249, 1980; Noordeloos, *Persoonia* 16: 127, 1995), whereas Singer (*Agaricales mod. Taxon.*, 4th ed., 1986) recognized a number of smaller segregate genera (*Hypholoma*, *Melanotus*, *Psilocybe*, *Stropharia*). Recognition of these segregate genera is unsatisfactory, a number of species having been transferred from one genus to another and moved back again, depending on the significance attached on various characters. Recognition of one broadly defined genus is not entirely satisfactory, and the older genera are still maintained at subgeneric or sectional level. Moncalvo *et al.* (*Mol. Phylog. Evol.* 23: 357, 2002) distributed the taxon over at least 8 clades, and 6 of these were also recognised by Bridge *et al.* (*Mycotaxon* 103: 109, 2008). The taxon in a broad sense also includes the gasteroid genera *Leratiomyces* and *Weraroa*. See Guzmán (*Beih. Nova Hedwigia* 74, 1983, monograph *Psilocybe*, *Bibl. Mycol.* 159: 91, 1995; suppl. to monogr., *International Journal of Medicinal Mushrooms* 7: 305, 2005), Noordeloos (*Öst. Z. Pilzk.* 10: 115, 2001; sect. *Psilocybe*), Boekhout *et al.* (*MR* 106: 1251, 2002; taxonomy sect. *Psilocybe*). See also Hallucinogenic Fungi.
- Psilocybe** Fayod (1889) = *Panaeolina* fide Singer & Smith (*Mycol.* 38: 287, 1946).
- psilocybin**, a hallucinatory indole derivative from *Psilocybe mexicana*. See Bazanté (*Rev. Mycol.* 36: 25, 1971; action). See also psilocin, hallucinogenic fungi.
- Psilodiporites** C.P. Varma & Rawat (1963), Fossil Fungi. 7, Cameroon; India.
- Psiloglonium** Höhn. (1918) = *Glonium* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Psilolechia** A. Massal. (1860), Lecanorales (L). 4, widespread. See Coppins & Purvis (*Lichenologist* 19: 29, 1987; key), Yoshimura & Harada (*Lichenology* 3: 41, 2004; Japan), Andersen & Ekman (*MR* 109: 21, 2005; phylogeny).
- Psilonia** Fr. (1825) ? = *Volutella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Psiloniaceae** Corda (1837) = *Nectriaceae*.
- Psiloniella** Costantin (1888) = *Catenularia* fide Mason (*Mycol. Pap.* 5: 120, 1941).
- Psiloparmelia** Hale (1989), Parmeliaceae. 12, S. America; S. Africa. See Elix & Nash (*Bryologist* 95: 377, 1992; key), Lumbsch *et al.* (*Mycotaxon* 45: 489, 1992; anatomy), Thell *et al.* (*J. Hattori bot. Lab.* 100:

- 797, 2006; phylogeny), Crespo *et al.* (*Mol. Phylogen. Evol.* 44: 812, 2007; phylogeny).
- Psilopezia** Berk. (1847), Pezizales. 5, widespread. See Pfister (*Am. J. Bot.* 60: 355, 1973; key), Zhuang (*Mycotaxon* 61: 3, 1997), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Psilophana** Syd. (1939), ? Helotiales. 1, Ecuador.
- Psilosphaeria** Cooke (1879), Pezizomycotina. 1. The genus needs typification.
- Psilospora** Rabenh. (1856) $\equiv$ Polymorphum fide Hawksworth & Punithalingam (*TBMS* 60: 501, 1973).
- Psilosporina** Died. (1913) $\equiv$ Polymorphum fide Hawksworth & Punithalingam (*TBMS* 60: 501, 1973).
- Psilothecium** Clem. (1903), ? Helotiales. 1, N. America.
- Psilothecium** Fuckel (1866) nom. dub., Pezizomycotina. 'Fusarium-like'. See Sutton (*Mycol. Pap.* 141, 1977), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003).
- Psora** Hoffm. (1789) nom. rej. = Physcia fide Hawksworth & Sherwood (*Taxon* 30: 338, 1981).
- Psora** Hoffm. (1796) nom. cons., Psoraceae (L). 31, widespread. See Schneider (*Biblthca Lichenol.* 13, 1980; key), Timdal (*Nordic J Bot.* 4: 525, 1984; gen. concept), Timdal (*Bryologist* 89: 253, 1987; key 18 spp. N. Am.), Kainz & Rambold (*Biblthca Lichenol.* 88: 267, 2004; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Psora** Link (1833) = Toninia fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Psoraceae** Zahlbr. (1898), Lecanorales (L). 6 gen. (+ 5 syn.), 51 spp.
Lit.: Brusse (*Lichenologist* 17: 267, 1985), Timdal (*Bryologist* 89: 253, 1986), Hertel & Rambold (*Pl. Syst. Evol.* 158: 289, 1988), Pant (*J. Bombay nat. Hist. Soc.* 85: 658, 1988), Lumbsch & Kothe (*Nova Hedwigia* 57: 19, 1993), Timdal (*Cryptog. Bryol.-Lichénol.* 15: 171, 1994), Buschbom & Mueller (*Mol. Phylogen. Evol.* 32: 66, 2004), Peršoh *et al.* (*Mycol. Progr.* 3: 103, 2004), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny).
- Psorella** Müll. Arg. (1894) ? = Bacidia fide Brako (*Mycotaxon* 35: 1, 1989).
- Psorinia** Gotth. Schneid. (1980), Lecanoraceae (L). 2, Europe; former USSR. See Schneider (*Biblthca Lichenol.* 13: 128, 1979).
- Psoroglaena** Müll. Arg. (1891), Verrucariaceae (L). 9, widespread. See Eriksson (*SA* 11: 11, 1992), Eriksson & Hawksworth (*SA* 14: 65, 1995), Henssen (*Biblthca Lichenol.* 57: 161, 1995; key), Grube (*Nova Hedwigia* 68: 241, 1999; asci), Harada (*Lichenology* 2: 5, 2003; Japan), Aptroot *et al.* (*Biblthca Lichenol.* 97, 2008; Costa Rica).
- Psoroglaenomyces** Cif. & Tomas. (1953) $\equiv$ Psoroglaena.
- Psorographis** Clem. (1909) = Acanthothecis fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Psoroma** Ach. ex Michx. (1803), Pannariaceae (L). c. 58, widespread (esp. south temperate). See Jørgensen (*Op. bot. Soc. bot. Lund* 45, 1978), Quilhot *et al.* (*J. Nat. Prod.* 52: 191, 1989; chemistry), Jørgensen & Wedin (*Lichenologist* 31: 341, 1999; cephalodiate spp.), Jørgensen (*Bryologist* 103: 670, 2000; N America), Ekman & Jørgensen (*CJB* 80: 625, 2002; phylogeny), Wiklund & Wedin (*Cladistics* 19: 419, 2003; phylogeny), Jørgensen (*Biblthca Lichenol.* 88: 229, 2004; S hemisphere), Miadlikowska & Lutzoni (*Am. J. Bot.* 91: 449, 2004; phylogeny), Carballal Durán & López de Silanes Vázquez (*Cryptog. Mycol.* 27: 69, 2006; Iberian peninsula), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Psoromaria** Nyl. ex Hue (1891) = Psoromidium fide Galloway & James (*Lichenologist* 17: 173, 1985).
- Psoromatomyces** Cif. & Tomas. (1953) $\equiv$ Psoroma.
- Psoromella** Gyeln. (1940), Parmeliaceae (L). 1, Argentina.
- Psoromidium** Stirt. (1877), Pannariaceae (L). 2, S. America; Australasia. See Galloway & James (*Lichenologist* 17: 173, 1985; key), Ekman & Jørgensen (*CJB* 80: 625, 2002; phylogeny), Jørgensen (*Biblthca Lichenol.* 88: 229, 2004).
- Psoromopsis** Nyl. (1863) ? = Phyllopsora fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Psoropsis** Nyl. ex Zwackh (1883) nom. inval. = Porocyphus fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Psorotheciella** Sacc. & P. Syd. (1902) = Asterothyrium Müll. Arg. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Psorotheciopsis** Rehm (1900), Asterothyriaceae (L). 5, pantropical. See Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952), Lücking (*Willdenowia* 29: 299, 1999; Ecuador), Henssen & Lücking (*Ann. bot. fenn.* 39: 273, 2002; morphology, anatomy, ontogeny).
- Psorothecium** A. Massal. (1860) nom. dub., Fungi. See Sipman (*Willdenowia* 15: 557, 1986).
- Psorotichia** A. Massal. (1855), Lichinaceae (L). c. 52, widespread. See Moreno & Egea (*Bull. Soc. linn. Provence* 45: 291, 1994), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key), Schultz & Büdel (*Lichenologist* 35: 151, 2003; phylogeny), Schultz (*Bryologist* 110: 286, 2007; USA).
- Psorotichiella** Werner (1955), ? Lecanorales (L). 1, Lebanon. See Werner (*Bull. Soc. bot. Fr.* 102: 350, 1955).
- Psorotichiomyces** Cif. & Tomas. (1953) $\equiv$ Psorotichia.
- Psorula** Gotth. Schneid. (1980), ? Psoraceae (L). 3, widespread. See Pietschmann (*Nova Hedwigia* 51: 521, 1990; posn).
- Psorulaceae** Hafellner (1984) = Psoraceae.
- psychrophile**, see thermophily.
- psychrotolerant**, growing at temperatures below 10°C (opt. below 20°C).
- Psyllidomyces** Buchner (1912), ? Saccharomycetales. 1 (in insects), Europe.
- psylocybin**, see psilocybin.
- Ptechetelium** Oberw. & Bandoni (1984), Eocronartiaceae. 1, Ecuador. See Oberwinkler & Bandoni (*TBMS* 83: 645, 1984).
- pterate**, having wings; alate.
- Pteridiosperma** J.C. Krug & Jeng (1979), Ceratostomataceae. 1, Japan. See Krug & Jeng (*Mycotaxon* 10: 41, 1979).
- Pteridiospora** Penz. & Sacc. (1897), Dothideomycetes. 4, widespread. See Filer (*Mycol.* 61: 167, 1969).
- Pteridomyces** Jülich (1979), Atheliaceae. 7. See Jülich (*Persoonia* 10: 331, 1979).
- Pteroconium** Sacc. ex Grove (1914), anamorphic *Apiospora*, Hsp.0eP.37. 3, widespread.
- Pterodinia** Chevall. (1837) = Botrytis fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pteromaktron** Whisler (1963), Legeriomycetaceae. 1

- (in *Ephemeroptera*), USA. See Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986).
- Pteromyces** E. Bommer, M. Rousseau & Sacc. (1906), ? Helotiales. 1, Europe.
- Pteromycula** P.F. Cannon (1997), Dothideomycetes. 1, Great Britain. See Cannon (*SA* 15: 121, 1997).
- Pterophyllus** Lév. (1844) nom. rej. = *Pleurotus* fide Stalpers (*in litt.*).
- Pteropus** R.W. Ham (2005), Fossil Fungi, Pezizomycotina. 1 (Maastrichtian), Belgium. See van der Ham & Dortangs (*Review of Palaeobotany and Palynology* 136: 60, 2005).
- Pterospora** Métrod (1949) [non *Pterospora* Nutt. 1818, *Pyrolaceae*] = *Tetrapyrgos*.
- Pterosporidium** W.H. Ho & K.D. Hyde (1996), Phyl-lachoraceae. 2 (living mangrove leaves), widespread. See Ho & Hyde (*CJB* 74: 1826, 1996).
- Pterula** Fr. (1832), Pterulaceae. ca 50, widespread (esp. tropical). See Corner (*Ann. Bot. Mem.* 1: 394, 1950; *Deflexula*), Pine *et al.* (*Mycol.* 91: 944, 1999; phylogeny), Roberts (*Kew Bull.* 54: 517, 1999; Cameroon), Munkacsi *et al.* (*Proc. R. Soc. Lond. B* 271: 177, 2004; phylogeny, co-evolution with fungus-growing ants).
- Pterulaceae** Corner (1970), Agaricales. 12 gen. (+ 6 syn.), 99 spp.
Lit.: Petersen (*Bull. N.Z. Dept. Sci. Industr. Res., Pl. Dis. Div.* 263: 143, 1988), Perez-Moreno & Villarreal (*Micol. Neotrop. Aplic.* 2: 123, 1989), Cripps & Caesar (*Mycotaxon* 69: 153, 1998), Pine *et al.* (*Mycol.* 91: 944, 1999), Roberts (*Kew Bull.* 54: 517, 1999), Roberts & Spooner (*Kew Bull.* 55: 843, 2000), Munkacsi *et al.* (*Proc. R. Soc. Lond. B. Biol. Sci.* 271: 1777, 2004).
- Pterulicium** Corner (1950), Pterulaceae. 1, S.E. Asia. See Corner (*Ann. Bot. Mem.* [A monograph of *Clavaria* and allied genera] 1: 689, 1950).
- Pterulopsis** Wakef. & Hansf. (1943), anamorphic *Pezizomycotina*, Hsy.0fH.?. 1, Uganda.
- Pterygellaceae** Jülich (1982) = *Cantharellaceae*.
- Pterygellus** Corner (1966), *Cantharellaceae*. 5, Asia (tropical). See Corner (*Monogr. Cantharelloid Fungi*: 166, 1966).
- Pterygiopsidomyces** Cif. & Tomas. (1953) = *Pterygiopsis*.
- Pterygiopsis** Vain. (1890), *Lichinaceae* (L.). 12, widespread (arid regions). See Henssen (*Symb. bot. upsal.* 18 no. 1, 1963), Jørgensen (*Lichenologist* 22: 213, 1990), Moreno & Egea (*Bull. Soc. linn. Provence* 45: 291, 1994), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key), Schultz & Büdel (*Lichenologist* 35: 151, 2003; phylogeny), Schultz (*Bibliotheca Lichenol.* 88: 555, 2004; Yemen), Schultz (*Bryologist* 109: 68, 2006; USA, Mexico).
- Pterygium** Nyl. (1854) = *Placynthium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pterygosporopsis** P.M. Kirk (1983), anamorphic *Pezizomycotina*, Hso.0eP.4. 1, British Isles. See Kirk (*Mycotaxon* 18: 285, 1983).
- Ptychella** Roze & Boud. (1879), *Bolbitiaceae*. 1, Europe. See Singer (*Agaric. mod. Tax.* 4th ed: 851, 1986; possible teratological variant of *Agrocybe*).
- Ptychogaster** Corda (1838), anamorphic *Oligoporus*. 6, widespread. See Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974), Sigler & Carmichael (*Mycotaxon* 4: 394, 1976), Stalpers (*Karstenia* 40: 167, 2000).
- Ptychographa** Nyl. (1874), *Agyriaceae* (L.). 2, Europe. See Redinger (*Rabenh. Krypt.-Fl.* 9 2.1: 217, 1938), McCune (*Bryologist* 100: 239, 1997; N America), Schmitt *et al.* (*Mycol.* 95: 827, 2003; phylogeny), Balloch & Grube (*MR* 110: 125, 2006; phylogeny), Lumbsch *et al.* (*MR* 111: 1133, 2007).
- Ptychographomyces** Cif. & Tomas. (1953) = *Ptychographa*.
- Ptychopeltis** Syd. (1927) = *Calothyriopsis* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962), von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Ptychoverpa** Boud. (1907) = *Verpa* fide Eckblad (*Nytt Mag. Bot.* 15: 1, 1968).
- ptytrophagous** (of endotrophic mycorrhiza), the young hyphae rupturing and extruding plasmas masses (**ptyosomes**) which are digested by the host cells (Burgeff, 1924); **tolypophagous**, the penetrating hyphae killed and digested by the host (Burgeff, 1924); **thamnisophagous**, forming haustorial arbuscles which are finally digested by the host (Burgeff, 1938). Cf. *halmophagous*.
- pubescent**, having soft hairs.
- Pubigera** Baral, Gminder & Svrček (1995) nom. inval., *Hyaloscyphaceae*. 1, Europe. See Baral *et al.* (*Docums Mycol.* 25 nos 98-100: 47, 1995).
- Puccinella** Fuckel (1860) [non *Puccinella* Parl. 1848] nom. cons., *Gramineae*] = *Uromyces* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- Puccinia** Pers. (1794), *Pucciniaceae*. c. 4000 (on angiosperms, 1 on ferns), widespread. Heteroecious or autoecious, macro- or micro-cyclic; teliospores 2-celled, though in some species (e.g. *P. heterospora* on *Malvaceae*) most of the spores are 1-celled (mesospores), or spores several-celled by transverse septa ('*Rostrupia*'). There are important pathogens of cereals (*P. hordei*) (barley, brown or leaf rust; I on *Ornithogalum*), *P. coronata* (oat, crown rust; I on *Rhamnus*), *P. striiformis* (syn. *P. glumarum*) (yellow or stripe rust), *P. graminis* (black or stem rust; I on *Berberis*), *P. recondita* (syn. *P. dispersa*) (rye, brown, or leaf rust; I on *Anchusa*) and *P. perplexans* f.sp. *trititica* (syn. *P. trititica*) (wheat, brown, or leaf rust; I on *Isopyrum*); *P. polysora* (maize rust), *P. kuehnii*, *P. melanocephala* (sugarcane), groundnut (*P. arachidis*), sunflower (*P. helianthi*), and a great number of other crop plants. See Lehmann *et al.* (*Der Schwarzrost*, 1937; *P. graminis*), Chester (*Cereal rusts* □, 1946; *P. recondita*), Cammack (*TBMS* 41: 89, 1958; *P. polysora*), Cummins (*Rust fungi of cereals, grasses and bamboos*, 1971), Johnson *et al.* (*TBMS* 58: 475, 1972; *P. striiformis*, physiologic races), Urban (*Česká Mykol.* 28: 80, 1974; *P. recondita*), Cummins (*Rust fungi on legumes and composites in North America*, 1978), Bushnell & Roelfs (Eds) (*The cereal rusts 1* Origin, specificity, structure and physiology, 1984), Bushnell & Roelfs (Eds) (*The cereal rusts 2* Diseases, distribution, epidemiology, control, 1985), Mordue (*TBMS* 84: 758, 1985; *P. kuehnii*, *P. melanocephala*, grasses), Urban & Marková (*Acta Univ. Carol. Biol.* 37: 93, 1994; *P. coronata*), Buriticá & Pardo-Cardona (*Revista de la Academia Colombiana de Ciencias Exactas, Físicas y Naturales* 20: 183, 1996; Colombia), Swann *et al.* (*The Mycota, A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research* 7 B: 37, 2001), Virtudazo *et al.* (*Mycoscience* 42: 167, 2001; sugarcane), Berndt (*Frontiers in Basidiomycote Mycology*: 185, 2004; Costa Rican),

Wingfield *et al.* (*Australasian Plant Pathology* 33: 327-335, 2004; phylogeny), Helfer (*Nova Hedwigia* 81: 325, 2005; on *Rosaceae* in Europe), Hennen *et al.* (*Catalogue of the Species of Plant Rust Fungi (Uredinales) of Brazil*: 490 pp., 2005), Aime (*Mycoscience* 47: 112, 2006; phylogeny) Probably not separable from *Uromyces*.

Pucciniaceae Chevall. (1826), Pucciniales. 20 gen. (+ 50 syn.), c. 4938 spp.

Lit.: Lee & Kakishima (*Mycoscience* 40: 109, 1999), Virtudazo *et al.* (*J. Gen. Pl. Path.* 67: 28, 2001), Ono (*Mycoscience* 43: 421, 2002), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003), Maier *et al.* (*CJB* 81: 12, 2003), Weber *et al.* (*MR* 107: 15, 2003), Anikster *et al.* (*Phytopathology* 94: 569, 2004), Araya *et al.* (*Pl. Dis.* 88: 830, 2004), Chung *et al.* (*Mycoscience* 45: 1, 2004), Chung *et al.* (*Mycoscience* 45: 233, 2004), Kosman *et al.* (*Phytopathology* 94: 632, 2004), Wingfield *et al.* (*Australas. Pl. Path.* 33: 327, 2004), Anikster *et al.* (*Mycol.* 97: 474, 2005), Wood & Crous (*MR* 109: 387, 2005), Aime (*Mycoscience* 47: 112, 2006), Maier *et al.* (*MR* 111: 176, 2007), van der Merwe *et al.* (*MR* 111: 163, 2007).

Pucciniales Clem. & Shear (1931). Pucciniomycetes. 14 fam., 166 gen., 7798 spp. The rust fungi or rusts. Mycelium (without clamp connexions) generally intercellular (frequently with haustoria), limited to parts of leaves or other aerial organs of the host ('local' infection), sometimes perennial, if systemic overwintering in roots or other parts; cosmop. on seed plants and ferns, frequently causing major disease; obligate parasites but axenic culture reported for *Gymnosporangium juniperi-virginianae* (Cutter, *Mycol.* 51: 248, 1959), *Puccinia graminis* f.sp. *tritici* (Williams *et al.*, *Phytopath.* 56: 1418, 1966; 57: 326, 1967; *TBMS* 57: 129, 137, 1971), *Melampsora lini* (Turel, *CJB* 47: 821, 1969), *Uromyces dianthi* (Jones, *TBMS* 58: 29, 1972) and others, are now known to be possible from all states of the life cycle (Narisawa *et al.*, *Trans. Mycol. Soc. Japan* 33: 35, 1992).

Rusts have up to five spore states (frequently numbered 0-IV; these roman numerals can be ambiguous unless restricted to a morphological system. See Holm, *Notes R. Bot. Gard. Edin.* 44: 433, 1987) (Fig. 25A). Traditionally the spore terminology was based on morphology. Arthur coined contractions for the original terms (e.g. telium for teleutosorus) and later linked them to the nuclear events in the life cycle, as did Cummins (1959). Other authors have used either the long or short spellings with interchanged definitions and much confusion resulted. In attempts to unite the merits of both schemes Laundon (*TBMS* 50: 189, 1964; 58: 344, 1972) proposed a basically morphological terminology which incorporated nuclear events by adding qualifiers where desirable and Holm (1987) devised a compromise in which 'short' terms were linked to nuclear events and 'long' terms to morphology. Essentially, Hiratsuka (*Mycol.* 65: 432, 1973, *Rep. Tottori mycol. Inst.* 12: 99, 1975), who, following Cummins, relates the spore states to the nuclear cycle, is followed here. Hennen & Hennen (*Biologico São Paulo* 62: 113, 2000) provide a review of the terminology applied to the sori and life cycles of rust fungi from 1729 to 2000.

0. Spermatia (sing. -ium; pycniospores), monokaryotic gametes produced in **Spermogonia** (sing. -ium; pycnia; morphological types of spermogonia,

see Hiratsuka & Hiratsuka, *Rept. Tottori Mycol. Inst.* 18: 257, 1980) which are variable in form and position, contain a palisade of sporogenous cells which produce spores in nectar exuded through the ostiole and may have periphyses and flexuous hyphae (q.v.). Savile (*Mycotaxon* 33: 387, 1988) emphasized that spermogonia are 'hermaphroditic' structures.

I. Aeciospores (aecidiospores, plasmogamospores), produced in **aecia** (sing. -ium; aecidiosori; morphological types of aecia see Sato & Sato, *TBMS* 85: 223, 1985), are unicellular, non-repeating vegetative spores, usually resulting from dikaryotization (and thus usually associated with pycnia), which germinate to give dikaryotic mycelium. Aeciospores (aecial aeciospore (I^I), Laundon) are typically catenulate, thin-walled, and verrucose but sometimes they resemble typical urediniospores when they are designated **uredinioid aeciospores** by Cummins (= aecial urediniospores (II^I), Laundon; primary uredospores, Winter).

II. Urediniospores (uredospores, urediospores (for orthography see Savile, *Mycol.* 60: 459, 1968), summer spores, red rust spores), repeating vegetative spores (which give urediniospores again or teliospores), usually on dikaryotic mycelium, in **uredinia** (uredosori, uredia; morphological types of uredinia, see Sathe, *Kavaka* 5: 59, 1977; Hiratsuka & Sato, in Scott & Chakravorty (Eds), 1982). Typical urediniospores are unicellular, pedicellate, deciduous, with the pigmented echinulate wall showing two or more germ pores. Rarely they resemble typical aeciospores when they are designated **aecidioid urediniospores** by Cummins (= uredinial aeciospores (I^{II}), Laundon). **Amphisporae** (II^{II};X) or resting urediniospores are produced by some rusts. These spores generally have thicker and darker walls than normal urediniospores.

III. Teliospores (teleutospores, teleutosporodesma, winter spores, black rust spores), produced in **telia** (sing. -ium; teleutosori; ontogeny and morphology, see Hiratsuka, *Mycotaxon* 31: 517, 1988), are basidia-producing spores. Telia and teliospores, which characterize the teleomorph of rust fungi, show wide morphological variation but typically teliospores are resting spores, 2- or more celled, sessile or pedicellate but not deciduous, and the thick wall is variously ornamented. Rarely they resemble typical aeciospores when they are designated **aecidioid teliospores** by Cummins (= telial aeciospores (I^{III}), Laundon). Teliospores that germinate immediately, especially in species of genera that usually show dormancy, may be termed leptospores.

IV. Basidiospores (sporidia) are haploid, unicellular, thin-walled, short-lived spores produced on 2-4-celled **basidia** (sing. -ium; promycelium, metabasidium) after meiosis and liberated from sterigmata by abjection (Buller, 3).

Hughes (*CJB* 48: 2147, 1970) studied the development (ontogeny) of rust spores and concluded that in his hyphomycete spore terminology O spores are phialospores; I, meristem arthrospores; II, sympodiocidia (or, less common, meristem arthrospores); III, terminal chlamydospore-like cells, sympodiocidia, or meristem arthrospores. Savile (*in* Kendrick (Ed.), *The whole fungus* 2: 547, 1979) has considered the evolution of anamorphs in rusts.

Rust life cycles (Petersen, *Bot. Rev.* 40: 453, 1974) vary according to which stages are present or absent. Special terms designate the different life cycles as

TABLE 5. Nomenclature of rust life-cycles.

Example	Schröter (1894-7)	Arthur (1925)	Laundon (1974)	Durrieu (1979)	Cummins & Hiratsuka (2003)
<i>Puccinia graminis</i>	0 I II III IV eu-form	0 I II III IV macrocytic	0 I II III IV macrocytic	macrocytic	0 I-II III IV heteromacrocytic
<i>P. helianthi</i>					0 I II III IV automacrocytic
<i>P. punctiformis</i>	0 II III IV brachy-form	0 I II III IV macrocytic	0 II ^I II ^{II} III IV brachycyclic	brachycyclic	
<i>Gymnosporangium</i> sp. (most spp.)	0 I III IV opsis-form	0 I III IV macrocytic	0 I III IV demicytic	opsicytic	0 I-III IV heterodemicytic
<i>Gymnoconia peckiana</i>					0 I III IV autodemicytic
<i>Coleosporium</i> sp. ^a	0 I II III IV eu-form	0 I II III IV macrocytic	0 I ^I II ^{II} III IV demicytic	opsicytic (pseudopsicytic)	
<i>P. lagenophorae</i> ^b	(0) I III IV opsis-form	(0 I) II III IV macrocytic	(0 I ^I) II ^{II} III IV demicytic	opsicytic (pseudopsicytic)	
<i>P. heterospora</i> ^c	(0) III IV micro-form	(0) III IV macrocytic	(0) III IV demicytic	microcytic	0 III IV microcytic
<i>Endophyllum</i> sp.	0 I IV endo-form(s)	0 III IV microcytic	0 I ^{III} IV microcytic	endocyclic	0 III IV endocyclic
<i>P. chryanthemi</i>	II III IV hemi-form				

^a The uredinial aecia of *Coleosporium* spp. have been traditionally known as uredosori because of their association with telia in a heteroecious life-cycle.

^b The uredinial aecia of such rusts as this have not generally been recognized on account of their being morphologically indistinguishable from ordinary aecia. The pycnia and true aecia are rarely found.

^c Rusts like *P. malvacearum* with spores which germinate immediately were referred to as leptofoms by Schröter.)

shown in Table 8 but have been applied in slightly different ways (see Durrieu, *BSMF* 95: 379, 1979). Hiratsuka *et al.* (*Rust flora of Japan*, 1992) revert to terminology similar to Schröter.

A rust fungus may be **autoecious** (Fig. 25B) with its life cycle on one host (or group of closely related collateral hosts) or **heteroecious** (Fig. 25A) with O and I on one sort of host and II and III (or I^{II}, III or III only) on another sort (i.e. it has alternate hosts generally living in the same plant association).

The life-cycle of a rust is generally constant, though there may be no development of O, II, or sometimes I, because of weather or other conditions. A species with I, II, III, but not O, is sometimes given the name **cata-species**. If there is no knowledge of III, the form-genus (e.g. *Aecidium*, *Uredo*) is, however, still included in the Uredinales.

Physiologic specialization of *Uredinales* has had much attention. *Puccinia graminis* s.l. has 7 races (formae speciales) (*tritici*, *avenae*, etc.), and there are about 250 physiologic races of *P. graminis* f.sp. *tritici*, and so on. Races are determined by the use of differential hosts.

Nuclear cycle: A rust may be heterothallic or homothallic. In a heterothallic macrocytic species a basidium has two + and two – basidiospores (see Sex). A + (or –) spore, after infection of the right host, gives a haploid mycelium, pycnia with + (–)

spermatia, and protoaecia. If taken (frequently by an insect) to a flexuous hypha of a – (+) pycnium, a + (–) spermatium may put out a ‘peg’ to make a connexion, its nucleus goes into (spermatizes) the hypha, and by division gives nuclei for the diploidization of cells down to the protoaecia. The cells of a protoaecium undergo conjugate division and an aecium with aeciospores is produced. An aeciospore and its mycelium, and urediniospores and their mycelia, are dikaryotic. There is nuclear fusion in the teliospore, meiosis in the basidium.

In homothallic species, where pycnia are not necessary and are frequently not present, the dikaryophase has its start from two cell nuclei at some point or points in the life-cycle. Nuclear fusion and reduction are as in heterothallic species. Following Dietel (1928) two families, *Melampsoraceae* and *Pucciniaceae*, have frequently been recognized. Concepts have been refined by subsequent workers (see Hennen & Buriticá, *Rept. Tottori Mycol. Inst.* 18: 43, 1980). In this edition of the *Dictionary* fourteen families are recognized as they are in current use by Cummins & Hiratsuka (1983) and in the major compilation Hiratsuka *et al.* (*Rust Flora of Japan*, 1992).

Fams:

(1) **Chaconiaceae**

(2) **Coleosporiaceae**

(3) **Cronartiaceae**

- (4) Melampsoraceae
- (5) Mikronegeriaceae
- (6) Phakopsoraceae
- (7) Phragmidiaceae
- (8) Pileolariaceae
- (9) Pucciniaceae
- (10) Pucciniastraceae
- (11) Pucciniosiraceae
- (12) Raveneliaceae
- (13) Uncolaceae

(14) Uropyxidaceae

Placement of some genera is controversial and still others cannot be accommodated in any of the accepted families due to absence of key structures (especially pycnia, regarded as conservative and therefore valuable at the higher levels of classification) or otherwise incomplete information on their characters. It is acknowledged that family circumscription requires further investigation.

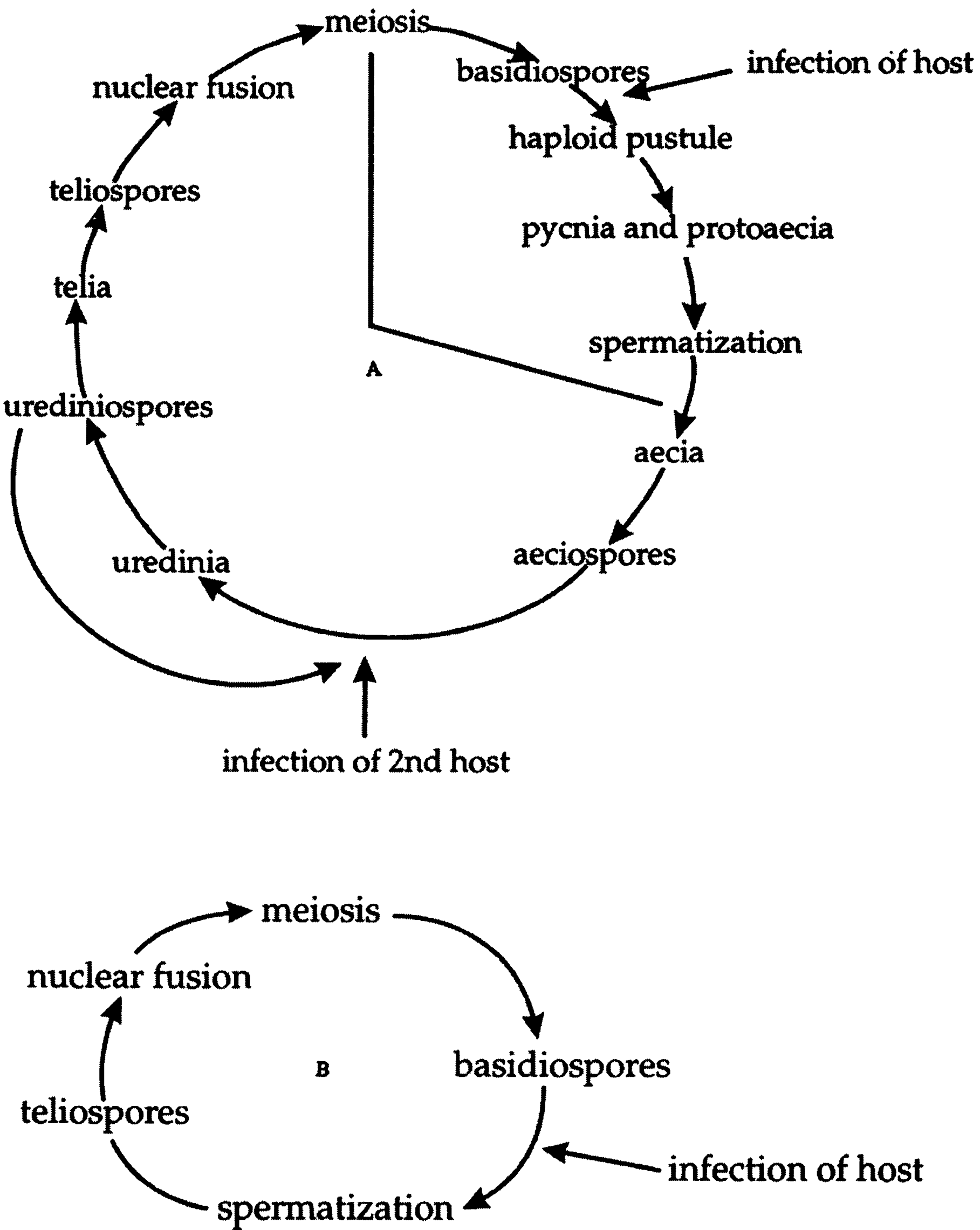


Fig. 25. Life cycles of A, a macrocyclic heteroecious rust; B, a microcyclic autoecious rust

Control: Sulphur is used against a number of rusts. Destruction of an alternate host (e.g. *Berberis* for *Puccinia graminis*) is sometimes of value. The development of resistant varieties of plants is ever in view.

Lit. (General): Sydow (*Monographia Uredinearum*, 4 vols, 1902-24), Dietel (*Naturl. PflFam.* 6, 1928), Arthur (*Plant rusts*, 1929), Guyot (*Les Uredinées*, 1939-57), Thirumalachar & Mundkur (*Indian Phytopath.* 2: 65, 3: 4, 203, 1949-50; gen.), Hiratsuka (*Revision of taxonomy of the Pucciniastreae*, 1958), Cummins (*Illustrated genera of rust fungi*, 1959; keys, bibliogr. [edn 2, Cummins & Hiratsuka, 1983]; *The rust fungi of cereals, grasses and bamboos*, 1971, keys; *Rust fungi on legumes and composites in North America*, 1978), Staples & Wynn (*Bot. Rev.* 31: 537, 1965; urediniospore physiology), Preece & Hick (*Introductory scanning electron microscope atlas of rust fungi*, 1990), Ziller (*Tree Rusts of Western Canada*, 1974), Dupias (*BSMF* 87: 129, 1971; biogeogr.), Hart (*Cladistics* 4: 339, 1988; coevolution), Laundon (*Mycol. Pap.* 89, 91, 102, 1963-65; *Acanthaceae-Amaryllidaceae*; 99 gen. names), Leppik (*Mycol.* 45: 46, phylogeny conifer rusts; 48: 637, *Gymnosporangium*; 51: 512, grass rusts; 53: 378, stem rusts; 1953-61; *Annls bot. fenn.* 9: 135, 1972; evolutionary specialization), Littlefield (*Biology of rust fungi*, 1981), Littlefield & Heath (*Ultrastructure of rust fungi*, 1979), Petersen (*Bot. Rev.* 40: 453, 1975; life cycle), Savile (*Evol. Biol.* 9: 137, 1976; *Rept. Tottori Mycol. Inst.* 28: 15, 1990; evolution with hosts, *Nova Hedw.* 57: 269, 1993; cladistics), Scott & Chakravorty (Eds) (*The rust fungi*, 1982), Bushnell & Roelfs (Eds) (*The cereal rusts 1 Origin, specificity, structure and physiology*, 1984; 2 *Diseases, distribution, epidemiology, control*, 1985), Zhang, Dickinson & Pryor (*Ann. Rev. Phytopathol.* 32: 115, 1994; double-stranded RNAs), Vogler & Bruns (*in* Reynolds & Taylor (Eds), *The fungal holomorph*: 273, 1993; molecular approaches), Swertz (*Stud. Mycol.* 36, 1994; morphology of urediniospore germlings), Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 1351, 2000; mol. phylogeny basidiomycetous yeast), and (esp.) under Fams.

Serials: *Uredineana*, 1939 on (Paris); *Cereal rusts bulletin*, 1973 on (Wageningen).

Regional: **Australia**, McAlpine (*Rusts of Australia*, 1906). **Canada**, see USA. **Central Europe**, Gäumann (*Beitr. Kryptog.-fl. Schweiz.* 12, 1959). **Austria**, Poelt (*Catalogus Florae Austriae* 3(1) *Uredinales*, 1985). **former Czechoslovakia**, Markova & Urban (*Novit. Bot. Univ. Carol.* 3: 25, 1987). **Finland**, Liro (*Uredineae Fennicae*, 1908), Makinen (*Annls bot. fenn.* 1: 214, 1964). **Germany**, Braun (*Feddes Repert.* 93: 213, 1982, Brandenburger (*Regensb. Mykol. Schriften* 3, 1994). **British Isles**, Wilson & Henderson (*British rust fungi*, 1966), Henderson & Bennell (*Notes R. bot. Gdn Edinb.* 37: 475, 1979; 38: 184, 1980); see also Grove, Plowright. **Iceland**, Jørstad (*Skr. norske Vidensk Akad. I Mat. Nat. n.s.* 2, 1952). **Indonesia**, Boedijn (*Nova Hedw.* 1: 463, 1960). **Italy**, Ciferri & Camara (*Ist. Bot. Univ. Pavia Quaderno* 23, 1962; list). **Jamaica**, Dale (*Mycol. Pap.* 60, 1955). **Japan**, Hiratsuka *et al.* (*The rust flora of Japan*, 1992). **Madagascar**, Bouriquet & Bassino (*Prodr. Flor. mycol. Madagascar* 5, 1966). **Majorca and Minorca**, Jørstad (*Skr. norske Vidensk Akad., I Mat. Nat. n.s.* 2, 1962). **Morocco**, Guyot &

Malençon (*Uredinées du Maroc*, I, 1957). **Mexico**, León-Gallegos & Cummins (*Uredinales (Royas) de Mexico* 1+2, 1981). **Nepal**, Durrieu (*Mycol.* 79: 90, 1987). **New Caledonia**, Huguenin (*BSMF* 82: 248, 83: 941, 1966-68). **New Zealand**, Cunningham (*Rust fungi of New Zealand*, 1931), Dingley (*N.Z. Jl Bot.* 15: 29, 1977). **Nigeria**, Eboh (*Mycol.* 70: 1077; 73: 445; 76: 179, 1978-84). **Norway**, Jørstad (*Nytt. Mag. Bot.* 8: 103, list; 9: 61, distribution; 11: 27, life cycles, etc., 109, distribution, 1960-64), Gjaerum (*Nordeus Rustsopper*, 1974). **Malawi**, Bisby & Wiehe (*Mycol. Pap.* 51, 1953). **Pakistan**, Ahmad (*Biologia* 2: 26, 1956). **Poland**, Majewski (*Flora Polska* 9, 11 *Uredinales* 1, 1977, 2, 1979). **Romania**, Savulescu (*Monografia Uredinalelor.*, 2 vols, 1953). **Scandinavia**, Hylander, Jørstad & Nannfeldt (*Op. bot. Soc. bot. Lund* 1, 1953). **Spain**, Gonzales-Fragoso (*Flora Iberica. Uredinales*, 2 vols, 1924-25). **South Africa**, Doidge (*Bothalia* 2, 3, 4, 1927-48). **USA**, Arthur (*Manual of rusts in the United States and Canada*, 1934 [suppl. by Cummins, 1962]), Cummins & Stevenson (*Pl. Dis. Reprtr. Suppl.* 240, 1956; list), Gardner & Hodges (*Pacific Science* 43: 41, 1989; Hawaii). **Cuba**, Urban (*Rept. Tottori Mycol. Inst.* 28: 37, 1990). **Argentina**, Lindqvist (*Royas de la Republica Argentina*, 1981). **Brazil**, Hennen, Hennen & Figueiredo (*Arq. Inst. Biol., São Paulo* 49(Suppl. 1), 1982). **former USSR**, Tranzschel (*Conspectus Uredinalium U.R.S.S.*, 1939), Kuprevich & Tranzschel ([*Crypt. Pl. USSR* 4], 1957 [Engl. transl. 1970]). **Ukraine**, Gutsevich ([*Survey of the rust fungi of the Crimea*], 1952 [Russ.]). **Kazakhstan**, Nevodovsky (*Flora sporovykh rastenii Kazakhstana* [I. *Uredinales*], 1956), Kuprevich & Ulyanishchev ([*Keys to the rust fungi of USSR*] 1, 1975, 2, 1978). **Lithuania**, Minkevičius & Ignatavičiute (*Lietuvos Grybai* 5, 1991). **Tadzhikistan**, Korbonskaya ([*Rust fungi of Tadzhikistan*], 1954). *Melampsoraceae*.

Pucciniasporonites Ramanujam & Ramachar (1980), Fossil Fungi, Pucciniaceae. 1. See Ramanujam & Ramachar (*Records of the Geological Survey of India* 113: 82, 1980).

Pucciniastraceae Gäum. ex Leppik (1972), Pucciniales. 11 gen. (+ 2 syn.), 158 spp.

Lit.: Yamaoka & Katsuya (*Trans. Mycol. Soc. Japan* 28: 155, 1987), Berndt *et al.* (*CJB* 72: 1084, 1994), Berndt & Oberwinkler (*Mycol.* 89: 698, 1997), Kurkela *et al.* (*Mycol.* 91: 987, 1999), Motokura *et al.* (*Res. Bull. Pl. Protect. Serv. Japan* 35: 103, 1999), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003), Maier *et al.* (*CJB* 81: 12, 2003), Aime (*Mycoscience* 47: 112, 2006), Liang *et al.* (*Mycoscience* 47: 137, 2006).

Pucciniastrum G.H. Oth (1861), Pucciniastraceae. c. 34 (on *Abies*, *Picea*, *Tsuga* (0, I) (*Pinaceae*); on dicots, orchids? (II, III)), widespread (esp. north temperate). See Hiratsuka (*Revision of taxonomy of the Pucciniastreae*, 1958), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* rev. edit., 1983), Liang *et al.* (*Mycoscience* 47: 137, 2006; phylog.) Cf. *Thekopsora*, *Calypso*, which are sometimes included.

Puccinidia Mayr (1890) = *Rostrupia* fide Saccardo (*Syll. fung.* 9: 316, 1891) = *Puccinia* fide Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* rev. edit., 1983).

Pucciniola L. Marchand (1829) nom. rej. = *Uromyces* fide Berndt (*in litt.*).

Pucciniomycetes R. Bauer, Begerow, J.P. Samp., M.

- Weiss (2006), Pucciniomycotina. 5 ord., 21 fam., 190 gen., 8016 spp. Ords:
- (1) **Helicobasidiales**
 - (2) **Pachnocybales**
 - (3) **Platyglloeales**
 - (4) **Pucciniales**
 - (5) **Septobasidiales**
- For *Lit.* see ord. and fam.
- Pucciniomycotina** R. Bauer, Begerow, J.P. Samp, M. Weiss & Oberw. (2006), Basidiomycota. 8 class., 18 ord., 36 fam. Class.:
- (1) **Agaricostilbomycetes**
 - (2) **Atractiellomycetes**
 - (3) **Classiculomycetes**
 - (4) **Cryptomycocolacomycetes**
 - (5) **Cystobasidiomycetes**
 - (6) **Microbotryomycetes**
 - (7) **Mixiomycetes**
 - (8) **Pucciniomycetes**
- For *Lit.* see ord. and fam.
- Pucciniopsis** Speg. (1888) nom. ambig., anamorphic *Pezizomycotina*. See Sutton (*TBMS* 60: 525, 1973).
- Pucciniosira** Lagerh. (1892), Pucciniosiraceae. c. 15 (on angiosperms (0, III)), America; Africa; Asia. May include *Gambleola*. See Buriticá (*Rev. Acad. Colomb. Cienc.* 19: 131, 1991), Gjørum *et al.* (*Lidia* 5: 18, 2000; Uganda).
- Pucciniosiraceae** Cummins & Y. Hirats. (1983), Pucciniales. 10 gen. (+ 7 syn.), 57 spp.
- Lit.*: Gjørum *et al.* (*Lidia* 5: 18, 2000), Hernández (*Mycotaxon* 76: 329, 2000), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003), Wingfield *et al.* (*Australas. Pl. Path.* 33: 327, 2004), Aime (*Mycoscience* 47: 112, 2006).
- Pucciniospora** Speg. (1886), anamorphic *Pezizomycotina*, Cpd.1eH.?. 1, S. America.
- Pucciniostele** Tranzschel & Kom. (1899), Phakopsoraceae. c. 4 (on *Astilbe* (*Saxifragaceae*)), Asia. Cf. *Scalarispora*. See Cummins & Thirumalachar (*Mycol.* 45: 572, 1953), Koursanov *et al.* (*Bull. Soc. Nat. Moscou. Cinenc.* 19 (no. 69): 131, 1991).
- Puccinites** Ettingsh. (1853), Fossil Fungi. 3 (Cretaceous, Tertiary), Europe; USA.
- Puciola** De Bert. (1976) = *Dicyma* fide von Arx (*Gen. Fungi Sporul. Cult.* Edn 3, 1981).
- puff-ball**, basidioma of the *Lycoperdales*.
- puffing**, a phenomenon in which thousands of asci in an apothecial ascoma discharge their ascospores simultaneously, producing a visible cloud.
- Puiggariella** Speg. (1881) = *Strigula* fide Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952).
- Puiggarina** Speg. (1919) = *Phyllachora* Nitschke ex Fuckel (1870) fide Cannon (*Mycol. Pap.* 163, 1991).
- Pulcherrium** Parmasto (1968) = *Terana* fide Parmasto (*Consp. System. Corticiac.*: 132, 1968).
- Pulchromyces** Hennebert (1973), anamorphic *Pezizomycotina*, Hso.0eH.7. 1 (coprophilous), Ghana. See Pfister *et al.* (*Mycotaxon* 1: 137, 1974).
- Pulicispora** Vedmed, S.V. Krylova & I.V. Issi (1991), Microsporidia. 1.
- Pulina** Adans. (1763) nom. rej. = *Lepraria*.
- Pullospora** Faurel & Schotter (1965), anamorphic *Pezizomycotina*, Cpd.0eH.15. 2 (coprophilous), Algeria; USA. See Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993).
- Pullularia** Berkhout (1923) = *Aureobasidium* fide Cannon (*Mycopathologia* 111: 75, 1990), Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- pullulation**, budding, as in yeasts.
- Pulmonaria** Hoffm. (1789) [non *Pulmonaria* L. 1753, *Boraginaceae*] = *Lobaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pulmosphaeria** Joanne E. Taylor, K.D. Hyde & E.B.G. Jones (1996), Xylariales. 1 (on *Palmae*), Australia. Perhaps related to *Linocarpon*. See Taylor *et al.* (*Sydowia* 48: 255, 1996).
- Pulparia** P. Karst. (1866) nom. rej. = *Pulvinula*. See also *Marcelleina*. fide Dissing (*Mycotaxon* 32: 365, 1988), Dissing *et al.* (*Taxon* 39: 130, 1990; nomencl.), Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- pulque**, a Mexican alcoholic drink made by yeast fermentation of the juice of *Agave* spp.; *Lactobacillus* and *Leuconostoc* spp. add acidity and viscosity; when distilled yields the spirit **tequila**.
- pulsed field gel-electrophoresis**, see Electrophoresis.
- pulveraceo-delitescens**, covered with a layer of powdery granules.
- Pulveraria** Ach. (1803) nom. rej. prop. = *Chrysothrix* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pulverariaceae** Schltdl. (1824) = *Chrysothricaceae*.
- Pulveria** Malloch & Rogerson (1977) = *Pyrenomyxa* fide Læssøe (*SA* 13: 43, 1994; nomencl.).
- Pulveroboletus** Murrill (1909), Boletaceae. 25, cosmopolitan. See Singer (*Am. midl. Nat.* 37: 1, 1947), Gómez (*Revta Biol. trop.* 44 Suppl. 4: 59, 1996; Costa Rica), Zang *et al.* (*Mycotaxon* 80: 481, 2001; China).
- Pulverolepiota** Bon (1993) = *Cystolepiota* fide Kuyper (*in litt.*).
- pulverulent**, powdered; as if powdered over.
- Pulvinaria** Bonord. (1851), *Pezizomycotina*. 1, Europe.
- Pulvinaria** Rodway (1918) = *Waydora*.
- Pulvinaria** Velen. (1934) ? = *Pachyella* fide Pfister (*CJB* 51: 2009, 1973).
- pulvinate**, cushion-like in form.
- Pulvinella** A.W. Ramaley (2001), anamorphic *Pezizomycotina*. 1, USA. See Ramaley (*Mycotaxon* 79: 52, 2001).
- Pulvinodecton** Henssen & G. Thor (1998), Roccella-ceae (L). 2, tropical. See Henssen & Thor (*Nordic J Bot.* 18: 95, 1998; ontogeny), Thor (*J. Jap. Bot.* 77: 47, 2002; Japan, Taiwan).
- Pulvinotrichum** Gamundí, Aramb. & Giaioti (1981), anamorphic *Pezizomycotina*, Hso.0-1eH.15. 2, Argentina; Australia. See Summerbell *et al.* (*CJB* 67: 577, 1989; synonymy with *Cylindrodendrum*), Sutton (*Sydowia* 41: 330, 1989), Crous *et al.* (*Mycotaxon* 50: 441, 1994), Wu *et al.* (*Mycoscience* 38: 11, 1997).
- Pulvinula** Boud. (1885) nom. cons., *Pezizales*. 27, widespread. See Pfister (*Occ. Pap. Farlow Herb. Crypt. Bot.* 9, 1976; key), O'Donnell & Hooper (*CJB* 56: 101, 1978; ontogeny), Kaushal (*Kavaka* 9: 21, 1981), Korf & Zhuang (*Mycotaxon* 20: 607, 1984), Dissing (*Mycotaxon* 32: 365, 1988; nomencl.), Korf & Zhuang (*Mycotaxon* 40: 79, 1991), Liu (*Acta Mycol. Sin.* 10: 185, 1991), Yao & Spooner (*MR* 100: 193, 1996), Yao & Spooner (*MR* 100: 883, 1996; Brit. spp.), Landvik *et al.* (*Nordic J Bot.* 17: 403, 1997; DNA), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Liu & Zhuang (*Mycosystema* 25: 546, 2006; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Pumilus** Viala & Marsais (1934), *Pezizomycotina*. 1 (on *Vitis*), Europe.

punctate, marked with very small spots (Fig. 20.5);
puncta, small spots.

Punctelia Krog (1982), Parmeliaceae (L). 42, widespread. See Galloway & Elix (*N.Z. Jl Bot.* 22: 441, 1984; Australasia, key), Modenesi (*Nova Hedwigia* 45: 423, 1987; histochemistry), Wilhelm & Ladd (*Mycotaxon* 44: 495, 1992; key 13 N. Am. spp.), Longán *et al.* (*Mycotaxon* 74: 367, 2000), van Herk & Aptroot (*Lichenologist* 32: 233, 2000; Eur.), Aptroot (*Bryologist* 106: 317, 2003; sorediate spp., N America), Crespo *et al.* (*Lichenologist* 36: 299, 2004; Iberian peninsula), Thell *et al.* (*Folia cryptog. Estonica* 41: 115, 2005; phylogeny), Blanco *et al.* (*Mol. Phylogen. Evol.* 39: 52, 2006; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).

punctiform (of rust sori, bacterial colonies, etc.), very small, but seen without a lens.

Punctillina Toro (1934), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, S. America.

Punctillum Petr. & Syd. (1924), Dothideomycetes. 2 (on *Musci*), widespread. See Döbbeler (*Beih. Nova Hedwigia* 79: 203, 1984).

Punctodiporites C.P. Varma & Rawat (1963), Fossil Fungi, anamorphic *Ascomycota*. 1. See Varma & Rawat (*Grana Palynologica* 4: 136, 1963).

Punctonora Aptroot (1997), Lecanoraceae (L). 1, Papua New Guinea. See Aptroot *et al.* (*Bibliotheca Lichenol.* 64: 151, 1997).

Punctularia Pat. (1895), Corticiaceae. 2, widespread. See Niemelä (*Sienilehti* 55: 67, 2003; *P. strigosozonata* in Finland and Estonia).

Punctulariaceae Donk (1964) = Corticiaceae.

punk, see touchwood or amadou; **punky**, soft and tough.

Pureke P.R. Johnst. (1991), Rhytismataceae. 1, New Zealand. See Johnston (*N.Z. Jl Bot.* 29: 395, 1991).

Pustularia Bonord. (1851) nom. dub., *Pezizomycotina*. Used for a wide range of taxa.

Pustularia Fuckel (1870) ≡ *Pustulina*.

pustule, a blister-like, frequently erumpent, spot or spore-mass.

Pustulina Eckblad (1968) = *Tarsetta* fide Rogers *et al.* (*Mycol.* 63: 1084, 1971).

Pustulipora P.F. Cannon (1982), Ceratostomataceae. 1, British Isles. See Cannon (*Mycotaxon* 15: 523, 1982), Ranghoo & Hyde (*MR* 103: 938, 1999).

Putagraivam Subram. & Bhat (1978) = *Didymostilbe* Henn. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

putrescent (of basidiomata), decaying, rotting. Cf. marcescent.

Puttemansia Henn. (1902), Tubeufiaceae. Anamorphs *Guelichia*, *Tetracrium*. 7 (on fungi), widespread (tropical). See Rossman (*Mycol. Pap.* 157, 1987; key), Kodsueb *et al.* (*Fungal Diversity* 21: 105, 2006).

Puttemansiella Henn. (1908) nom. dub., Fungi.

pv., see pathovar.

Pycnidiales (obsol.), see *Sphaeropsidales* (Anam. fungi).

Pycnidiella Höhn. (1915), anamorphic *Sarea*, St.0eH.15. 1 (on resin), widespread. See Hawksworth & Sherwood (*CJB* 59: 357, 1981).

Pycnidioarxiella Punith. & N.D. Sharma (1980), anamorphic *Pezizomycotina*, Cpd.1eP.2. 1, India. See Punithalingam & Sharma (*Nova Hedwigia* 31: 893, 1979).

Pycnidiochaeta Sousa da Câmara (1950) = *Dine-*

masporium fide Sutton (*Mycol. Pap.* 141, 1977).

Pycnidiopeltis Bat. & C.A.A. Costa (1959), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, USA; Brazil. See Batista & Costa (*Mycopath. Mycol. appl.* 11: 83, 1959).

Pycnidiphora Clum (1956), Sporormiaceae. Anamorph *Phoma*-like. 2 (from soil etc.), widespread. See Cain (*CJB* 39: 1633, 1961; as *Preussia*), Berbee (*Mol. Biol. Evol.* 13: 462, 1996; DNA, as *Westerdykella*), Barr (*Mycotaxon* 76: 105, 2000), Kruys *et al.* (*MR* 110: 527, 2006; phylogeny).

pycnidiospore, a conidium in or from a pycnidium (obsol.).

Pycnidiostroma F. Stevens (1927) = *Phomachora* fide Petrak (*Annls mycol.* 27: 324, 1929).

pycnidium (pl. -ia), a frequently ± flask-shaped conidioma of fungal tissue with a circular or longitudinal ostiole, the inner surface of which is lined entirely or partially by conidiogenous cells; pycnidial conidioma (Fig. 10A-F).

pycniospore (of *Pucciniales*), a spore from a pycnium; spermatium; sometimes used in error for pycnidiospore.

Pycnis Bref. (1881), anamorphic *Pezizomycotina*, Cpd.0eH.?. 1, Europe.

pycnium (in *Pucciniales*), the pycnidium-like haploid fruit-body, or spermogonium. See Hiratsuka & Cummins (*Mycol.* 55: 487, 1963), Savile (*Mycol.* 63: 1089, 1971).

pycnoascocarp, an ascoma arising from a pycnidial conidioma.

Pycnocalyx Naumov (1916) = *Bothrodiscus* fide Sutton (*Mycol. Pap.* 141, 1977).

Pycnocarpon Theiss. (1913), Dothideomycetes. 4, India; Philippines.

Pycnochytrium (de Bary) J. Schröt. (1892) = *Synchytrium* fide Fitzpatrick (*The lower fungi. Phycomycetes*, 1930).

Pycnociliospora Bat. (1962) = *Strigula* fide Lücking *et al.* (*Lichenologist* 30: 121, 1998).

pycnoconidium, see pycnidiospore (obsol.).

Pycnodactylus Bat., A.A. Silva & Cavalc. (1967), anamorphic *Pezizomycotina*, Cpd.#eP.?. 1, Brazil. See Batista *et al.* (*Atas Inst. Micol. Univ. Pernambuco* 5: 140, 1967).

Pycnodallia Kohlm. & Volkm.-Kohlm. (2001), anamorphic *Pezizomycotina*. 1, USA. See Kohlmeyer & Volkmann-Kohlmeyer (*MR* 105: 500, 2001).

Pycnoderma Syd. & P. Syd. (1914), Cookellaceae. 2, widespread (tropical). See Petrak (*Sydowia* 1: 108, 1947).

Pycnoderma Petr. (1947) = *Saccardinula* fide von Arx (*Persoonia* 2: 421, 1963).

Pycnoderma Bat. & H. Maia (1957) ? = *Echinoplaca* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).

Pycnoderma Petr. (1954) ? = *Pycnoderma* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).

Pycnodon Underw. (1898) ≡ *Neokneiffia*.

Pycnodothis F. Stevens (1924) nom. dub., Fungi. See Petrak (*Sydowia* 5: 169, 1951).

Pycnofusarium Punith. (1973) = *Fusarium* fide Sutton (*TBMS* 86: 1, 1986).

pycnogonidium, see pycnidiospore (obsol.), pycniospore, or stylospore (obsol.).

Pycnographa Müll. Arg. (1890) = *Parmularia* Lév. fide Santesson (*Svensk bot. Tidskr.* 43: 547, 1949).

Pycnoharknessia Matsush. (1996), anamorphic *Pezizomycotina*, Cpd.?.?. 1, Pakistan. See Matsushima

- (*Matsush. Mycol. Mem.* 9: 23, 1996).
- Pycnomma** Syd. (1924), anamorphic *Pezizomycotina*, St.0eH.?. 1, Canary Islands.
- Pycnomoreletia** Rulamort (1990), anamorphic *Pezizomycotina*, St.≡ eP.1. 2, Africa; Pakistan. See Rulamort (*Bull. Soc. bot. Centre-Ouest Nouv. sér.* 21: 512, 1990).
- Pycnopeltis** Syd. & P. Syd. (1916) = *Saccardinula* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Pycnopeziza** W.L. White & Whetzel (1938), Sclerotiniaceae. Anamorph *Acarosporium*. 4, Europe; N. America. See Whetzel & White (*Mycol.* 32: 616, 1940), Holst-Jensen *et al.* (*Mycol.* 89: 885, 1997; phylogeny), Holst-Jensen *et al.* (*Mycol.* 96: 135, 2004).
- Pycnopleiospora** C.Z. Wei, Y. Harada & Katum. (1997), anamorphic *Pezizomycotina*, Hso.?.?. 1, Japan. See Wei *et al.* (*Mycol.* 89: 496, 1997).
- Pycnopodium** Corda (1842) ≡ *Pilobolus* fide Heseltine (*Mycol.* 47: 344, 1955).
- Pycnoporellus** Murrill (1905), Fomitopsidaceae. 2, widespread. See Ryvarden (*Polyp. N. Eur.* 2, 1978), Piątek (*Polish Botanical Journal* 48: 131, 2003; Poland).
- Pycnopus** P. Karst. (1881), Polyporaceae. 4, widespread. See Nobles & Frew (*CJB* 40: 987, 1962), Roberts & Ryvarden (*Kew Bull.* 61: 55, 2006; Cameroon).
- Pycnopsamma** Diederich & Etayo (1995) = *Psamma* fide Etayo & Diederich (*Flechten Follmann Contributions to Lichenology in Honour of Gerhard Follmann*: 215, 1995), Earland-Bennett & Hawksworth (*Lichenologist* 37: 191, 2005).
- Pycnora** Hafellner (2001), Lecanoromycetes. 4, widespread. See Hafellner & Türk (*Stappia* 76: 157, 2001), Kubiak *et al.* (*Botanica Lithuanica* 9: 371, 2003; Poland), Wedin *et al.* (*MR* 109: 159, 2005; phylogeny), Crewe *et al.* (*MR* 110: 521, 2006; phylogeny).
- Pycnorostrium** Golovin (1950) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- pycnosclerotium**, a more or less hard-walled structure resembling a pycnidial conidioma but having no spores.
- Pycnoseynesia** Kuntze (1898), anamorphic *Pezizomycotina*, Cpt.0eH.?. 2, widespread (tropical).
- pycnosis** (of *Microthyriaceae*), the process by which a part of the stroma is arched up and becomes thick while an ascigerous hymenium is formed under it.
- pycnospore**, formerly occasionally used for pycnospore or pycnidiospore (obsol.).
- Pycnosporium** Siegel (1909) nom. dub., anamorphic *Pezizomycotina*.
- Pycnostemma** Syd. (1927) = *Poropeltis* fide Clements & Shear (*Gen. Fung.*, 1931).
- Pycnostroma** Clem. (1909) = *Munkia* fide Höhnelt (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt. 1* 120: 379, 1911).
- pycnostroma**, see stroma.
- Pycnostysanus** Lindau (1904) = *Sorocybe*. See also *Seifertia*. fide Kaneko *et al.* (*Ann. phytopath. Soc. Japan* 54: 323, 1988), Partridge & Morgan-Jones (*Mycotaxon* 83: 335, 2002).
- pycnothecium** (of *Microthyriaceae*), an ascoma formed by pycnosis.
- Pycnothele** Sommerf. (1826) ≡ *Dufourea*.
- Pycnothelia** (Ach.) Dufour (1821), Cladoniaceae (L). 2, widespread. See Laundon (*Lichenologist* 18: 169, 1986; nomencl.), Ahti (*Regnum veg.* 128: 58, 1993), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998; DNA), Hammer (*Am. J. Bot.* 87: 33, 2000; ontogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Zhou *et al.* (*J. Hattori bot. Lab.* 100: 871, 2006; phylogeny).
- Pycnotheliomyces** Cif. & Tomas. (1953) ≡ *Pycnothelia*.
- Pycnothera** N.D. Sharma & G.P. Agarwal (1974), anamorphic *Pezizomycotina*, Cpt.0eH.38. 2, India. See Punithalingam (*Nova Hedwigia* 31: 95, 1979).
- Pycnothyriella** Bat. (1952), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, Brazil. See Batista (*Bol. Secr. Agric. (Pernambuco)* 19: 110, 1952).
- Pycnothyrium** Died. (1913), anamorphic *Pezizomycotina*, Cpt.0eH.?. 6, Europe; Philippines. See Holm & Holm (*Bot. Notiser* 130: 115, 1977; sensu v. Arx (1964) = *Leptopeltis*), Sutton (*Mycol. Pap.* 141, 1977).
- pycnothyrium**, a superficial flattened shield-shaped conidioma with radiate upper and sometimes lower walls; pycnothyrial conidioma. See Hughes (*Mycol. Pap.* 50: 7, 1953). Characteristic of *Microthyriaceae* (q.v.) etc. (Fig. 10G-M).
- Pycnovellomyces** R.F. Castañeda (1987), anamorphic *Agaricomycetes*, Cpd.0eH.41. 1 (with clamp connections), Cuba. See Nag Raj *et al.* (*CJB* 67: 3386, 1989; redescription).
- Pygmaea** Stackh. (1809) nom. rej. = *Lichina* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pyonema** Nieuwl. (1916) ≡ *Myxonyphe*.
- Pyramidospora** Sv. Nilsson (1962), anamorphic *Pezizomycotina*, Hso.1bH.1. 2 (aquatic), widespread. See Nilsson (*Svensk bot. Tidskr.* 56: 358, 1962), Kendrick (*CJB* 81: 75, 2003; morphogenesis).
- Pyrenastromyces** Cif. & Tomas. (1953) ? = *Pyrenula* Ach. (1809) fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pyrenastrum** Eschw. (1824) = *Pyrenula* Ach. (1814) fide Harris (*Mem. N. Y. bot. Gdn* 49, 1989).
- Pyrenidiaceae** Zahlbr. (1898) = *Dacampiaceae*.
- Pyrenidiomyces** Cif. & Tomas. (1953) ≡ *Pyrenidium*.
- Pyrenidium** Nyl. (1865), *Dacampiaceae*. 3 (on lichens), widespread. See Hawksworth (*TBMS* 80: 547, 1983).
- Pyreniella** Theiss. (1916) = *Botryosphaeria* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Pyrenillium**, see *Pyrenyllum*.
- Pyreniococcus** Wheldon & A. Wilson (1915) ? = *Phaeospora* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pyreniopsis** Kuntze (1898) ≡ *Trichoderma* Pers. (1794).
- Pyrenisperma**, see *Pyrisperma*.
- Pyrenium** Tode (1790) = *Trichoderma* Pers. (1794) fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- pyrenium**, a pyrenomycete ascoma (obsol.).
- Pyrenobotrys** Theiss. & Syd. (1914), *Venturiaceae*. 3, America; Scandinavia. See Eriksson (*Svensk bot. Tidskr.* 68: 223, 1974), Barr (*Sydowia* 41: 25, 1989; key 3 N. Am. spp.).
- pyrenocarp**, a perithecium (s.l., q.v.); used colloquially as a term for any fungus with a perithecium-like ascoma.
- Pyrenocarpon** Trevis. (1855), *Lichinaceae* (L). 1,

Europe. See Jørgensen & Henssen (*Taxon* 39: 343, 1990), Jørgensen (*SA* 10: 51, 1991), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key).

pyrenocarpous, see *pyrenocarp*.

Pyrenochaeta De Not. (1849), anamorphic *Herpotrichia*, *Leptosphaeria*, Cpd.0eH.15. 16, widespread. See Last *et al.* (*Ann. appl. Biol.* 57: 95, 1966), Last *et al.* (*Ann. appl. Biol.* 62: 55, 1968), Last *et al.* (*Ann. appl. Biol.* 64: 449, 1969; *P. lycopersici*, tomato brown rot), Schneider (*Mitt. biol. BundAnst. Ld- u. Forstw.* 189, 1979), Schneider in Subramanian (Ed.) (*Taxonomy of fungi* 2: 513, 1984; disposition of spp.), Datnoff *et al.* (*TBMS* 87: 297, 1986; sclerotial state), Ferreira *et al.* (*J. Phytopath.* 133: 289, 1991; variability in *P. terrestris* using isozyme polymorphism etc.), Sieber (*MR* 99: 274, 1995; *P. ligniputridi* in *Abies* butt rot), Grondona *et al.* (*MR* 101: 1405, 1997), Padhye & McGinnis in Murray *et al.* (Eds) (*Manual of Clinical Microbiology*: 1318, 1999), Infantino *et al.* (*MR* 107: 707, 2003; Italy), Boerema *et al.* (*Phoma Identification Manual* Differentiation of Specific and Infra-Specific Taxa in Culture: 470 pp., 2004), Infantino & Pucci (*Eur. J. Pl. Path.* 112: 337, 2005; molecular detection), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).

Pyrenochaetella P. Karst. ex Höhn. (1917) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).

Pyrenochaetina Syd. & P. Syd. (1916) = *Parodiella* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).

Pyrenochium Link (1833), ? Dothideomycetes. 1, Europe.

Pyrenocollema Reinke (1895), Xanthopyreniaceae (L). 1, Europe; N. America. Most species are transferred to *Collemopsidium*. See Puymaly (*Botaniste* 36: 331, 1952), Tucker & Harris (*Bryologist* 83: 1, 1980), Harris (*More Florida Lichens*, 1995), Aptroot & van den Boom (*Cryptog. Bryol.-Lichénol.* 19: 193, 1998), Harada (*Bryologist* 102: 50, 1999), McCarthy & Kantvilas (*Herzogia* 14: 39, 2000; Tasmania), Kohlmeier *et al.* (*Mycol. Progr.* 3: 51, 2004), Mohr *et al.* (*MR* 108: 515, 2004).

Pyrenocyclus Petr. (1955), Dothideomycetes. 1, Hawaii. See Petrak (*Sydowia* 9: 515, 1955).

Pyrenodermium Bonord. (1851) = *Hypoxylon* Bull. fide Læssøe (*SA* 13: 43, 1994).

Pyrenodesmia A. Massal. (1853) nom. rej. = *Caloplaca* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Pyrenodiscus Petr. (1927) = *Diplonaevia* fide Hein (*Nova Hedwigia* 38: 669, 1983).

Pyrenodium Fée (1837) = *Asterothelium* fide Zahlbruckner (*Catalogus Lichenum Universalis* 1, 1921).

Pyrenodochium Bonord. (1851) = *Diatrype* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Pyrenogaster Malençon & Rioussset (1977) = *Schenella* fide Estrada-Torres *et al.* (*Mycol.* 97: 139, 2005).

Pyrenographa Aptroot (1991), Requienellaceae. 1, Australia; S.E. Asia. Placed in the *Pyrenulaceae* by Eriksson (*in litt.*). See Alias *et al.* (*MR* 100: 580, 1996).

pyrenomycete, one of the *Pyrenomycetes*.

Pyrenomycetes. Class of *Ascomycota*; used in various senses, but mostly for fungi with perithecioid ascumata which are also ascohymenial in ontogeny and have unitunicate asci, often with an apical annulus

(e.g. *Diaporthales*, *Hypocreales*, *Sordariales*, *Xylariales*). The *Dothideales*, *Erysiphales*, *Meliolales* and *Laboulbeniales* also included by some authors.

The class is not generally accepted but was reintroduced by Berbee & Taylor (1992) in a restricted sense (see *Ascomycota*). However, the term 'pyrenomycetes' still has value as a colloquial term for all ascomycetes with flask-shaped ascumata. See Hanlin (*in* Parker, 1982, 1: 225), Rogers (*in* Hawksworth, 1994: 321).

Pyrenomyxa Morgan (1895), Xylariaceae. 3, N. America; Asia. See Læssøe (*SA* 13: 43, 1994; nomencl.), Stadler *et al.* (*Mycol.* 97: 1129, 2005; key, chemistry), Bitzer *et al.* (*MR* 112: 251, 2008; phylogeny, chemistry).

Pyrenopeziza Fuckel (1870), Helotiales. Anamorph *Cylindrosporium*. c. 59, widespread. See Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932; 32 spp.), Gremmen (*Fungus Wageningen* 28: 37, 1958; key sects.), Hütter (*Phytopath. Z.* 33: 1, 1958; key), Majer *et al.* (*Pl. Path.* 47: 22, 1998; genetic variation), Foster *et al.* (*Physiol. Mol. Pl. Pathol.* 55: 111, 1999; PCR), Paavolainen *et al.* (*MR* 104: 611, 2000), Paavolainen *et al.* (*Mycol.* 93: 258, 2001; population genetics), Foster *et al.* (*Eur. J. Pl. Path.* 108: 379, 2002; molecular diagnosis), Vrålstad *et al.* (*New Phytol.* 155: 131, 2002; phylogeny), Pärtel & Raitviir (*Mycol. Progr.* 4: 149, 2005; ultrastr.).

Pyrenopezizopsis Höhn. (1917) = *Cenangiosis* Rehm fide Dennis (*Persoonia* 2: 171, 1962).

Pyrenophora Fr. (1849), Pleosporaceae. Anamorph *Drechslera*. 8, widespread. Plant pathogens include: *P. chaetomioides*, anamorph *Drechslera avenacea* (oat leaf spot and seedling blight); *P. graminea*, anamorph *D. graminea* (barley leaf stripe); *P. teres*, anamorph *D. teres* (net blotch of barley). See Ammon (*Phytopath. Z.* 47: 269, 1963; keys), Shoemaker (*CJB* 39: 901, 1963; status), Sutton (*Taxon* 21: 319, 1972; nomencl.), Crivelli (*Über die heterogene Ascomycetengattung Pleospora Rbh.*, 1983; key), Sivanesan (*Mycol. Pap.* 158: 261 pp., 1987; anamorph), Scott (*Mycopathologia* 116: 29, 1991; on *Hordeum*), Medd (*Review of Plant Pathology* 71: 891, 1992; *P. semeniperda*), Peever & Milgroom (*CJB* 72: 915, 1994; population structure), Stevens *et al.* (*Diagnosis and Identification of Plant Pathogens. Proceedings of the 4th International Symposium of the European Foundation for Plant Pathology*: 461, 1997; phylogeny), Dong *et al.* (*MR* 102: 151, 1998; phylogeny), Pecchia *et al.* (*FEMS Microbiol. Lett.* 166: 21, 1998; IGS analysis), Liew *et al.* (*Mol. Phylogen. Evol.* 16: 392, 2000; phylogeny), Wu *et al.* (*Can. J. Pl. Path.* 25: 82, 2003; genetic variation), Friesen *et al.* (*Phytopathology* 95: 1144, 2005; population genetics), Serenius *et al.* (*MR* 109: 809, 2005; genetic variation, mating types), Kodsueb *et al.* (*Mycol.* 98: 571, 2006; phylogeny), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).

Pyrenophoraceae M.E. Barr (1979) = Pleosporaceae.

Pyrenophoromyces Cif. & Tomas. (1953) = *Pyrenophorum*.

Pyrenophoropsis C. Ramesh (1988), Fungi. 1, India. See Eriksson & Hawksworth (*SA* 8: 75, 1989).

Pyrenophorum Tomas. & Cif. (1952) = *Thelidium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Pyrenopolyporus Lloyd (1917) = *Daldinia* fide Miller (*Monogr. World spec. Hypoxylon*, 1961), Læssøe (*SA*

- 13: 43, 1994; ? synonym of *Xylaria*).
- Pyrenopsidaceae** Th. Fr. (1860) = Lichinaceae.
- Pyrenopsidium** (Nyl.) Forssell (1885) = *Cryptothela* fide Henssen & Büdel (*Beih. Nova Hedwigia* 79: 381, 1984), Moreno & Egea (*Biología y taxonomía de la familia Lichinaceae*: 87 pp., 1991).
- Pyrenopsis** (Nyl.) Nyl. (1858) nom. cons., Lichinaceae (L). c. 41, widespread. See Jørgensen & Henssen (*Taxon* 39: 343, 1990; nomencl.), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key).
- Pyrenostigme** Syd. (1926), Dothideomycetes. 2, C. America. See Hansford (*Mycol. Pap.* 15, 1946).
- Pyrenotea** Fr. (1821) nom. rej. = *Lecanactis* Körb. fide Hawksworth & David (*Taxon* 38: 493, 1989).
- Pyrenothamnia** Tuck. (1883) = *Endocarpon* fide Santesson (*Svensk bot. Tidskr.* 43: 547, 1949).
- Pyrenothamniaceae** Zahlbr. (1898) = Verrucariaceae.
- Pyrenothamniomyces** Cif. & Tomas. (1953) = *Pyrenothamnia*.
- Pyrenotheca**, see *Pyrenotea*.
- Pyrenotheca** Pat. (1886) = *Myriangium* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Pyrenothricaceae** Zahlbr. (1926), *Pezizomycotina* (inc. sed.) (L). 2 gen. (+ 1 syn.), 2 spp.
Lit.: Eriksson (*Systematic Botany*: 560, 1981)
Lit.: Eriksson (*Op. Bot.* 60, 1981), Rogers (*Flora of Australia* 54: 65, 1992), Herrera-Campos *et al.* (*Mycol.* 97: 356, 2005).
- Pyrenothrix** Riddle (1917), *Pyrenothricaceae* (L). 1, N. America; New Zealand. See Eriksson (*Op. Bot.* 60, 1981), Tschermak-Woess *et al.* (*Pl. Syst. Evol.* 143: 293, 1983; ultrastr.), Herrera-Campos *et al.* (*Mycol.* 97: 356, 2005; Mexico).
- Pyrenotrichum** Mont. (1843), anamorphic *Badimia*, *Calopadia*, *Lasioloma*, *Sporopodium*, *Tapellaria*, *St. of-bH.15* (L). 2, widespread (esp. tropical). See Hawksworth (*Bull. Br. Mus. nat. hist. Bot.* 9: 59, 1981), Sérusiaux (*Lichenologist* 18: 1, 1986; conidioma campylidia), Kalb & Vězda (*Folia geobot. phytotax.* 22: 286, 1987; nomencl.), Lücking *et al.* (*Lichenologist* 30: 121, 1998), Lücking & Santesson (*Bryologist* 105: 57, 2002).
- Pyrenotrochila** Höhn. (1917) = *Trochila* fide Dennis (*British Ascomycetes*, 1968).
- Pyrenowilmsia** R.C. Harris & Aptroot (1991), *Pyrenulaceae* (L). 1, S. Africa. See Aptroot (*Biblhca Lichenol.* 44: 75, 1991).
- Pyrenula** Ach. (1809) nom. rej. = *Thelidium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pyrenula** Ach. (1814) nom. cons., *Pyrenulaceae* (L). c. 200, widespread (esp. tropical). See Singh & Upreti (*Geophytology* 17: 75, 1987; key 21 spp. Andaman Isl.), Upreti & Singh (*Geophytology* 18: 67, 1988; key 14 spp. Sri Lanka), Harris (*Mem. N. Y. bot. Gdn* 49: 74, 1989; gen. concept, key 47 N. Am. spp.), Upreti (*Bull. Soc. bot. Fr. Let. bot.* 3: 241, 1991; key 12 spp. *P. brunnea* group), Upreti (*Feddes Repert.* 103: 279, 1992; 24 spp. India), Aptroot *et al.* (*Biblhca Lichenol.* 64, 1997; key Papua New Guinea spp.), Upreti (*Nova Hedwigia* 66: 557, 1998; key Indian spp.), Etayo & Aptroot (*Lichenologist* 35: 233, 2003; Panama), Grube *et al.* (*MR* 108: 1111, 2004; phylogeny), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny), Aptroot *et al.* (*Biblhca Lichenol.* 97, 2008; Costa Rica).
- Pyrenulaceae** Rabenh. (1870), *Pyrenulales* (±L). 10 gen. (+ 12 syn.), 284 spp.
Lit.: Hawksworth (*Nova Hedwigia* 43: 1, 1986), Harris (*Mem. N. Y. bot. Gdn* 49: 74, 1989), Aptroot (*Biblhca Lichenol.* 44, 1991), Aptroot (*Biblhca Lichenol.* 44: 120, 1991), Eriksson & Hawksworth (*SA* 11: 71, 1992; concept), Tibell (*Fl. Neotrop. Monogr.* 69: 78 pp., 1996), Upreti (*Nova Hedwigia* 66: 557, 1998), Harada (*Lichenologist* 31: 567, 1999), Hyde & Wong (*MR* 103: 347, 1999), Bhattacharya *et al.* (*Mol. Biol. Evol.* 17: 1971, 2000), Lumbsch *et al.* (*Symb. bot. upsal.* 34 no. 1: 9, 2004), Prado *et al.* (*MR* 110: 511, 2006).
- Pyrenulales** Fink ex D. Hawksw. & O.E. Erikss. (1986), (±L). *Chaetothyriomycetidae*. 6 fam., 42 gen., 538 spp. Thallus (where present) crustose, often immersed, often inconspicuous; ascomata perithecial, immersed or erumpent, ± globose or flattened, often clypeate, sometimes aggregated into stromata, the peridium usually thick-walled, usually composed of small-celled pseudoparenchymatous tissue, sometimes crystalline; interascal tissue initially of thin-walled anastomosing pseudoparaphyses, subsequently ± unbranched paraphyses often developing from the base of the ascoma, occasionally only of true paraphyses; asci cylindrical, persistent, usually multilayered and fissitunicate, sometimes with a conspicuous apical ring, not blueing in iodine; ascospores hyaline or brown, septate, sometimes muriform, often with strongly thickened septa and angular lumina, sometimes with a sheath. Anamorphs pycnidial where known. Saprobes on bark, or lichenized with green algae (esp. *Trentepohliaceae*), mainly trop.
- Fams:
- (1) **Celotheliaceae**
 - (2) **Massariaceae**
 - (3) **Monoblastiaceae** (syn. *Acrocordiaceae*)
 - (4) **Pyrenulaceae** (syn. *Pleurotremataceae*)
 - (5) **Requienellaceae**
 - (6) **Xanthopyreniaceae**
- Lit.*: Aptroot (*Biblhca Lichenol.* 44, 1991), Del Prado *et al.* (*MR* 110: 511, 2006; phylogeny), Lutzoni (*Am. J. Bot.* 91: 114, 2004).
- Pyrenulella** Fink (1935) = *Pharcidiella*.
- Pyrenulomyces** E.A. Thomas ex Cif. & Tomas. (1953) = *Pyrenula* Ach. (1814) fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pyrenyllum** Clem. (1909), anamorphic *Pezizomycotina* (?L). 1. See Aguirre-Hudson (*Bull. Br. Mus. nat. hist. Bot.* 21: 85, 1991).
- Pyrgidiomyces** Cif. & Tomas. (1953) = *Pyrgidium*.
- Pyrgidium** Nyl. (1867), *Sphinctrinaceae* (?L). 1, widespread. See Tibell (*Lichenologist* 14: 219, 1982), Tibell (*Symb. bot. upsal.* 27 no. 1, 1987), Tibell (*Symb. bot. upsal.* 32: 291, 1997; anamorphs), Tibell & Wedin (*Mycol.* 92: 577, 2000).
- Pyrgillocarpon** Nádv. (1942) = *Pyrgillus* fide Aptroot (*Biblhca Lichenol.* 44, 1991).
- Pyrgillomyces** Cif. & Tomas. (1953) = *Pyrgillus*.
- Pyrgillus** Nyl. (1858), *Pyrenulaceae* (L). 4, widespread. See Tibell (*Beih. Nova Hedwigia* 79: 597, 1984), Lumbsch *et al.* (*Symb. bot. upsal.* 34 no. 1: 9, 2004; phylogeny), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny), Aptroot *et al.* (*Biblhca Lichenol.* 97, 2008; Costa Rica).
- Pyrgostroma** Petr. (1951), anamorphic *Pezizomycotina*, St. = eP.?. 1, USA. See Petrak (*Sydowia* 5: 484, 1951).
- Pyricularia** Sacc. (1880), anamorphic *Magnaporthe*,

- Hso.≡ eP.10. 14, widespread. *P. oryzae* (sometimes as *P. grisea*; conservation to be sought), rice blast. See Ou (Ed.) (*The rice blast disease*, 1965), Vales *et al.* (*L'Agron. Tropic.* 41: 242, 1986; electrophoresis in *P. oryzae* identification), Leung & Williams (*CJB* 65: 112, 1987; nuclear division and chromosomes), Rossman *et al.* (*Mycol.* 82: 509, 1990; nomencl. rice blast pathogen), Zhu *et al.* (*Mycosystema* 5: 89, 1992; DNA fingerprinting and pathotype identification), Zeigler *et al.* (*Rice blast disease*, 1994), George *et al.* (*Phytopathology* 88: 223, 1998), Kusaba *et al.* (*Ann. phytopath. Soc. Japan* 64: 125, 1998), Babujee & Gnanamanickam (*Curr. Sci.* 78: 248, 2000; population analysis), Kato *et al.* (*J. Gen. Pl. Path.* 66: 30, 2000; genetics, pathogenicity), Kusaba *et al.* (*Ann. phytopath. Soc. Japan* 65: 588, 1999; genetic diversity), Couch & Kohn (*Mycol.* 94: 683, 2002; separation of *P. oryzae* and *P. grisea*), Farman & Kim (*Molecular Plant Pathology* 6: 287, 2005; genetics), Hirata *et al.* (*MR* 111: 799, 2007; speciation).
- Pyriculariopsis** M.B. Ellis (1971), anamorphic *Pezizomycotina*, Hso.≡ eP.10. 5, widespread (tropical). See Lai & Gao (*Acta Mycol. Sin.* 10: 79, 1991; synonymy of *Gonatopyricularia*), Bussaban *et al.* (*Mycol.* 97: 1002, 2005; phylogeny).
- pyriform**, pear-like in form. Cf. obpyriform (Fig. 23.14).
- Pyriomyces** Bat. & H. Maia (1965), anamorphic *Bysoloma*, Cpd.0eH.? (L). 1, Brazil. See Lücking *et al.* (*Lichenologist* 30: 121, 1998).
- Pyripnomycetes** Cavalc. (1972), anamorphic *Pezizomycotina*, Cpt.1bH.? (L). 1, Brazil. See Cavalcanti (*Publicações. Instituto de Micologia da Universidade de Pernambuco* 647: 20, 1972), Lücking *et al.* (*Lichenologist* 30: 121, 1998).
- Pyrisperma** Raf. (1808) nom. dub., Agaricomycetes. 'gasteromycetes'. = *Hymenogaster* (*Hymenogaster*) fide Soehner, 1962; or 'discomycetes', hypogeous).
- Pyrispora**, see *Pyrisperma*.
- Pyrobolus** Kuntze (1891) ≡ *Eurotium*.
- Pyrochroa** Eschw. (1824) = *Phaeographis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pyroctonum** Prunet (1897) = *Cladochytrium* fide Karling (*Chytriomyc. Iconogr.*, 1977).
- Pyrofomes** Kotl. & Pouzar (1964), Polyporaceae. 6, widespread. See Decock & Ryvarden (*MR* 103: 1138, 1970), Ryvarden & Johansen (*Prelim. Polyp. Fl. E. Afr.*: 528, 1980; key 3 Afr. spp.), Piątek & Cabala (*Mycotaxon* 91: 173, 2005; Poland).
- Pyrographa** Fée ex A. Massal. (1860) nom. rej. prop. = *Phaeographis* fide Lücking *et al.* (*Taxon* 56: 1296, 2007; nomencl.).
- Pyronema** Carus (1835), Pyronemataceae. 2, widespread. See Moore & Korf (*Bull. Torrey bot. Club* 90: 33, 1963; key), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Pyronemataceae** Corda (1842), Pezizales. 80 gen. (+ 55 syn.), 662 spp.
Lit.: Trappe (*Mycotaxon* 9: 297, 1979) separated the *Geneaceae* from cleistothecial *Pyronemataceae*, based primarily on a hollow rather than solid or chambered ascoma. Molecular data do not as yet provide a convincing picture of evolution within the *Pyronemataceae*, but it is likely that further subdivision will occur.
Lit.: Kimbrough & Curry (*Mycol.* 78: 735, 1986; septal ultrastr.), Kimbrough & Curry (*Mycol.* 78: 407, 1986), Zhuang & Korf (*Mycotaxon* 26: 361, 1986), Benkert (*Z. Mykol.* 53: 195, 1987), Moore (*Mycotaxon* 29: 91, 1987), Hohmeyer (*Mitt. Arb. Pilzk. Niederrhein* 6: 32, 1988; synoptic key *Aleuriae*), Kimbrough (*Mem. N. Y. bot. Gdn* 49: 323, 1989) Many previous authors have separated the *Humariaceae* from this fam., based largely on the presence of carotenoid pigments.
Lit.: Kimbrough (*Mem. N. Y. bot. Gdn* 49: 326, 1989; limits), Moravec (*Mycotaxon* 36: 169, 1989), Schumacher (*Op. bot.* 101: 107 pp., 1990), Wu & Kimbrough (*Bot. Gaz.* 152: 421, 1991), Wu & Kimbrough (*Int. J. Pl. Sci.* 153: 128, 1992; ascosporogenesis) and under *Pezizales*, Pegler *et al.* (*British truffles*, 1993; hypogeous taxa), Landvik *et al.* (*Nordic J Bot.* 17: 403, 1997; DNA), Harrington *et al.* (*Mycol.* 91: 41, 1999), Norman & Egger (*Mycol.* 91: 820, 1999; phylogeny), Hansen *et al.* (*Mol. Phylogen. Evol.* 36: 1, 2005), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Hansen *et al.* (*Mycol.* 97: 1023, 2005), Liu & Zhuang (*Fungal Diversity* 23: 181, 2006), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Pyronemella** (Vido) Sacc. (1889) = *Lasiobolus* fide Pfister (*Mycol.* 76: 843, 1984).
- pyrophilous**, growing on burnt ground, steam sterilized soil etc.; carbonicolous; - **fungi**, fireplace fungi, phoenicoid fungi (see Ramsbottom, *Mushrooms and toadstools*: 231, 1953; list of some larger fungi, Webster *et al.*, *TBMS* 47: 445, 1964; discomycetes); see also *Pyronema*.
- Pyropolyporus** Murrill (1903) ≡ *Phellinus*.
- Pyropyxis** Egger (1984), Pyronemataceae. Anamorph *Dichobotrys*. 1, N. America. See Egger (*CJB* 62: 705, 1984).
- Pyrotheca** E. Hesse (1935), Microsporidia. 3.
- pyroxylophilous**, living on burnt wood.
- Pyrrhoderma** Imazeki (1966), Hymenochaetaceae. 2, Japan. See Ryvarden (*Syn. Fung.* 5, 1991), Wagner & Fischer (*Mycol.* 94: 998, 2002; phylogeny).
- Pyrrhoglossum** Singer (1944), Cortinariaceae. 11, widespread (tropical). See Horak (*Op. bot.* 100: 115, 1989), Horak & Desjardin (*Mem. N. Y. bot. Gdn* 89: 61, 2004).
- Pyrrhospora** Körb. (1855), Lecanoraceae (L). 28, widespread. See Hafellner (*Herzogia* 9: 725, 1993; key), Ekman & Wedin (*Pl. Biol.* 2: 350, 2000; phylogeny), Spribille & Hauck (*Bryologist* 106: 560, 2003; N America), Elix (*Australasian Lichenology* 55: 26, 2004; Australia), Elix & Kantvilas (*Australasian Lichenology* 57: 6, 2005; Australia), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- pythiosis**, a cosmopolitan disease of horses, cattle, and dogs caused by *Pythium insidiosum* (De Cock *et al.*, *J. clin. Microbiol.* 25: 344, 1987). See also Mendoza *et al.* (*J. med. vet. Mycol.* 26: 5, 1988).
- Pythites** Pampal. (1902), Fossil Fungi. 1 (Eocene), Italy.
- pyxidate**, provided with a lid, pertaining to, of having the character of a box; box-like.
- Pyxidiophora** Bref. & Tavel (1891), Pyxidiophoraceae. Anamorphs *Chalara*-like, *Thaxteriella*. 17 (mainly coprophilous), widespread. See Lundqvist (*Bot. Notiser* 133: 121, 1980), Barrasa & Moreno (*Cryptog. Mycol.* 4: 251, 1983; sects.), Blackwell *et al.* (*Science* 232: 993, 1986; anamorphs), Blackwell & Malloch (*CJB* 67: 2552, 1989; life-histories), Blackwell *et al.*

- (*MR* 92: 397, 1989; spp. on mites), Blackwell (*Mycol.* 86: 1, 1994; life-cycle, molec. relationships), Weir & Blackwell (*MR* 105: 1182, 2001; phylogeny), Kirschner (*Mycol. Progr.* 2: 209, 2003; Europe).
- Pyxidiophoraceae** G.R.W. Arnold (1971), Pyxidiophorales. 5 gen. (+ 13 syn.), 22 spp.
Lit.: Lundqvist (*Bot. Notiser* 133: 121, 1980), Blackwell *et al.* (*Science* N.Y. 232: 993, 1986), Webster & Hawksworth (*TBMS* 87: 77, 1986), Blackwell & Malloch (*Mem. N. Y. bot. Gdn* 49: 23, 1989), Blackwell & Malloch (*CJB* 67: 2552, 1989), Blackwell *et al.* in Wingfield *et al.* (Eds) (*Ceratocystis and Ophiostoma* Taxonomy, Ecology and Pathogenicity: 105, 1993; rels), Blackwell & Jones (*Biodiv. Cons.* 6: 689, 1997; biology), Henk *et al.* (*Mycol.* 95: 561, 2003).
- Pyxidiophorales** P.F. Cannon (2001). Laboulbeniomycetidae. 1 fam., 5 gen., 22 spp.
 The order is confirmed as a member of *Laboulbeniomycetidae* by molecular data (Blackwell, *Mycol.* 86: 1, 1994). Fam.:
Pyxidiophoraceae
Lit.: see under Fam. and *Pyxidiophora*.
- Pyxidium** Hill (1771) = *Cladonia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Pyxine** Fr. (1825), Caliciaceae (L.). 51, widespread (tropical). See Imshaug (*Trans. Am. microsc. Soc.* 76: 246, 1957), Swinscow & Krog (*Norw. J. Bot.* 22: 43, 1975; E. Afr.), Kashiwadani (*J. Jap. Bot.* 52: 137, 1977; Japan), Kashiwadani (*Bull. natn. Sci. Mus. Tokyo*, B 3: 63, 1977; Papua New Guinea), Awasthi (*Phytomorphology* 30: 359, 1982; key 21 spp. India), Rogers (*Aust. J. Bot.* 34: 131, 1986; key 15 spp. Australia), Rogers (*Brunonia* 9: 229, 1986; Australia), Kalb (*Biblhca Lichenol.* 24, 1987; key 24 spp. Brazil), Sammy (*Nuytsia* 6: 279, 1988; key 4 spp. W. Australia), Kalb (*Herzogia* 10: 61, 1994; key 21 spp. Australia), Nordin & Mattsson (*Lichenologist* 33: 3, 2001; phylogeny), Scheidegger *et al.* (*Lichenologist* 33: 25, 2001; evolution), Helms *et al.* (*Mycol.* 95: 1078, 2003; phylogeny), Hu & Chen (*Mycotaxon* 86: 445, 2003; China), Moberg (*Symb. bot. upsal.* 34 no. 1: 257, 2004; S Africa), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Pyxineaceae** Stizenb. (1862) = Caliciaceae.
- Q**, the ratio of length to breadth of elongate spores of agarics; spores ellipsoidal or ovoid when $Q = \square 2$, ellipsoidal-oblong, fusoid, cylindrical, etc. when $Q = \triangleright 2$ (Singer, 1962: 68). Cf. E, sporograph.
- Quadraceae** Lunghini, Pinzari & Zucconi (1996), anamorphic *Pezizomycotina*, Hso.?.?. 1, Italy. See Lunghini *et al.* (*Mycotaxon* 60: 103, 1996), Wu & Zhuang (*Fungal Diversity Res. Ser.* 15, 2005).
- quadrangular**, see rhomboidal.
- Quadricladium** Nawawi & Kuthub. (1989), anamorphic *Pezizomycotina*, Hso.1bH.10. 1 (aquatic), Malaysia. See Nawawi & Kuthubutheen (*Mycotaxon* 34: 489, 1989).
- Quadriskora** Bougher & Castellano (1993), Cortinariaceae. 3, Australia. See Bougher & Castellano (*Mycol.* 85: 285, 1993).
- Quadriskoromyces** Sekunova (1960) = *Schizosaccharomyces* fide Batra in Subramanian (Ed.) (*Taxonomy of fungi* 1: 187, 1978).
- Quambalaria** J.A. Simpson (2000), Quambalariaceae. 4, widespread. See Simpson (*Australasian Mycologist* 19: 60, 2000), Beer *et al.* (*Stud. Mycol.* 55: 289, 2006; mol. phylog.).
- Quambalariaceae** Z.W. Beer, Begerow & R. Bauer (2006), Microstromatales. 1 gen., 4 spp.
Lit.: Simpson (*Australas. Mycol.* 19: 57, 2000), Begerow *et al.* (*MR* 105: 809, 2001), Beer *et al.* (*Stud. Mycol.* 55: 289, 2006).
- Quasiconcha** M.E. Barr & M. Blackw. (1981), Mytiliniaceae. Anamorph *Chalara*-like. 1, USA. See Blackwell & Gilbertson (*Mycol.* 77: 50, 1985; anamorph), Barr (*N. Amer. Fl. ser.* 2 13: 129 pp., 1990).
- Quasidiscus** B. Sutton (1991), anamorphic *Pezizomycotina*, Ccu.0eH.15. 1, Australia. See Sutton (*Sydowia* 43: 276, 1991).
- Quasiphloeospora** B. Sutton, Crous & Shamoun (1996), anamorphic *Mycosphaerellaceae*. 1, USA. See Sutton *et al.* (*MR* 100: 979, 1996), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003).
- Quaternaria** Tul. & C. Tul. (1863), Diatrypaceae. 2, widespread (temperate). See Rappaz (*Mycol. Helv.* 2: 285, 1987).
- Quatsinoporites** S.Y. Sm., Currah & Stockey (2004), Fossil Fungi. 1, Canada. See Smith *et al.* (*Mycol.* 96: 181, 2004).
- Queenslandia** Bat. & H. Maia (1959), anamorphic *Pezizomycotina*, Cpt.0eH.?. 4, widespread. See Batista & Maia (*Mycopath. Mycol. appl.* 11: 75, 1959).
- Queirozia** Viégas & Cardoso (1944) = *Pleochaeta* fide Braun (*Mycotaxon* 15: 150, 1982), Liberato *et al.* (*MR* 110: 567, 2006; anamorph).
- Quélet** (Lucien; 1832-1899; France). Student, Montbéliard; medical student then laboratory technician, Strasbourg (c. 1854); practising doctor, Montbéliard (c. 1854 onwards). An amateur contributing significantly to the mycota of France; first President of the Société Mycologique de France (1885); decorated for services as a volunteer doctor during the Franco-Prussian war (1870-1871); described as a 'rough diamond' particularly after the premature death of his son. *Publs.* *Les Champignons du Jura et des Voges* (1872-1875) [in which a number of Fries' sub-genera of the *Agaricaceae* were first used as genera; reprint 1964 + 1972 suppl., 1872-1902; index to reprint, *BSMF* 88: cxi, 1973]; (with Cooke, q.v.) *Clavis Synoptica Hymenomycetum Europaeorum* (1878); *Encheiridion Fungorum in Europa Media et Praesertim in Gallia Vigentium* (1886); *Flore Mycologique de la France*. (1888) [reprint 1962]. *Biogs, obits etc.* Boudier (*BSMF* 15: 321, 1899); Gilbert (*BSMF* 65: 5, 1949) [bibliography]; Grumann (1974: 294); Mangin & Chomette (*Essai d'une Table de Concordance des Principales Espèces Mycologiques avec la Flore de France et des Pays Limitrophes de Lucien Quélet* (1906) [reprint 1963]); Stafleu & Cowan (*TL*-2 4: 453, 1983).
- Queletia** Fr. (1872), Agaricaceae. 2, widespread. See Wright (*Cryptog. Bot.* 1: 26, 1989).
- quellkörper**, a mucilaginous mass of thick-walled cells within the ascoma of *Nitschkeaceae*; believed to induce rupture of the ascoma.
- Quercella** Velen. (1921) nom. rej. = *Phaeocollybia* fide Kuyper (*in litt.*).
- Questieria** G. Arnaud (1918) = *Schiffnerula* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Questieriella** G. Arnaud ex S. Hughes (1983), anamorphic *Schiffnerula*, Hso.≡ eP.1. 10, widespread. See Hughes (*CJB* 61: 1729, 1983), Hughes (*Mycol.* 82: 657, 1990), Hosagoudar (*Zoos' Print Journal* 18: 1071, 2003).

- Quezelia** Faurel & Schotter (1965), anamorphic *Pezizomycotina*, Cpt.1eH.?. 1 (coprophilous), Sahara. See Faurel & Schotter (*Revue Mycol. Paris* 30: 161, 1964).
- Quilonia** K.P. Jain & R.C. Gupta (1970), Fossil Fungi, anamorphic, *Pezizomycotina*. 1 (Miocene), India.
- quinine fungus**, *Fomes officinalis*.
- Quintaria** Kohlm. & Volkm.-Kohlm. (1991), Lophiostomataceae. 1 (marine), Belize; Australasia. See Kohlmeyer & Volkmann-Kohlmeyer (*Aust. J. mar. Freshwat. Res.* 42: 91, 1991), Hyde & Goh (*Nova Hedwigia* 68: 251, 1999).
- Quorn**, The trade name under which mycoprotein (q.v.) manufactured from *Fusarium graminearum* by Marlow Foods (a subsidiary of Rank Hovis McDougall and ICI) is marketed.
- Rabdosporium** Chevall. (1826) = *Cheirospora* fide Hughes (*CJB* 36: 800, 1958).
- Rabenhorst** (Gottlob Ludwig; 1806-1881; Germany). Student, Belzig and Berlin (1822-1830); a pharmacist in Lukau (1830-1840); doctorate, Jena (1841); private scientists, Dresden (1840-1875) and Meissen (1875-1881). An outstanding collector, publishing large series of exsiccati; first editor of *Hedwigia* (1852-1878). *Publs. Klotzschii Herbarium Vivum Mycologicum* (1842-1855) [nearly 2,000 fungal exsiccati]; *Deutschlands Kryptogamen-Flora* (1844-1853); 2 Aufl. *Kryptogamen-Flora von Deutschland, Oesterreich und der Schweiz* 2 Aufl. (1884-1932) [a vast work, initiated by him and continuing long after his death]; *Lichenes Europaei Exsiccati* (1855-1879) [nearly 1,000 exsiccati]; *Fungi Europaei Exsiccati* (1859 onwards) [see Kohlmeyer, *Beihefte zur Nova Hedwigia* 4, 1963; Stevenson, *Taxon* 16: 112, 1967, numbering of specimens]. *Biogs, obits etc.* Grummann (1974: 38); Richter (*Hedwigia* 20: 113, 1881); Stafleu & Cowan (*TL-2* 4: 460, 1983).
- Rabenhorstia** Fr. (1849), anamorphic *Hercospora*, St.0eH.1. 10, widespread (esp. Europe).
- Rabenhorstiites** Teterenv. & Tasl. (1977), Fossil Fungi. 1 (Tertiary), former USSR.
- Rabenhorstinidium** R.B. Singh & G.V. Patil (1980), Fossil Fungi, anamorphic *Pezizomycotina*. 1 (Cretaceous), India.
- race**, see physiologic race and Classification.
- Racemella** Ces. (1861) = *Cordyceps* fide Tulasne & Tulasne (*Select. fung. carpol.* 3: 4, 1865).
- Racemosporium** Moreau & Moreau (1941) = *Arthrimum* fide Ellis (*Mycol. Pap.* 103, 1965).
- Rachicladosporium** Crous, U. Braun & C.F. Hill (2007), anamorphic *Capnodiales*. 1, New Zealand. See Crous *et al.* (*Stud. Mycol.* 58: 33, 2007).
- Rachidicola** K.D. Hyde & J. Fröhl. (1995), Dothideomycetes. 1, Hong Kong. See Hyde (*Sydowia* 47: 217, 1995).
- rachis**, a geniculate or zig-zag holoblastic extension of a conidiogenous cell (as in *Tritirachium*) resulting from sympodial conidiogenous cell development; **rachiform** (of conidiogenous cells), having a rachis; cf. raduliform.
- Rachisia** Lindner (1913) = *Fusarium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Raciborski** (Marjan; 1863-1917; Poland). Student, München (1894); Indonesia (1896-1900); Professor of Botany, Agricultural Academy, Dublany (1900-1909) then Professor and Director, Plant Physiological Institute (1909-1912), L'viv; Professor of Botany, Cracow University (1912-1917). Pioneer mycologist in Indonesia; pioneer of nature conservation in Poland; also wrote papers on fungi of Poland and Switzerland. *Publs. Parasitische Algen und Pilze Java's* (1900). *Biogs, obits etc.* Goebel (*Bericht der Deutschen Botanischen Gesellschaft* 35: (97), 1918; bibliography); Grummann (1974: 437); Kornasia (*Marian Raciborski*, 1986); Stafleu & Cowan (*TL-2* 4: 529, 1983).
- Raciborskiella** Höhn. (1909) = *Strigula* fide Harris (*in litt.*), Roux & Sérusiaux (*Bull. Soc. linn. Provence* 46: 91, 1995; ascospores), Roux *et al.* (*Bibliotheca Lichenol.* 90: 96 pp., 2004).
- Raciborskiella** Speg. (1919) = *Trichopeltella*.
- Raciborskiomyces** Siemaszko (1925) = *Epipolaeum* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- racket (racquette) cell** (of dermatophytes), a hyphal cell having a swelling at one end; cf. hypha.
- Racoblenna** A. Massal. (1852) = *Placynthium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Racoblennaceae** Arnold (1858) = *Placynthiaceae*.
- Racodium** Fr. (1829) nom. cons., anamorphic *Capnodiales*, Hso.0eP.? ($\pm$ L). 1, widespread. See Hawksworth & Riedl (*Taxon* 26: 208, 1977; nomencl.), Kantvilas (*Muelleria* 16: 65, 2002; Australia), Sakamoto & Miyamaoto (*Forest Pathology* 35: 1, 2005; Japan), Tribe *et al.* (*Mycologist* 20: 171, 2006), Muggia *et al.* (*MR* 112: 50, 2008; phylogeny).
- Racodium** Pers. (1794) nom. rej. = *Rhinocladiella* Nannf. See cellar fungus. fide Hawksworth & Riedl (*Taxon* 26: 208, 1977), Tribe *et al.* (*Mycologist* 20: 171, 2006).
- Racoplaca** Fée (1825) = *Strigula* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Racospermyces** J. Walker (2001), ? *Raveneliaceae*. 6 (on *Acacia* (*Leguminosae*)), Australia; E. Asia; Hawaii. See Walker (*Australasian Mycologist* 20: 3, 2001; monogr., key), Scholler & Aime (*Mycoscience* 47: 159, 2006; syn. of *Endoraecium*).
- Racovitziella** Döbbeler & Poelt (1978), Dothideomycetes. 1 (on *Musci*), Austria. See Döbbeler & Poelt (*Mitt. bot. StSamml. Münch.* 14: 206, 1978).
- racquette cell**, see racket cell.
- Radaisiella** Bainier (1910) = *Botryosporium* Corda fide Mason (*Mycol. Pap.* 2: 27, 1928).
- Raddetes** P. Karst. (1887) nom. rej. = *Conocybe* fide Kuyper (*in litt.*).
- radial** (of lichen thalli), radially symmetrical in transverse section (e.g. *Alectoria*, *Bryoria*, *Coelocaulon*, *Usnea*).
- radiate**, spreading from a centre.
- Radiation and fungi**. Fungi like all living organisms are influenced by ionizing and non-ionizing radiation.
- Ionizing radiation affects fungal DNA both directly and indirectly and causes a wide range of damage. Harmful effects, including chromosomal breaks and elevated mutation frequencies were identified during satellite and space studies with different fungi (Dublin & Volz, *Origins of Life and Evolution of Biospheres* 4: 223, 1973; Volz *et al.*, *Mycopath. mycol. Appl.* 54: 221, 1974). Spore germination and subsequent hyphal growth of soil microfungi in the presence of pure gamma or mixed beta and gamma radiation is influenced by the origin of the isolate. Fungi isolated from background radiation sources show inhibition or no response in germination when experi-

mentally irradiated, but isolates from sites with elevated mixed radiation showed stimulation in spore germination and enhanced hyphal growth. Prior long-term exposure to radiation influences fungal decomposition of radionuclide-bearing resources in the environment (Tugay *et al.*, *Mycologia* **98**: 521, 2006).

Ecosystems throughout the world have been contaminated with radionuclides as a result of above ground nuclear testing, nuclear reactor accidents and nuclear power generation. The reactor disaster at the Chernobyl Nuclear Power Station in April 1986, in particular, led to huge amounts of radioactive material being distributed over a large area of Europe, stimulating studies of radiation effects on fungi. Radioisotopes characteristic of nuclear fission, such as ^{137}Cs and ^{90}Sr , were released into the environment, becoming more concentrated as they move up the food chain and often becoming human health hazards. Following Chernobyl, lichens (mainly *Cladonia rangiferina*) of northern Scandinavia accumulated so much radioactivity that reindeer feeding on them were considered dangerous for human consumption. Basidiomycete fruit bodies are known to accumulate radioactive nuclides (Haselwandter, *Health Phys.* **4**: 713, 1978; Bakken & Olsen, *Can. J. Microbiol.* **36**: 704, 1990; Grodzinskaya *et al.*, *Sydowia* **10**: 88, 1995). Concentrations of radioactive ^{134}Cs , ^{137}Cs in mushrooms vary in different regions with, e.g. a maximum of 2860 Bq kg⁻¹ (dry wt.) for France (Kirchner & Daillant, *Science of the Total Environment* **222**: 63, 1998). Radionuclides accumulate in mushroom fruit bodies under experimental conditions in the following order: ^{83}Rb ^{65}Zn ^{54}Mn ^{22}Na ^{75}Se and ^{85}Sr ^{60}Co ^{88}Y , ^{102}Rh , ^{139}Ce ^{143}Ce , ^{144}Pm ^{146}Pm , ^{153}Gd and ^{173}Lu ^{175}Hf (Tadaaki Ban-Nai *et al.*, *J. Radiation Res.* **38**: 213, 1997).

Reports of high concentrations of fallout radiocaesium in basidiomycete fruit bodies after Chernobyl and speculation that fungi could be long-term ^{137}Cs accumulators led to special studies which indicated that uptake of Cs by common fungi of upland grassland ranged from 44 to 235 nmol Cs g⁻¹ d.w. h⁻¹ with more than 40% of the Cs taken up from environment being bound within the hyphae. Immobilization of radiocaesium fallout by the soil fungal component is discussed by Dighton *et al.* (*MR* **95**: 1052, 1991). Study during 1996-1998 of ^{137}Cs concentration in mushrooms from one of the regions of Ukraine contaminated by radiation revealed higher accumulations in fruit bodies of *Paxillus involutus*, *Sarcodon imbricatus*, *Xerocomus subtomentosus* and *Cantharellus cibarius* than in mycelium from soil, with ratios ranging from 0.1 to 66 and a mean of 9.9. Fungal mycelium accumulated from 0.1 to 50% ^{137}Cs compared with sampled soil (Vinichuk & Johanson *J. environ. Radioactivity* **64**: 27, 2002). Another study revealed higher levels of ^{90}Sr transfer to fruit bodies of some mushrooms from soils of sampling sites than $^{239} + ^{240}\text{Pu}$ and ^{241}Am transfer. The Available Transfer Factor (ATF) index, based on the ratio between fruit-body content and the amount of radionuclide available for transfer in soil, has been proposed as a measure of the actual process of transfer. *Hebeloma cylindrosporum* and *Lycoperdon perlatum* were found to have $^{239} + ^{240}\text{Pu}$ and ^{241}Am ATF values greater than or similar to those of ^{90}Sr , and such fungi have been suggested as suitable as bioindicators for radioactive nuclides in a forest ecosystems (Baeza *et al.*, *Radio-*

chimica Acta **94**: 75, 2006). *Ganoderma lucidum* has also been proposed as an indicator for ^{137}Cs environmental monitoring because of its high levels of accumulation (Tran Van & Le Duy, *J. radioanalytical nucl. chem.* **155**: 451, 1991).

Biosorption of radioactive elements is exhibited by different fungi. *Rhizopus arrhizus* takes up to 180 mg U⁶/g of uranium from aqueous solutions. Uranium adsorption in cell-wall chitin occurs simultaneously and rapidly; precipitation of uranyl hydroxide within the chitin microcrystalline cell-wall occurs at a lower rate (Tsezos & Volesky, *Biotechnol. Bioeng. Symp.* **24**: 385, 1982). There is experimental evidence for fungal transformations of uranium solids and production of secondary mycogenic uranium minerals. Saprotrophic, ericoid and ectomycorrhizal fungi dissolve uranium oxides and accumulate uranium within the mycelium to over 80 mg (g dry weight)⁻¹ biomass (Fomina *et al.*, *Environ. Microbiol.* **9**: 1696, 2007). Absorption and adsorption of radionuclides from 'hot particles' originating from the Chernobyl accident and from atomic bomb testing sites has also been observed. Studied species and strains of soil fungi overgrew and dissolved the 'hot particles' after prolonged contact. Accumulation was generally more intensive for ^{152}Eu than for ^{137}Cs by a factor of about 2.6-134. The main factors influencing Cs and Eu accumulation in soil fungi seem to be fungal species, fungal strain, and size and composition of the 'hot particle' (Zhdanova *et al.*, *J. environ. radioactivity* **67**: 119, 2003).

Microfungi have been found to be highly resilient to exposure to ionizing radiation. Free-living and mycorrhizal fungi can colonize thermodynamically unstable depleted uranium surfaces and transform metallic depleted uranium into uranyl phosphate minerals (Fomina *et al.*, *Curr. Biol.* **18**: R375, 2008). Radioresistance of some fungal species has been linked to the presence of melanin, which has been shown to have emerging properties of acting as an energy transporter for metabolism (Dighton *et al.*, *FEMS Microbiology Letters* **281**: 109, 2008; review). Sustained exposure of microfungi to radiation appears to have resulted in formerly unknown adaptive features, such as directed growth of fungi toward sources of ionizing radiation. Soil microfungi isolated from around the Chernobyl Nuclear Power Station are able to grow into and decompose 'hot particles' in the carbon based radioactive graphite from the reactor. Long-term investigations of about 2000 strains of 200 species of 98 genera revealed that both beta and gamma radiation promote directional growth of hyphae towards the source of radiation (Zhdanova *et al.*, *MR* **108**: 1089, 2004). Recent research raises the possibility that some fungi use the pigment melanin to extract energy from ionizing radiation, such as gamma radiation, for 'radiotrophic' growth. There is speculation that these properties of energy capture may have potential use in genetic engineering for development of biofuels, bioremediation of sites with radioactive contamination, and similar applications (Dadachova *et al.*, *PLoS ONE* **2** (5): e457, 2007).

Non-ionizing radiation effects are electromagnetic and do not carry enough energy per quantum to ionize atoms and molecules of fungi. Among them are near ultraviolet (UV), infrared and visible light radiation, etc. Some lethal effects of UV radiation on fungus spores are known (Zahl *et al.*, *J. gen. physiol.* **22**:

- 689, 1939; Dimond & Duggar, *Proc. nat. acad. sci. USA* 27: 459, 1941; Ghar *et al.*, *Biocontrol Sci. Technol.* 16: 451, 2006). UV radiation trigger sporogenesis in many fungi, and action spectra constructed for fungal sporogenesis typically have peaks at 280-290 nm (Leach & Trione, *Photochem. Photobiol.* 5: 621, 1966; Leach, *In: Booth (Ed.) Methods in microbiology* 4: 609, 1971) or near 360, 440, and 480 nm (Curtis, *Plant Physiol.* 49: 235, 1972). Shortwave UV-B radiation (280-315 nm) influences distribution of fungi on leaf surfaces and its increase directly affects abundance of specific phylloplane fungi. Yeasts and yeast-like fungi such as *Aureobasidium pullulans* and *Sporobolomyces roseus* are reduced by supplemental levels of UV radiation, but *Alternaria* spp. and *Microdochium nivale* are less affected, while the most tolerant are *Cladosporium* spp. and *Epicoccum nigrum* (Newsham *et al.*, *New phytologist* 136: 287, 1997). Sometimes UV radiation influence is unpredictable (Duguay & Klironomos *Appl. soil ecol.* 14: 157, 2000). Solar UV radiation has been observed to reduce fungal growth on Antarctic soil surfaces. Exposure to solar radiation of >287 nm reduced hyphal extension rates of *Geomyces pannorum*, *Phoma herbarum*, *Pythium* sp., *Verticillium* sp., and *Mortierella parvispora*, each isolated from Antarctic terrestrial habitats. Short-wave solar UV radiation of between 287 and 305 nm inhibited growth of hyphae on and below the surface of an agar medium in a day, but radiation of ≥ 345 nm only reduced growth of surface hyphae (Hughes *et al.*, *Appl. environ. microbiol.* 69: 1488, 2003).
- Radiatispora** Matsush. (1995), anamorphic *Pezizomycotina*, Hso.1bH.1. 1, China. See Matsushima (*Matsush. Mycol. Mem.* 8: 32, 1995).
- radicating** (of stipes), like a root; rooting (Fig. 4H).
- Radiciseta** Sawada & Katsuki (1959), anamorphic *Pezizomycotina*, Hso. $\equiv$ eH.?. 1, Taiwan. See Sawada & Katsuki (*Publ. Coll. Agric. Nat. Taiwan Univ.* 8: 205, 1959).
- Radiigera** Zeller (1944), Geastraceae. 4, widespread. See Kers (*Bot. Notiser* 129: 173, 1976), Domínguez & Castellano (*Mycol.* 88: 863, 1996), Calonge (*Boletín de la Sociedad Micológica de Madrid* 22: 105, 1997).
- Radiogaster** Lloyd (1924) nom. inval. ? = *Hymenogaster* fide Stalpers (*in litt.*).
- Radiomyces** Embree (1959), Radiomycetaceae. 3, USA. See Benjamin (*Aliso* 4: 523, 1960), Ellis & Hesseltine (*Mycol.* 66: 85, 1974), Kitz *et al.* (*Mycol.* 74: 110, 1982), Benny & Khan (*Scanning Microsc.* 2: 1199, 1988; ultrastr.), Benny & Samson (*Mem. N. Y. bot. Gdn* 49: 11, 1989; ultrastr.), Benny & Benjamin (*Mycol.* 83: 713, 1991; key), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny), White *et al.* (*Mycol.* 98: 872, 2006; phylogeny).
- Radiomycetaceae** Hesselt. & J.J. Ellis (1974), Mucorales. 3 gen. (+ 1 syn.), 5 spp.
Lit.: Kitz *et al.* (*Sabouraudia* 18: 115, 1980), Benny & Khan (*Scanning Microscopy* 2: 1199, 1988; ultrastr., sporangial appendage chemistry), Benny & Samson (*Mem. N. Y. bot. Gdn* 49: 11, 1989; ultrastr.), Tanphaichitr *et al.* (*Mycoses* 33: 303, 1990), Benny & Benjamin (*Mycol.* 83: 713, 1991; key), Benny & Benjamin (*Mycol.* 83: 713, 1991), Meis *et al.* (*J. Clin. Microbiol.* 32: 3078, 1994), Ribes *et al.* (*Clin. Microbiol. Rev.* 13: 236, 2000), Chakrabarti *et al.* (*J. Clin. Microbiol.* 41: 783, 2003).
- Radiomycopsis** Pidopl. & Milko (1971) = *Radiomyces* fide Benny & Benjamin (*Mycol.* 83: 713, 1991).
- Radotinea** Velen. (1934), ? Helotiales. 1, former Czechoslovakia.
- radula spore** (radulaspore, radulospore), one of the slimy spores borne over the surface of ascospores as in *Nectria coryli* while still in the ascus; dry - = sympodulospore (Mason, 1933, 1937).
- Radulaceae** Gäum. (1926) = Valsaceae.
- Radulidium** Arzanlou, W. Gams & Crous (2007), anamorphic *Pezizomycotina*. 1. See Arzanlou *et al.* (*Stud. Mycol.* 58: 57, 2007).
- raduliform** (of conidiogenous cells), the elongating conidiogenous axis resulting from holoblastic sympodial development, clavate or somewhat inflated rather than zig-zag; cf. rachiform.
- Raduliporus** Spirin & Zmitr. (2006), Polyporaceae. 1.
- Radulochaete** Rick (1940) nom. dub., Cantharellales. 'basidiomycetes' fide Donk (*Persoonia* 3: 199, 1964).
- Radulodon** Ryvarden (1972), Meruliaceae. 9, widespread. See Ryvarden (*Česká Mykol.* 30: 38, 1976; key), Hjortstam *et al.* (*Kew Bull.* 45: 303, 1990; key).
- Radulomyces** M.P. Christ. (1960), Pterulaceae. 10, widespread. See Christiansen (*Dansk bot. Ark.* 19: 230, 1960), Gilbertson & Nakasone (*Mycol.* 95: 467, 2003; key Hawaiian spp.).
- Radulum** Fr. (1825) = *Xenotypa* fide Donk (*Taxon* 5: 109, 1956).
- Raesaeneniolichen** Tomas. & Cif. (1952) = *Polyblastia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Raesaeneniomyces** Cif. & Tomas. (1953) = *Raesaeneniolichen*.
- Raffaelea** Arx & Hennebert (1965), anamorphic *Ophiostoma*, Hso.0eH.10. 12, widespread. See Scott & du Toit (*TBMS* 55: 181, 1970), Kubono & Ito (*Myco-science* 43: 255, 2002; Japan), Gebhardt & Oberwinkler (*Antonie van Leeuwenhoek* 88: 61, 2005; ontogeny).
- ragi**, a starter for arrack, etc. composed of small balls of rice flour containing *Mucor*, *Rhizopus*, yeasts and bacteria (Hesseltine, *Mycol.* 57: 163, 1965).
- Ragnhildiana** Solheim (1931) = *Passalora* fide Deighton (*Mycol. Pap.* 137, 1974), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003).
- Raizadenia** S.L. Srivast. (1981), anamorphic *Pezizomycotina*, Hsy. $\equiv$ eP.1. 1, India. See Srivastava (*Indian Phytopath.* 34: 335, 1981).
- Rajapa** Singer (1945) = *Termitomyces* fide Singer (*Agaric. mod. Tax.*, 1951).
- Ramakrishnanella** Kamat & Ullasa ex Ullasa (1970), anamorphic *Pezizomycotina*, Cpd.0eP.?. 1, India. See Kamat & Ullasa ex Ullasa (*Bull. Torrey bot. Club* 97: 255, 1970).
- Ramakrishnanian** Ramachar & Bhagyan. (1979), Pucciniaceae. 1 (on *Ixora* (*Rubiaceae*)), India. See Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003; syn. of *Gymnoconia*) Probably a *Puccinia* with atypical sporogeneous cells.
- Ramalea** Nyl. (1866), Cladoniaceae (L.). 4, widespread. See Stenroos *et al.* (*Mycol. Progr.* 1: 267, 2002; phylogeny), Printzen & Kantvilas (*Bibliotheca Lichenol.* 88: 541, 2004; phylogeny).
- Ramaleaceae** Elenkin (1929) = Cladoniaceae.
- Ramalia** Bat. (1957), anamorphic *Dothideomycetes*. See Sutton & Pascoe (*Aust. Syst. Bot.* 1: 79, 1988; synonymy with *Fusicladium*), Braun & Mouchacca

- (MR 104: 1009, 2000).
- Ramalina** Ach. (1809) nom. cons., Ramalinaceae (L). c. 246, widespread. See Howe (*Bryologist* 16: 65, 1913), Howe (*Bryologist* 17: 1, 1914), Krog & Swinscow (*Norw. Jl Bot.* 23: 153, 1976; E. Afr.), Krog & James (*Norw. Jl Bot.* 24: 15, 1977; Fennoscandia, UK), Krog & Østhagen (*Norw. Jl Bot.* 27: 255, 1980; Canary Is.), Stevens (*Bull. Br. Mus. nat. hist. Bot.* 16: 107, 1987; key 20 spp. Australia), Kashiwadani & Kalb (*Lichenologist* 25: 1, 1993; key 22 spp. Brazil), Blanchon *et al.* (*J. Hattori bot. Lab.* 79: 43, 1996; NZ), Groner & LaGreca (*Lichenologist* 29: 441, 1997; DNA), LaGreca (*Bryologist* 102: 602, 1999; DNA), Rosato & Scutari (*Mycotaxon* 74: 141, 2000; Argentina), Alvarez *et al.* (*Cryptog. Mycol.* 22: 271, 2001; chemistry, Spain), Kashiwadani & Nash (*Mycotaxon* 83: 385, 2002; Mexico), Kashiwadani *et al.* (*J. Jap. Bot.* 77: 351, 2002; Hawaii), Cordeiro *et al.* (*Phytochem.* 63: 967, 2003; chemistry), Bannister *et al.* (*N.Z. Jl Bot.* 42: 121, 2004; New Zealand), Joneson *et al.* (*Bryologist* 107: 98, 2004; Kuril Is), Sparrius (*Bibliotheca Lichenol.* 89, 2004; monogr.), Stocker-Wörgötter *et al.* (*Bryologist* 107: 152, 2004; chemistry), Kashiwadani *et al.* (*Bull. natn. Sci. Mus. Tokyo*, B 32: 161, 2006; China), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Aptroot & Bungartz (*Lichenologist* 39: 519, 2007; Galápagos Is), Honegger & Zippler (MR 111: 424, 2007; mating systems), Kashiwadani & Moon (*Bibliotheca Lichenol.* 96: 145, 2007; Indonesia), Werth & Sork (*Am. J. Bot.* 95: 568, 2008; genetic structure).
- Ramalinaceae** C. Agardh (1821), Lecanorales (L). 36 gen. (+ 27 syn.), 679 spp. Treated in a broad sense including *Bacidiaceae* and relatives.
- Lit.*: Stevens (*Bull. Br. Mus. nat. Hist. Bot.* 16: 107, 1987), Culberson *et al.* (*Bryologist* 93: 167, 1990), Rambold & Triebel (*Notes R. bot. Gdn Edinb.* 46: 375, 1990), Culberson *et al.* (*Am. J. Bot.* 80: 1472, 1993), Kashiwadani & Kalb (*Lichenologist* 25: 1, 1993), Blanchon *et al.* (*J. Hattori bot. Lab.* 79: 43, 1996), Spjut (*Sida Bot. Misc.* 14: 208 pp., 1996), Groner & LaGreca (*Lichenologist* 29: 441, 1997), Lumbsch (*Lichenologist* 30: 357, 1998), LaGreca (*Bryologist* 102: 602, 1999), LaGreca & Lumbsch (*Lichenologist* 33: 172, 2001), Cordeiro *et al.* (MR 108: 489, 2004), Stocker-Wörgötter *et al.* (*Bryologist* 107: 152, 2004), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny), Næsborg *et al.* (MR 111: 581, 2007; phylogeny).
- Ramalinomyces** E.A. Thomas ex Cif. & Tomas. (1953) = *Ramalina*.
- Ramalinopsis** (Zahlbr.) Follmann & Huneck (1969), Ramalinaceae (L). 1, Hawaii. See Riedl (*Sydowia* 28: 134, 1977).
- Ramalinora** Lumbsch, Rambold & Elix (1995), Lecanoraceae (L). 1, Australia. See LaGreca & Lumbsch (*Lichenologist* 33: 172, 2001).
- Ramalodium** Nyl. (1879), Collemataceae (L). 5, Japan; New Caledonia; Tasmania. See Henssen (*Lichenologist* 3: 29, 1965), Henssen (*Nova Hedwigia* 68: 117, 1999).
- Ramaraomyces** N.K. Rao, Manohar. & Goos (1989), anamorphic *Pezizomycotina*, Hsy. = eH.1. 1, India. See Rao *et al.* (*Mycol.* 81: 790, 1989).
- Ramaria** Fr. ex Bonord. (1851) nom. cons., Gomphaceae. c. 220, widespread. See Corner (*Ann. Bot. Mem.* [A monograph of *Clavaria* and allied genera] 1: 542, 1950), Mann & Stuntz (*Ramaria of western Washington*, 1973; keys), Petersen (*Bibliotheca Mycol.* 43, 1975; subgen. *Lentoramaria*), Petersen (*Bibliotheca Mycol.* 79, 1981; subgen. *Echinoramaria*), Humpert *et al.* (*Mycol.* 93: 465, 2001; molecular phylogenetics), Christan & Hahn (*Z. Mykol.* 71: 7, 2005; systematics), Nouhra *et al.* (*Mycorrhiza* 15: 55, 2005; mycorrhizal spp.).
- Ramaria** Holmsk. (1790) nom. rej. = *Clavulinopsis* fide Donk (*Persoonia* 1: 25, 1959).
- Ramariaceae** Corner (1970) = Gomphaceae.
- Ramaricium** J. Erikss. (1954), Gomphaceae. 3, widespread. See Ginns (*Bot. Notiser* 132: 93, 1979), Villegas *et al.* (*Fungal Diversity* 18: 157, 2005; spore characters).
- ramarioid**, with a form similar to that of the basidioma of *Ramaria*.
- Ramariopsis** (Donk) Corner (1950), Clavariaceae. 44, widespread. See Petersen (*Mycol.* 61: 557, 1967; key N. Am. spp.), Pegler & Young (*TBMS* 84: 207, 1985; basidiospore structure), García-Sandoval *et al.* (*Mycotaxon* 82: 323, 2002; Mexico), García-Sandoval *et al.* (*Mycotaxon* 94: 265, 2005; phylogeny).
- Ramasricellites** Kalgutkar & Janson. (2000), Fossil Fungi, anamorphic *Ascomycota*. 1, Tibet. See Kalgutkar & Jansonius (*AASP Contributions Series* 39: 259, 2000).
- Ramboldia** Kantvilas & Elix (1994), Lecanoraceae (L). 9, Australia; Papua New Guinea. See Kantvilas *et al.* (*Lichenologist* 31: 213, 1999), Kantvilas & Elix (*Lichenologist* 39: 135, 2007; key), Kalb *et al.* (*Nova Hedwigia* 86: 23, 2008; phylogeny).
- Ramgea** Brumm. (1992), Thelebolaceae. 1, Netherlands. See Brummelen (*Persoonia* Suppl. 14: 577, 1992), Brummelin (*Persoonia* 16: 425, 1998), Hoog *et al.* (*Stud. Mycol.* 51: 33, 2005).
- Ramicandelaber** Y. Ogawa, S. Hayashi, Degawa & Yaguchi (2001), Kickxellaceae. 2, Japan. See Ogawa *et al.* (*Mycoscience* 42: 193, 2001), Kurihara *et al.* (MR 108: 1143, 2004; n.sp. Japan), Ogawa *et al.* (*Nippon Kingakukai Kaiho* 46: 13, 2005; phylogeny).
- Ramicephala** Voglmayr & Delg.-Rodr. (2003), anamorphic *Pezizomycotina*. 1 (aeroaquatic), Cuba. See Voglmayr & Delgado-Rodríguez (MR 107: 237, 2003).
- Ramichloridium** Stahel ex de Hoog (1977), anamorphic *Mycosphaerellaceae*, Hso.0eP.10. 27, widespread. The genus is polyphyletic. See de Hoog *et al.* (*TBMS* 81: 485, 1983; relationships with *Stenella* and *Veronaea*), Campbell & Al-Hedaithy (*J. Med. Vet. Mycol.* 31: 325, 1993; *R. mackenziei*, phaeohyphomycosis of the brain), Samuels & Candoussau (*Nova Hedwigia* 62: 47, 1996; teleomorph), Untereiner (*Mycol.* 89: 120, 1997; teleomorph), Sutton *et al.* (*J. Clin. Microbiol.* 36: 708, 1998; phaeohyphomycosis), Haase *et al.* (*Stud. Mycol.* 43: 80, 1999; phylogeny), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny), Arzanlou *et al.* (*Stud. Mycol.* 58: 57, 2007; phylogeny, polyphyly).
- Ramicola** Velen. (1929) = *Simocybe* fide Kuyper (*in litt.*).
- ramicolous**, living on branches.
- Ramoconidiifera** B. Sutton, Carmarán & A.I. Romero (1996), anamorphic *Pezizomycotina*, Hso.?.?. 1, Argentina. See Sutton *et al.* (MR 100: 1338, 1996).
- ramoconidium**, an apical branch of a conidiophore which secedes and functions as a conidium, as in

- Cladosporium* and *Subramaniomyces*.
- Ramonia** Stizenb. (1862), ? Gyalectaceae (L). 17, widespread. See Vězda (*Folia geobot. phytotax.* 2: 311, 1967), Coppins (*Lichenologist* 19: 409, 1987; key 4 Br. spp.), Coppins *et al.* (*Graphis Scripta* 6: 89, 1994; Sweden), Lücking *et al.* (*Mycol.* 96: 283, 2004; phylogeny).
- Ramophialophora** M. Caldusch, Stchigel, Gené & Guarro (2004), anamorphic *Sordariales*. 1, Spain. See Caldusch *et al.* (*Stud. Mycol.* 50: 84, 2004).
- Ramosiella** Syd. & P. Syd. (1917) = *Anhellia* fide von Arx (*Persoonia* 2: 421, 1963).
- Ramosphaerella** Laib. (1921) = *Mycosphaerella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Ramsaysphaera** H.D. Pflug (1978), Fossil Fungi, anamorphic *Pezizomycotina*. 1 (c. 3400 million yr old Swartkoppie chert), S. Africa.
- Ramsbottom** (John; 1885-1974; England). Taxonomist (1910-1930) then Keeper of Botany (1930 onwards), British Museum (Natural History). Wrote extensively on many aspects of mycology including taxonomy, nomenclature, and history (q.v.) and did much to popularize the study of fungi. *Publs. Edible Fungi* (1944); *Poisonous Fungi* (1944); *Mushrooms and Toadstools; a Study of the Activities of Fungi* (1953). *Biogs, obits etc.* Gregory (*TBMS* 65: 1, 1975) [portrait]; Grumann (1974: 411); Stafleu & Cowan (*TL*-2 4: 574, 1983).
- Ramsbottomia** W.D. Buckley (1923), *Pyronemataceae*. 3, widespread (boreal; temperate). See Benkert & Schumacher (*Agarica* 6: 28, 1985), Caillet & Moyne (*Bull. Soc. Hist. nat. Doubs* 84: 9, 1991; keys), Kullman & van Brummelen (*Persoonia* 15: 93, 1992), Yao & Spooner (*MR* 99: 1521, 1995; Brit. spp.), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Ramularia** Sacc. (1880) = *Ramularia* Unger fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Ramularia** Unger (1833) nom. cons., anamorphic *Mycosphaerella*, Hso.0eH/≡ eH.3/10. 138 (causing leaf spots), widespread (esp. temperate). *R. vallisumbrosae* (*Narcissus* white mould). See Hughes (*TBMS* 32: 50, 1949), Vimba (*The flora of the genus Ramularia Sacc. in the Latvian SSR*, 1970), Braun (*Int. J. Mycol. Lichenol.* 3: 271, 1988), Deighton (*TBMS* 90: 330, 1988; spp. on *Salix*), Sutton & Waller (*TBMS* 90: 55, 1988; spp. on *Gramineae*), Braun (*Nova Hedwigia* 47: 335, 1989), Braun (*Nova Hedwigia* 53: 291, 1991; related genera), Braun & Sutton (*Taxon* 112: 656, 1991; conservation), Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 1, 1995), Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 2: 11, 1998; monogr., subgen. keys), Crous *et al.* (*Mycol.* 93: 1081, 2001; phylogeny), Goodwin *et al.* (*Phytopathology* 91: 648, 2001; phylogeny), Braun *et al.* (*Australas. Pl. Path.* 34: 509, 2005; checklist, Australia), Havis *et al.* (*FEMS Microbiol. Lett.* 256: 217, 2006; on *Hordeum*).
- Ramulariaceae** Nann. (1934) = *Mycosphaerellaceae*.
- Ramulariites** Babajan & Tasl. (1973), Fossil Fungi. 1 (Tertiary), former USSR.
- Ramulariopsis** Speg. (1910), anamorphic *Mycosphaerella*, Hso.1≡ eH.3. 4, S. America. See Deighton (*TBMS* 59: 185, 1972), Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 2: 313, 1998; key).
- Ramulariospora** Bubák (1914) = *Phacidiella* P. Karst. fide Sutton (*Mycol. Pap.* 141, 1977).
- Ramularisphaerella** Kleb. (1918) = *Mycosphaerella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Ramularites** Pia (1927), Fossil Fungi. 1 (Oligocene), Europe.
- Ramulaspera** Lindr. (1902), anamorphic *Pezizomycotina*, Hso.0eH.?. 2, Europe. See Griffiths (*TBMS* 40: 232, 1957).
- Ramulina** Velen. (1947) [non *Ramulina* Thurm. 1863, fossil ? *Algae*] = *Pseudombrophila* fide Svrček (*Acta Mus. Nat. Prag.* 32B: 115, 1976).
- Ramulispora** Miura (1920), anamorphic *Mycosphaerellaceae*, Cpd.≡ eH.10. 18, widespread (temperate). See also *Oculimacula* and *Helgardia*. See Rawla (*TBMS* 60: 285, 1973), von Arx (*Proc. K. ned. Akad. Wet. Ser. C, Biol. Med. Sci.* 86: 36, 1983; syn. with *Pseudocercospora*), Wallwork & Spooner (*TBMS* 91: 703, 1988; *Tapesia* teleomorph of *P. herpotrichoides*), Creighton (*Pl. Path.* 38: 484, 1989; identification of W-type and R-type isolates of *P. herpotrichoides*), Nicholson *et al.* (*Pl. Path.* 40: 584, 1991; DNA markers for classification of *P. herpotrichoides*), Fitt in Singh *et al.* (Eds) (*Plant Diseases of International importance: diseases of Cereals and Pulses*, 1992), Priestley *et al.* (*Pl. Path.* 41: 591, 1992; comparison of isoenzyme and DNA markers for *P. herpotrichoides*), Thomas *et al.* (*J. Gen. Microbiol.* 138: 2305, 1992; identification of R- and W-types of *P. herpotrichoides* by DNA probes), Frei & Wenzel (*J. Phytopath.* 139: 229, 1993; genomic DNA gene probes), Hocart *et al.* (*MR* 97: 967, 1993; parasexuality), Nicholson & Rezanoor (*MR* 98: 13, 1994; identification of pathotypes of *P. herpotrichoides* by random amplified polymorphic DNA), Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 1, 1995), Robertse *et al.* (*S. Afr. J. Bot.* 61: 43, 1995; spp. causing eyespot of wheat), Stewart *et al.* (*MR* 103: 1491, 1999), Kwasna *et al.* (*MR* 104: 765, 2000; UK), Crous *et al.* (*Mycol.* 93: 1081, 2001; phylogeny), Goodwin *et al.* (*Phytopathology* 91: 648, 2001; phylogeny), Crous *et al.* (*Eur. J. Pl. Path.* 109: 841, 2003; phylogeny, separation of eyespot disease-causing spp.).
- ramus** (1) (pl. -i), a branch (Lat.); (2) (of a penicillus), a cell bearing a verticil of 'metulae' and phialides.
- ramycin**, see fusidic acid.
- rangiferoid**, branched like a reindeer's horn.
- Ranojevicia** Bubák (1910), anamorphic *Pezizomycotina*, Hsp.0eH.?. 1, Europe.
- Rapacea** E. Horak (1999) = *Cortinarius* fide Peintner *et al.* (*Mycotaxon* 83: 447, 2002).
- RAPD**, see Molecular biology.
- Raperia** Subram. & Rajendran (1976) = *Aspergillus* fide Samson (*Stud. Mycol.* 18: 1, 1979), von Arx (*Mycotaxon* 26: 119, 1986; teleom. and affinities with *Onygenaceae*), Pitt *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 9, 2000; synonym).
- Raphanozon** P. Kumm. (1871) nom. rej. ≡ *Telamonina*.
- raphe** (of *Chaetomella*), the longitudinal dehiscence mechanism. See Di Cosmo & Cole (*CJB* 58: 1129, 1980; ultrastr. development).
- raphides**, needle-shaped crystals; as hyphae inside some lichen thalli.
- Raphiospora** A. Massal. (1853) nom. rej. = *Arthrorhaphis* fide Jørgensen & Santesson (*Taxon* 42: 881,

- 1993).
- Rasutoria** M.E. Barr (1987), Euantennariaceae. 4, widespread (tropical). Perhaps better placed in *Mycosphaerellaceae*, but molecular data are inconclusive. See Barr (*Mycotaxon* 29: 501, 1987), Winton *et al.* (*Mycol.* 99: 240, 2007; phylogeny).
- Ratnagiriathyrites** R.K. Saxena & N.K. Misra (1990), Fossil Fungi, Ascomycota. 1. See Saxena & Misra (*Palaeobotanist* 38: 268, 1989).
- Ravenelia** Berk. (1853), Raveneliaceae. c. 200 (on *Leguminosae* esp. *Mimosoideae*, 1 on *Zygophyllaceae*), widespread (tropical to subtropical). *R. esculenta* is edible. See Narasimhan & Thirumalachar (*Phytopath. Z.* 41: 97, 1961; *R. esculenta*) See, Hiremath & Pavgi (*Mycopathologia* 59: 95, 1976; morphology), Cummins (*Rust fungi on legumes and composites in North America*, 1978; key 61 spp.), El-Gazzar (*Symb. Bot. Upsal.* 44: 182, 1979), Mordue (*TBMS* 90: 473, 1988; SEM of III), Hennen & Cummins (*Rep. Tottori Mycol. Inst.* 28: 1, 1990), Berndt (*MR* 101: 23, 1997; haustorial types), Rezende & Dianese (*Fitopatol. Brasil* 26: 627, 2001; Brazilian cerrado), Hernández & Hennen (*MR* 106: 954, 2002; Argentina), Wood (*South African Journal of Botany* 72: 534, 2006; southern African).
- Raveneliaceae** Leppik (1972), Pucciniales. 26 gen. (+ 14 syn.), c. 323 spp.
Lit.: Savile (*CJB* 67: 2983, 1989), Reenen & Merwe (*Phytophylactica* 24: 127, 1992), Berndt (*MR* 101: 23, 1997), Hennen *et al.* (*Mycol.* 90: 1079, 1998), Gjerum *et al.* (*Lidia* 5: 91, 2000), Hennen (*Mycol.* 92: 315, 2000), Hernández & Hennen (*MR* 106: 954, 2002), Ono (*Mycoscience* 43: 421, 2002), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003), Aime (*Mycoscience* 47: 112, 2006).
- Ravenelites** Ramanujam & Ramachar (1980), Fossil Fungi, Raveneliaceae. 1. See Ramanujam & Ramachar (*Records of the Geological Survey of India* 113: 83, 1980).
- Ravenelula** Speg. (1881), ? Lecanorales. 1 or 2, America.
- ray fungi**, members of the *Actinomycetes* (Bacteria), q.v.
- razor-strop fungus**, basidioma of *Piptoporus betulinus*.
- RDA**, see Media.
- Readeriella** Syd. (1908), anamorphic *Teratosphaeriaceae*, Cpd.0eP.19. 1, widespread. See Macauley & Thrower (*TBMS* 48: 105, 1965), Crous *et al.* (*Stud. Mycol.* 50: 195, 2004; phylogeny), Decock (*Cryptog. Mycol.* 26: 143, 2005; French Guiana), Crous *et al.* (*Stud. Mycol.* 55: 99, 2006; phylogeny), Hunter *et al.* (*Stud. Mycol.* 55: 147, 2006; phylogeny), Crous *et al.* (*Stud. Mycol.* 58: 1, 2007; phylogeny).
- Rebentischia** P. Karst. (1869), Tubeufiaceae. 3, Europe; N. America. See Barr (*Mycotaxon* 12: 137, 1980; key), Crane *et al.* (*CJB* 76: 602, 1998), Kodsueb *et al.* (*Fungal Diversity* 21: 105, 2006).
- receptacle**, an axis having one or more organs, as the stem in *Phallales*; any hymenium-supporting structure.
- receptive body**, a small branched or unbranched process from the stroma (as in *Stromatinia gladioli*) able to be 'spermatized' by microconidia (see Drayton, *Mycol.* 26: 46, 1934); **receptive hypha** = flexuous hypha, trichogyne, and possibly other like structures.
- Rechingeria** Servít (1931) ? = *Lichinella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Rechingeriella** Petr. (1940), ? Zopfiaceae. 2, Europe; Asia. See Hawksworth (*CJB* 57: 91, 1979).
- Recifea** Bat. & Cif. (1962) = *Microcallis* fide von Arx (*in litt.*).
- recognition** (of mutualistic symbionts), the process by which two compatible potential symbionts initiate the relationship.
- Reconditella** Matzer & Hafellner (1990), Sordariales. 1 (on lichens, esp. *Physconia*), Europe. See Matzer & Hafellner (*Biblthca Lichenol.* 37: 46, 1990).
- Record fungi**. *Heaviest fruit body*, *Laetiporus sulphureus*, 45.4 kg, New Forest, Hants, UK (found 1990); *heaviest mycelium*, *Armillaria bulbosus*, 100+ tonnes, Michigan, USA, reported April 1992 (see Longevity); *highest spore count*, 161,037 fungus spores per m³, Cardiff 1971; *largest area occupied*, *Armillaria ostoyae* occupying 600 ha in Washington State, USA; *largest edible*, *Langermannia gigantea*, circumference 2.64 m, 22 kg, from Canada, 1987; *largest fruit body*, *Rigidoporus ulmarius*, 163 cm long × 140 cm wide × 50 cm tall, circumference 4.8 m, in the grounds of the former IMI (q.v.), Kew, Surrey, UK (measurements in Feb. 1995 when still growing; unweighed); *most poisonous*, *Amanita phalloides*, 5-7 mg amanitoxins lethal; *oldest spores* (see Longevity); *oldest thallus*, *Rhizocarpon geographicum* (see Longevity); *tallest* (see Fossil fungi). See Glenday (Ed.) (*Guinness world records*, 2008), also acidophily, alkilophily, Longevity, spore discharge, thermophily, water activity.
- Recticharella** D. Scheer (1944) = *Asellaria* fide Scheer (*Arch. Protistenk.* 114: 343, 1972).
- Rectipilus** Agerer (1973), Marasmiaceae. 9, widespread. See Wei & Dai (*Mycosystema* 23: 437, 2004; China).
- Rectispora** J.I.R. Larsson (1990), Microsporidia. 1. See Larsson (*Eur. J. Protist.* 26: 55, 1990).
- recurved** (of a pileus), convexo-expanded (q.v.).
- Red List**, see Conservation.
- red rice**, see ang-kak; - **bread mould**, see *Chrysonilia*; - **rust**, (1) urediniospore state of rusts, especially of cereals; (2) (of tea), the alga *Cephaleuros*; - **truffle**, *Melanogaster variegatus*.
- Redaellia** Cif. (1930) = *Aspergillus* fide Alecrim (*Ann. Fac. Med. Univ. Recife* 18: 81, 1958).
- Redbia** Deighton & Piroz. (1972), anamorphic *Pezizomycotina*, Hso.≡ eH.10. 2 (on *Puccinia*), widespread (tropical). See Deighton & Pirozynski (*Mycol. Pap.* 128: 83, 1972).
- Reddellomyces** Trappe, Castellano & Malajczuk (1992), Tuberaceae. 4, Australasia; Mediterranean. See Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Redheadia** Y. Suto & Suyama (2005), Sclerotiniaceae. Anamorph *Mycopappus*. 1, Japan. See Suto & Suyama (*Mycoscience* 46: 228, 2005).
- Redingeria** A. Frisch (2006), Thelotremataceae (L). 5, pantropical. See Frisch (*Biblthca Lichenol.* 92: 402, 2006).
- Redonia** C.W. Dodge (1973), ? Physciaceae (L). 1, S. America. See Dodge (*Lich. Fl. Antarct. Cont.*: 353, 1973).
- Reduviasporonites** L.R. Wilson (1962), Fossil Fungi. 1 (Permian), USA.
- Reference collections**. For fungi, reference collections are essential to secure the application of scientific

names (see Nomenclature), to serve as vouchers supporting the occurrence of species or material used in research, and as the raw materials for new systematic and other investigations. As for animals and plants, fungal reference collections are also, no less than art galleries and great libraries, an irreplaceable part of the cultural heritage of each country, although this is rarely recognized. Reference collections of fungi are of two main types: (1) Genetic resource collections (q.v.; culture collections) hold material in a living or metabolically inactive state from which they can be resuscitated; and (2) Reference collections of non-living material, including dried specimens attached to plant, rock or other substrata, dried cultures, microscope slides, colour transparencies, drawings and paintings, and ultrastructural mounts. Collections of dried fungal material have often been referred to inappropriately as herbaria (q.v.), but as fungi are not plants, and not always kept with plants, the more general term is preferable, particularly where living and dried material are stored by the same institution.

An immense amount of information related to knowledge of the distribution and ecology of fungi is stored in the world's mycological collections; this is increasingly being captured in computerized databases so that it can be made more accessible, and a substantial but still small proportion of that information is already available on-line (see Internet).

Most institutional collections have unique acronyms (generally retained unchanged despite name changes of the institutions), a selection of which are included in this edn of the *Dictionary* (e.g. **BPI**, **DAOM**, **IMI**, **K**, **L**, **LE**, **UPS**); collections of living cultures are given acronyms by the World Data Center for Microorganisms (see Genetic resource collections) - where possible the same acronym is used under both systems, and compatibility is maintained with acronyms used for plant reference collections. Acronyms are commonly associated with collection accession numbers in mycological publications to make it clear what material was employed.

Lit.: General (see also Internet: Fungal reference collections): Hall & Minter (*International mycological directory*, edn 3, 1994), Hawksworth (*Mycologist's handbook*, 1974), Laundon (*Lichenologist* 11: 1, 1974).

Regional: Australia, Walker (*Mycological herbaria and culture collections in Australia*, 1980); **British Isles**, Hawksworth & Seaward (*Lichenology in the British Isles 1568-1975*, 1977), Kent & Allen (*British and Irish herbaria*, 1984); **Germany**, Scholz (*Boletus* 12(2): 33, 1989; lichens); **Israel**, Ferber (*Israel national collections of natural history*, 1985); **Italy**, Ciferri (*Taxon* 1: 126, 1952), Tretiach & Pasadore (*Notiz. Soc. Lich. Ital.* 3 (Suppl.), 1990); **New Zealand**, Wright (*N.Z. Jl Bot.* 22: 323, 1984); **former USSR**, Parmasto (*Taxon* 34: 359, 1985); **Other useful works**: Bartz *et al.* (*Museums of the world*, edn 4, 1992), Bridson & Forman (*The herbarium handbook*, edn 2, 1992), Fosberg & Sachet (*Manual for tropical herbaria* [Regnum. veg. 39], 1965), Holmgren *et al.* (*Index herbariorum. Part 1. Herbaria of the world*, edn 8 [Regnum veg. 120], 1990), Pinniger (*Biodet. Abstr.* 5: 125, 1991; insect control in), Stafleu & Cowan (*TL-2*, 7 vols. [+ 3 suppl.], 1976-).

See also Collection and preservation, Genetic resource collections, herbarium beetle.

reflexed (of an edge), turned up or back (Fig. 19G).

Refractohilum D. Hawksw. (1977), anamorphic *Pezizomycotina*, Hso.0eH/≡ eH.19. 6 (on lichens), widespread (temperate). See Hawksworth (*J. Linn. Soc. Bot.* 75: 204, 1977), Castañeda Ruiz *et al.* (*Mycotaxon* 68: 23, 1998).

Regiocrella P. Chaverri & K.T. Hodge (2006), Clavicipitaceae. 2, Cameroon; China. See Chaverri & Hodge (*Mycol.* 97: 1232, 2005).

Rehm (Heinrich; 1828-1916; Germany). Student, Erlangen, München, Heidelberg; Dr med. (1852); medical studies, Prague then Vienna (1853-1854); physician (1854-1898). In his time, the foremost expert on ascomycetes, particularly discomycetes, particularly from central Europe, but also from North America, the Philippines and South America. Most specimens in the fungal reference collection in Stockholm (S). *Publs. Ascomyceten: Hysteriaceen und Discomyceten. Rabenhorst's Kryptogamen-Flora von Deutschland, Oesterreich und der Schweiz* (1896). *Biogs, obits etc.* Anon. (*Österreichische Botanische Zeitschrift* 66: 212, 1916); Grumann (1974: 39); Stafleu & Cowan (*TL-2* 4: 652, 1983).

Rehmia Kremp. (1861) = *Rhizocarpon* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Rehmiella G. Winter (1883) = *Gnomonia* fide Barr (*Mycol. Mem.* 7: 232 pp., 1978).

Rehmiellopsis Bubák & Kabát (1910) = *Delphinella* fide Barr (*Contr. Univ. Mich. Herb.* 9, 1972).

Rehmiodothis Theiss. & Syd. (1914), Phyllachoraceae. 7 (on living leaves of *Melastomataceae*), Asia. Possibly belongs rather to the Dothideomycetes. See Katumoto (*TMSJ* 32: 37, 1991), Pearce & Hyde (*Fungal Diversity Res. Ser.* 17: 308 pp., 2006; Australia).

Rehmiomycella E. Müll. (1962), Dothideomycetes. 1, Brazil. See Müller (*Beitr. Kryptfl. Schweiz* 11 no. 2: 601, 1962).

Rehmiomyces (Sacc. & P. Syd.) Syd. (1904) ≡ *Rehmiomycella*.

Rehmiomyces Henn. (1904) = *Dictyonina* fide Clements & Shear (*Gen. Fung.*, 1931).

Reichlingia Diederich & Scheid. (1996), anamorphic *Pezizomycotina*, Hso.???. 1 (lichenicolous), Germany. See Diederich & Scheidegger (*Bull. Soc. Nat. luxemb.* 97: 4, 1996).

Reimnitzia Kalb (2001), Thelotimataceae (L). 1, widespread. See Kalb (*Mycotaxon* 79: 325, 2001), Frisch (*Biblthca Lichenol.* 92: 3, 2006).

reindeer lichen (-moss), mainly *Cladonia stellaris* and *C. rangiferina*, species grazed by reindeer and caribou. Partially digested thalli from stomach contents of freshly-killed reindeer are highly nutritious, rich in vitamins A and B, and considered a delicacy by some native peoples. Affected by radiation pollution, particularly from Chernobyl, leading to food-chain concerns (Skuterud *et al.*, *J. Env. Radioactivity* 83: 231, 2005).

Reinkella Darb. (1897) = *Roccella* fide Choisy (*Bull. Soc. bot. Fr.* 104: 333, 1957), Tehler (*CJB* 68: 2458, 1990; cladistics), Follmann (*Biblthca Lichenol.* 67: 14, 1997), Tehler *et al.* (*Symb. bot. upsal.* 32 no. 1: 255, 1997; on *Roccella*), Myllys *et al.* (*Bryologist* 101: 70, 1998; phylogeny).

Reinkellomyces Cif. & Tomas. (1953) ≡ *Reinkella*.

Reisneria Velen. (1922) = *Gloeophyllum* fide Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974).

Relhanum Gray (1821) ≡ *Verpa*.

- Relicina** (Hale & Kurok.) Hale (1974), Parmeliaceae (L). 48, widespread. See Hale (*Smithson. Contr. bot.* 26, 1975; monogr.), Elix (*Biblthca Lichenol.* 62, 1996; revision), Elix (*Mycotaxon* 69: 129, 1998; key), Noicharoen *et al.* (*Mycotaxon* 85: 325, 2003; Thailand), Blanco *et al.* (*Mol. Phylogen. Evol.* 39: 52, 2006; phylogeny), Divakar *et al.* (*Mol. Phylogen. Evol.* 40: 448, 2006; phylogeny).
- Relicinopsis** Elix & Verdon (1986), Parmeliaceae (L). 5, S. Africa; Australasia. See Elix & Verdon (*Mycotaxon* 27: 281, 1986), Divakar & Upreti (*Parmelioid Lichens in India* (A Revisionary Study), 2005).
- religion** (use of mushrooms in), see entheogen, ethnomycology, hallucinogenic fungi, soma.
- Remersonia** Samson & Seifert (1997), anamorphic *Pezizomycotina*, Hso.??, 1, Europe. See Seifert *et al.* (*CJB* 75: 1160, 1997).
- Remispora** Linder (1944), Halosphaeriaceae. 6 (marine), widespread. See Johnson *et al.* (*Bot. Mar.* 27: 557, 1984), Manimohan *et al.* (*MR* 97: 1190, 1993).
- Remleria** Raitv. (2004), Hyaloscyphaceae. 1, widespread. See Raitviir (*Scripta Mycologica Tartu* 20: 109, 2004).
- remote** (of lamellae), proximal end free and at some distance from the stipe.
- Renatobasidium** Hauerslev (1993), Auriculariales. 1, Europe. See Hauerslev (*Mycotaxon* 49: 228, 1993).
- reniform**, kidney-like in form; fabiform (Fig. 23.7).
- Reniforma** Pore & Sorenson (1990), anamorphic *Microbotryales*. 1 (basidiomycetous yeast), USA. See Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 1351, 2000; mol. phylogeny), Scorzetti *et al.* (*FEMS Yeast Research* 2: 495, 2002; phylogeny), Aime *et al.* (*Mycol.* 98: 896, 2006; phylogeny).
- Renispora** Sigler & J.W. Carmich. (1979), Onygenaceae. Anamorph *Chrysosporium*. 1, USA. See Sugiyama *et al.* (*Mycoscience* 40: 251, 1999; DNA), Sugiyama & Mikawa (*Mycoscience* 42: 413, 2001; phylogeny).
- repand** (of a pileus), having a waved edge which is turned back.
- repeating spore**, a spore which gives rise to the same type of mycelium as that on which it developed.
- repetition** (spore germination by), producing a new spore like the first.
- Repetobasidiaceae** Jülich (1982) = Hydnaceae.
- Repetobasidiellum** J. Erikss. & Hjortstam (1981), Hydnaceae. 1, widespread (northern Europe). See Pegler & Roberts (*Mycologist* 14: 52, 2000; UK).
- Repetobasidiopsis** Dhingra & Avneet P. Singh (2006), Polyporales. 1, India. See Dhingra & Singh (*Mycotaxon* 97: 116, 2006).
- Repetobasidium** J. Erikss. (1958), Agaricomycetes. 11, widespread. *Hymenochaetales* or *Agaricales* (*Rickenella* clade). See Eriksson (*Symb. bot. upsal.* 16 no. 1: 67, 1958).
- Repetophragma** Subram. (1992), anamorphic *Dothideomycetes*, Hso.≡ eP.19. 11, widespread. See Subramanian (*Proc. Indian natn Sci. Acad. Part B. Biol. Sci.* 58: 185, 1992), Shenoy *et al.* (*MR* 110: 916, 2006; phylogeny).
- reproductocentric** (of *Chytridiales*), having development of one (mono-, monogenocentric) or more reproductive structures at the centre of gravity of the thallus; genocentric. See Karling (*Am. J. Bot.* 19: 54, 1932). Cf. mono- and polycentric.
- Requienella** Fabre (1883), Requienellaceae ($\pm$ L). 3, widespread (north temperate). See Boise (*Mycol.* 78: 37, 1986), Aptroot (*Biblthca Lichenol.* 44, 1991; monogr.).
- Requienellaceae** Boise (1986), Pyrenulales. 7 gen. (+ 2 syn.), 21 spp.
Lit.: Boise (*Mycol.* 78: 37, 1986), Harris (*Mem. N. Y. bot. Gdn* 49: 74, 1989), Aptroot (*Biblthca Lichenol.* 44, 1991), Alias *et al.* (*MR* 100: 580, 1996), Poonyth *et al.* (*Fungal Diversity* 4: 101, 2000).
- Resendea** Bat. (1961), ? Microthyriaceae. 2, S. America. See Batista (*Botéria Sér. Ci. Nat.* 30: 87, 1961).
- Resinicium** Parmasto (1968), Agaricomycetes. 5, widespread. *Hymenochaetales* or *Agaricales* (*Rickenella* clade). See Parmasto (*Consp. System. Corticiac.*: 97, 1968).
- Resinomycena** Redhead & Singer (1981), Mycenaceae. 8, N. America. See Redhead & Singer (*Mycotaxon* 13: 151, 1981), Antonín & Noordeloos (*A monograph of the genera Hemimycena*, □, 2004).
- Resiomeria** J.I.R. Larsson (1986), Microsporidia. 1. See Larsson (*Protistologica* 22: 379, 1986).
- resistance**, the power of an organism to overcome, completely or in some degree, the effect of a pathogen or other damaging factor. **acquired** -, a non-inherited resistance response in a normally susceptible host following a predisposing treatment. See immunity, axeny.
- resistant sporangium**, see meiosporangium.
- resting sporangium**, see meiosporangium.
- resting spore** (1) a spore germinating after a resting period (frequently after overwintering), as does an oospore or a teliospore; a 'winter spore'; (2) an encysted zygote formed after the fusion of gametes, meiosis occurring on germination to produce planospores which encyst to produce gametes (*Blastocladales*).
- Restiosporium** Vánky (2000), Websdaneaceae. 21 (in seeds of *Restionaceae*), Australia. See Vánky (*Mycotaxon* 74: 343, 2000), Vánky & McKenzie (*Fungal Diversity Res. Ser.* 8: 259 pp., 2002; New Zealand), Vánky & Shivas (*Fungal Diversity* 14, 2003; Australia), Vánky (*Mycol. Balcanica* 3: 19, 2006; key).
- Resupinataceae** Jülich (1982) nom. rej. = Tricholomataceae.
- resupinate** (of basidiomata), flat on the substrate with the hymenium on the outer side.
- Resupinatus** Nees ex Gray (1821) nom. rej., Tricholomataceae. c. 20, widespread. See Thorn *et al.* (*Mycol.* 92: 241, 2000; phylogeny), Thorn *et al.* (*Mycol.* 97: 1140, 2005; Puerto Rico).
- retention** (of surfaces), the ability of a surface to hold a fungicide or other crop protectant. Cf. adherence.
- Retiarius** D.L. Olivier (1978), anamorphic *Pezizomycotina*, Hso.1bH.10. 2 (on pollen), S. Africa. See Olivier (*TBMS* 71: 193, 1978).
- Retiboletus** Manfr. Binder & Bresinsky (2002), Boletaceae. 5, north temperate. See Binder & Bresinsky (*Feddes Repert.* 113: 36, 2002).
- Reticellites** D.L.E. Glass, D.D. Br. & Elsik (1987), Fossil Fungi. 1 (upper Eocene), USA. See Ethridge Glass *et al.* (*Pollen Spores* 28: 414, 1986).
- Reticularia** Baumg. (1790) = *Lobaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- reticulate**, like a net; netted (Fig. 20.12).
- Reticulatisporonites** Elsik (1968), Fossil Fungi. 1 (Paleocene), USA.
- Reticulocephalis** Benny, R.K. Benj. & P.M. Kirk (1992), Sigmoideomycetaceae. 2, USA; British Isles.

- See Benny *et al.* (*Mycol.* **84**: 635, 1992; key).
- Reticulosphaeria** Sivan. & Bahekar (1982), ? Xylariales. 1 (from wood), India. See Sivanesan & Bahekar (*TBMS* **78**: 547, 1982), Kang *et al.* (*MR* **103**: 1621, 1999).
- Reticulospidium** Thor (1930) nom. dub., ? Fungi.
- Retidiporites** C.P. Varma & Rawat (1963), Fossil Fungi ? Fungi. 1 (Eocene), India.
- Retigerus** Raddi (1829) = *Phallus* fide Stalpers (*in litt.*).
- Retihelicosporonites** Ramanujam & Rao (1979), Fossil Fungi, anamorphic *Pezizomycotina*. 1 (Miocene), India. ? Fossil *Hiospira*.
- Retinocyclus** Fuckel (1871) = *Tromera* A. Massal. ex Körb.
- Retocybe** Velen. (1947) = *Delicatula* fide Kuyper (*in litt.*).
- retraction septum**, see septum (adventitious).
- Retroa** P.F. Cannon (1991), Phyllachoraceae. 2 (on living legume leaves), S. America. See Cannon (*Mycol. Pap.* **163**, 1991).
- Retroconis** de Hoog & Bat. Vegte (1989), anamorphic *Pezizomycotina*, Hso.0eP.3. 1, old world. See de Hoog & Batenburg-van der Vegte (*Stud. Mycol.* **31**: 99, 1989).
- retroculture**, a reisolate of a pathogen from a host into which it had been experimentally introduced.
- retroneme**, a bipartite tubular hair.
- retorse**, backward.
- Retrostium** Nakagiri & Tad. Ito (1997), ? Spathulosporeae. 1 (on marine red algae), Japan. See Nakagiri & Ito (*Mycol.* **89**: 484, 1997).
- revalidated**, see devalidated.
- revolute**, having the edge rolled back or up (Fig. 19H).
- Reyesiella** Sacc. (1917) = *Anthomycetella*.
- Reymanella** Marcink. (1979), Fossil Fungi. 1 (Jurassic), Poland.
- RFLP**, see Molecular biology.
- Rhabdium** P.A. Dang. (1903) [non *Rhabdium* Wallr. 1833, *Algae*] = *Harpochytrium* fide Atkinson (*Ann. mycol.* **1**: 479, 1903).
- Rhabdoclema** Syd. (1939), anamorphic *Pezizomycotina*, Cpd.0eH.?. 2, S. America.
- Rhabdocline** Syd. (1922), Hemiphacidiaceae. Anamorphs *Meria*, *Rhabdogloeum*. 3, widespread (north temperate). *R. pseudotsugae* (needle cast of *Pseudotsuga menziesii*). See Parker & Reid (*CJB* **47**: 1533, 1969; infraspecific taxa), Sherwood-Pike *et al.* (*CJB* **64**: 1849, 1986), Stone (*CJB* **65**: 2614, 1987; devel.), Gernandt *et al.* (*Mycol.* **89**: 735, 1997; DNA), Gernandt *et al.* (*Mycol.* **93**: 915, 2001; phylogeny), Stone & Gernandt (*Mycotaxon* **91**: 115, 2005; revision), Wang *et al.* (*Mycol.* **98**: 1065, 2006; phylogeny).
- Rhabdodiscus** Vain. (1921) = *Ocellularia* fide Hale (*Bull. Br. Mus. nat. hist. Bot.* **8**: 227, 1981).
- Rhabdogloeopsis** Petr. (1925), anamorphic *Pezizomycotina*, Cac.0eH.10. 1, USA.
- Rhabdogloeum** Syd. (1922), anamorphic *Rhabdocline*, Cac.0eH.15. 3, N. America. See Stone & Gernandt (*Mycotaxon* **91**: 115, 2005).
- Rhabdomyces** Balbiani (1889), anamorphic *Pezizomycotina*, Hso.?.?. 1, France.
- Rhabdopsora** Müll. Arg. (1888), Verrucariaceae (L). 1, Brazil. See Hawksworth (*SA* **9**: 24, 1991).
- Rhabdopsoromyces** Cif. & Tomas. (1953) = *Rhabdopsora*.
- Rhabdospora** (Durieu & Mont. ex Sacc.) Sacc. (1884) nom. cons., anamorphic *Mycosphaerellaceae*, Cpd.= fH.?. 151, widespread. See Verkley & Priest (*Stud. Mycol.* **45**: 123, 2000; status).
- Rhabdosporium**, see *Rabdosporium*.
- Rhabdostroma** Syd. & P. Syd. (1916) = *Apiospora* fide Barr (*Mycol.* **68**, 1976).
- Rhabdostromella** Höhn. (1915), anamorphic *Pezizomycotina*, St.0eH.?. 1, Europe.
- Rhabdostromellina** Höhn. (1917) = *Coleophoma* fide Sutton (*Mycol. Pap.* **141**, 1977).
- Rhabdostromina** Died. (1921) = *Coleophoma* fide Petrak (*Annls mycol.* **27**: 324, 1929).
- Rhabdothyrella** Höhn. (1917) = *Leptothyrium* fide Clements & Shear (*Gen. Fung.*, 1931).
- Rhabdothyrium** Höhn. (1915) = *Leptothyrium* fide Clements & Shear (*Gen. Fung.*, 1931).
- Rhachomyces** Thaxt. (1895), Laboulbeniaceae. c. 71, widespread. See Balazuc (*Annls Soc. ent. Fr.* N.S. **6**: 677, 1970), Tavares (*Mycol. Mem.* **9**: 627 pp., 1985), Santamaría (*Nova Hedwigia* **68**: 351, 1999; Spain), Hughes *et al.* (*Mycol.* **96**: 1355, 2004; New Zealand), Rossi (*Nova Hedwigia* **83**: 129, 2006; on cave beetles), Santamaría & Faille (*Nova Hedwigia* **85**: 159, 2007; Pyrenees).
- Rhacodiella** Peyronel (1919) = *Myrioconium* Syd. fide Kendrick & Carmichael *in* Ainsworth *et al.* (Eds) (*The Fungi* **4A**: 390, 1973).
- Rhacodiopsis** Donk (1975) = *Racodium* Fr.
- Rhacodium**, see *Racodium* Fr.
- Rhacophyllus** Berk. & Broome (1871), anamorphic *Coprinus*. 1, Asia; Africa. See Petch (*TBMS* **11**: 238, 1926), Redhead *et al.* (*Taxon* **49**: 789, 2000; anamorphic of *Coprinopsis clastophyllus*).
- Rhadinomyces** Thaxt. (1893) ? = *Corethromyces* fide Tavares (*Mycol. Mem.* **9**: 627 pp., 1985).
- rhagadiose**, having deep cracks.
- Rhagadolobium** Henn. & Lindau (1896), Parmulariaceae. 10 (on *Pteridophyta*), widespread (esp. tropical). See Dingley (*N.Z. Jl Bot.* **10**: 74, 1972; NZ), Swart (*TBMS* **91**: 581, 1988; on *Dicksonia*).
- Rhagadostoma** Körb. (1865), Nitschkiaceae. 6 (lichenicolous), Europe. See Hawksworth (*TBMS* **74**: 363, 1980), Navarro-Rosinés & Hladun (*Bull. Soc. linn. Provence* **45**: 431, 1994), Navarro-Rosinés *et al.* (*Bull. Soc. linn. Provence* **50**: 233, 1999).
- Rhagadostomella** Etayo (2002), Nitschkiaceae. 1 (lichenicolous), Colombia. See Etayo (*Bibliotheca Lichenol.* **84**: 109, 2002).
- Rhagidiasporidium** Thor (1930) nom. dub., ? Fungi.
- Rhamphoria** Niessl (1876), ? Annulatasceae. Anamorph *Phaeoisaria*-like. 9 (from wood), widespread (esp. temperate). See Sivanesan (*TBMS* **67**: 469, 1976), Réblová & Winka (*Mycol.* **93**: 478, 2001; DNA), Campbell & Shearer (*Mycol.* **96**: 822, 2004; phylogeny), Réblová (*Mycol.* **98**: 68, 2006).
- Rhamphosphaeria** Kirschst. (1936), *Pezizomycotina*. 1, Europe.
- Rhamphospora** D.D. Cunn. (1888), Rhamphosporaceae. 1 (on leaf of *Nymphaeaceae*), widespread. See Reid (*TBMS* **52**: 25, 1969), Vánky (*Illustrated genera of smut fungi*, 1987).
- Rhamphosporaceae** R. Bauer & Oberw. (1997), Doasansiales. 1 gen., 1 spp.
Lit.: Vánky (*Cryptog. Stud.* **1**: 159 pp., 1987), Bauer *et al.* (*CJB* **75**: 1273, 1997), Begerow *et al.* (*CJB* **75**: 2045, 1998), Begerow *et al.* (*MR* **106**: 1392, 2002), Begerow *et al.* (*Mycol. Progr.* **1**: 187, 2002).

- Rhaphidicyrtis** Vain. (1921), Pyrenulales (L). 1, widespread (temperate). See Aguirre-Hudson (*Bull. Br. Mus. nat. hist. Bot.* 21: 85, 1991).
- Rhaphidophora** Ces. & De Not. (1863) [non *Rhaphidophora* Hassk. 1842, *Araceae*] = *Gaeumannomyces* fide Walker (*Mycotaxon* 11: 1, 1980).
- Rhaphidospora** Fr. (1849) [non *Rhaphidospora* Nees 1832, *Acanthaceae*] = *Rhaphidophora*.
- Rheophila** Cépède & F. Picard (1907) = *Peyritsiella* fide Cépède & Picard (*Bull. Sci. Fr. Belg.* 42: 251, 1908).
- Rheumatopeltis** F. Stevens (1927) = *Trabutia* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Rhexoacrodictys** W.A. Baker & Morgan-Jones (2002), anamorphic *Pezizomycotina*, H??.?. 4, widespread. See Baker *et al.* (*Mycotaxon* 82: 98, 2002), Baker & Morgan-Jones (*Mycotaxon* 85: 371, 2003).
- Rhexoampullifera** P.M. Kirk (1982), anamorphic *Pezizomycotina*, Hso. = eP.40. 1, British Isles; Brazil. See Kirk (*TBMS* 78: 299, 1982), Castañeda *et al.* (*Mycol.* 93: 168, 2001).
- Rhexocercosporidium** U. Braun (1994), anamorphic *Helotiales*, Hso. = eP.11. 1, Europe; Canada. See Braun (*Monogr. Cercospora*, *Ramularia Allied Genera (Phytopath. Hyphom.)* 1, 1995), Reeleder *et al.* (*Phytopathology* 96: 1243, 2006; on ginseng), Reeleder (*Mycol.* 99: 91, 2007; on ginseng).
- Rhexodenticula** W.A. Baker & Morgan-Jones (2001), anamorphic *Pezizomycotina*. 2, Cuba; S. Africa. See Baker *et al.* (*Mycotaxon* 79: 363, 2001), Mel'nik *et al.* (*Mycol. Progr.* 3: 19, 2004; S Africa).
- Rhexographium** M. Morelet (1995) = *Graphium* fide Morelet (*Annales de la Société des Sciences Naturelles et d'Archéologie de Toulon et du Var* 47: 90, 1995), Jacobs *et al.* (*Mycol.* 95: 714, 2003).
- rhexolytic**, secession of conidia involving the circumscissile splitting of the periclinal wall of the cell below the basal conidial septum (Cole & Samson, *Patterns of development in conidial fungi*, 1979) rather than the septum itself; fracture. Cf. schizolytic.
- Rhexophiale** Th. Fr. (1860) = *Sagiolechia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Henssen (*Bibliotheca Lichenol.* 58: 123, 1995).
- Rhexoprolifer** Matsush. (1996), anamorphic *Pezizomycotina*, Hso.?.?. 1, Transvaal. See Matsushima (*Matsush. Mycol. Mem.* 9: 24, 1996).
- Rhexosporium** Udagawa & Furuya (1977), *Sordariales*. 1, Japan. See Udagawa & Furuya (*TMSJ* 18: 302, 1977).
- Rhexothecium** Samson & Mouch. (1975), *Eremomycetaceae*. Anamorph *Trichosporiella*-like. 1, Egypt; Kenya. See Malloch & Sigler (*CJB* 66: 1929, 1988).
- Rhinocephalum** Kamyschko (1961) = *Arthrimum* fide Kendrick & Carmichael in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 390, 1973).
- Rhinocladella** Kamyschko (1960) [non *Rhinocladella* Nannf. 1934] = *Chrysosporium* fide Kendrick & Carmichael in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 390, 1973).
- Rhinocladella** Nannf. (1934), anamorphic *Capronia*, Hso.0eH.10. 10, widespread. See cellar fungus. See de Hoog (*Stud. Mycol.* 15, 1977), Onofri & Castagnola (*Mycotaxon* 18: 337, 1983; gen. synonymy), Iwatsu *et al.* (*Mycotaxon* 28: 199, 1987; conidiogenesis), Untereiner (*Mycol.* 89: 120, 1997; teleomorph), Haase *et al.* (*Stud. Mycol.* 43: 80, 1999; phylogeny), Untereiner & Naveau (*Mycol.* 91: 67, 1999; phylogeny), Hoog *et al.* (*J. Clin. Microbiol.* 41: 4767, 2003), Tribe *et al.* (*Mycologist* 20: 171, 2006).
- Rhinocladopsis** Kamyschko (1961) = *Chrysosporium* fide Carmichael (*in litt.*).
- Rhinocladium** Sacc. & Marchal (1885), anamorphic *Pezizomycotina*, Hso.0eP.1. 9, widespread. See Mercado Sierra & Castañeda Ruiz (*Acta Bot. Cubana* 50: 1, 1987; Cuba), Furlanetto & Dianese (*MR* 100: 244, 1996; Brazil), Mercado Sierra *et al.* (*Mycotaxon* 63: 155, 1997; Mexico).
- Rhinodinomyces** E.A. Thomas ex Cif. & Tomas. (1953) = *Rinodina* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- rhinosporidiosis**, polypoid growths in the nose and other organs of humans, horse, etc., caused by *Rhinosporidium seeberi* [formerly classified among the fungi, now considered to be a protozoan].
- Rhinotrichella** G. Arnaud ex de Hoog (1977), anamorphic *Pezizomycotina*, Hso.0eP.10. 2, Japan. See Matsushima & Matsushima (*Matsush. Mycol. Mem.* 8: 45, 1995), Crous *et al.* (*S. Afr. J. Bot.* 62: 89, 1996).
- Rhinotrichum** Corda (1837) nom. dub., anamorphic *Pezizomycotina*. See Carmichael *et al.* (*Genera of Hyphomycetes*, 1980).
- Rhipidiomyces** Thaxt. (1926), *Laboulbeniaceae*. 1, S. America. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- Rhipidium** Wallr. (1833) nom. rej. = *Schizophyllum*.
- Rhipidocarpon** (Theiss.) Theiss. & Syd. (1915), *Parmulariaceae*. 1, Java; Philippines.
- Rhipidocephalum** Trail (1888), anamorphic *Pezizomycotina*, Hso.0eH.?. 1, British Isles.
- Rhipidonema** Mattir. (1881) = *Dictyonema* C. Agardh ex Kunth fide Parmasto (*Nova Hedwigia* 29: 99, 1978).
- Rhipidonematomyces** Cif. & Tomas. (1954) = *Rhipidonema*.
- Rhizidiaceae** J. Schröt. (1886) = *Chytridiaceae*.
- Rhizidiocystis** Sideris (1929), ? *Chytridiales*. 1, Hawaii.
- Rhizidiopsis** Sparrow (1933) = *Podochytrium* fide Sparrow (*Aquatic Phycomycetes* Edn 2: 1187 pp., 1960).
- Rhizidium** A. Braun (1856), *Chytridiaceae*. c. 17, widespread. See Sparrow (*Aquatic Phycomycetes* Edn 2: 1187 pp., 1960; key).
- Rhizina** Fr. (1815), *Rhizinaceae*. 1 or 2, widespread (north temperate). See Abbott & Currah (*Mycotaxon* 62: 1, 1997; N. Am.), O'Donnell *et al.* (*Mycol.* 89: 48, 1997; phylogeny), Vasiliauskas & Stenlid (*Mycol.* 93: 447, 2001), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny).
- rhizina** (pl. -ae), a root-like hair or thread; the attachment organs of many foliose lichens (e.g. *Parmelia*); rhizine; they may be divided into several types, for details see Gyelnik (*Bot. Közl.* 24: 122, 1927), Hale & Kurokawa (*Contr. U.S. natn Herb.* 36: 122, 1964), Hannemann (*Bibl. Lich.* 1, 1973). Cf. hyphal net.
- Rhizinaceae** Bonord. (1851), *Pezizales*. 2 gen., 3 spp.
Lit.: Weber & Bresinsky (*Persoonia* Suppl. 14: 553, 1992), Abbott & Currah (*Mycotaxon* 62: 1, 1997), O'Donnell *et al.* (*Mycol.* 89: 48, 1997; phylogeny), Harrington *et al.* (*Mycol.* 91: 41, 1999; phylogeny), Lygis *et al.* (*Mycol.* 97: 788, 2005), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- rhizinose-strand** ('Rhizinenstränge'), a rhizine-like organ of attachment in squamulose (placodioid) lichens (e.g. *Toninia*), which is tough and much

- branched. At least 3 types occur. See Poelt & Baumgartner (*Öst. bot. Z.* 111: 1, 1964), Hannemann (*Bibl. Lich.* 1, 1973). Cf. hyphal net.
- Rhizoblepharia** Rifai (1968), Pyronemataceae. 2, Australia; Jamaica. See Erb (*Phytologia* 24: 11, 1972).
- Rhizocalyx** Petr. (1928), Helotiaceae. Anamorph *Rhizothyrium*. 1 (on *Abies*), Siberia.
- Rhizocarpaceae** M. Choisy ex Hafellner (1984), Rhizocarpaceae ($\pm$ L). 4 gen. (+ 14 syn.), 228 spp.
Lit.: Timdal & Holtan-Hartwig (*Graphis Scripta* 2: 41, 1988), Poelt (*Mitt. bot. StSamml. Münch.* 29: 515, 1990), Feuerer (*Biblthca Lichenol.* 39: 218 pp., 1991), Rambold *et al.* (*Cryptog. Bryol.-Lichénol.* 19: 247, 1998), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998), Ihlen & Ekman (*Biol. J. Linn. Soc.* 77: 535, 2002), Buschbom & Mueller (*Mol. Phylogen. Evol.* 32: 66, 2004), Grube *et al.* (*MR* 108: 1111, 2004), Ihlen (*MR* 108: 533, 2004), Wedin *et al.* (*MR* 109: 159, 2005), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Rhizocarpaceae** Miadl. *et al.* (2007). Lecanoromycetidae. 2 fam., 12 gen., 489 spp. Fams:
- (1) Catillariaceae
 - (2) Rhizocarpaceae
- For *Lit.* see under fam.
- Rhizocarpon** Ramond ex DC. (1805), Rhizocarpaceae ($\pm$ L). c. 224, widespread (esp. temperate and boreal). See also map lichen. See Runemark (*Op. bot. Soc. bot. Lund* 2, 1956; yellow spp. Eur.), Thomson (*Nova Hedwigia* 14: 421, 1967; arctic), Feuerer (*Ber. bayer. bot. Ges.* 49: 59, 1978; C. Eur.), Hertel & Leuckert (*Herzogia* 5: 25, 1979; lichenicolous spp.), Honegger (*Lichenologist* 12: 157, 1980; ultrastr., posn), Geyer *et al.* (*Pl. Syst. Evol.* 145: 41, 1984; key *R. superficiale* group), Innes (*Boreas* 14: 83, 1985; lichenometry nomencl.), Timdal & Holtan-Hartwig (*Graphis Scripta* 2: 41, 1988; key Scandinavian spp.), Poelt (*Mitt. bot. StSamml., München* 29: 515, 1990; key 28 parasitic spp.), Rambold *et al.* (*Cryptog. Bryol.-Lichénol.* 19: 247, 1998; asci), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998; DNA), Fryday (*Lichenologist* 32: 207, 2000; UK), Fryday (*Lichenologist* 34: 451, 2002; UK), Ihlen (*MR* 108: 533, 2004; non-yellow spp.), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Rhizocarponomyces** Cif. & Tomas. (1953) = *Rhizocarpon* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Rhizochaete** Gresl., Nakasone & Rajchenb. (2004), Phanerochaetaceae. 6, widespread. See Greslebin *et al.* (*Mycol.* 96: 261, 2004).
- Rhizocladosporium** Crous & U. Braun (2007), anamorphic Helotiales. 1, Japan. See Crous *et al.* (*Stud. Mycol.* 58: 33, 2007).
- Rhizoclostratium** H.E. Petersen (1903), Chytridiaceae. 4, widespread.
- Rhizoctonia** DC. (1805) nom. cons., anamorphic *Thanatephorus*. c. 1, widespread. *R. solani* s.l. is a serious pathogen of a wide variety of crops. In a wide sense *Rhizoctonia* has also been used for mycelial anamorphs belonging to *Athelia* (*Fibulorhizoctonia*), *Helicobasidium* (*Thanatophytum*), *Sebacina* (*Opa-dorhiza*), *Tulasnella* (*Epulorhiza*), *Waitea* (*Chrysorhiza*), and even to ascomycetous species (*Ascorhizoctonia*). See Parmeter (Ed.) (*Rhizoctonia solani. Biology and pathogenicity*, 1970), Carling *et al.* (*Phytopathology* 77: 1609, 1987; new anastomosis group AG-9), Moore (*Mycotaxon* 29: 91, 1987; segregated genera), Ogoshi (*Ann. Rev. Phytopath.* 25: 125, 1987; ecology and pathology), Liu *et al.* (*Phytopathology* 79: 1205, 1989; isozyme phylogeny), Mordue *et al.* (*MR* 92: 78, 1989; integrated approach to taxonomy), Yang *et al.* (*MR* 93: 429, 1989; sclerotial morphogenesis), Andersen (*Mycotaxon* 37: 25, 1990; hyphal morphology), Cruickshank (*MR* 94: 938, 1990; pectic zymograms), Jabaji-Hare *et al.* (*Can. J. Pl. Path.* 12: 393, 1990; anastomosis group relationships using cloned DNA probes), Liu *et al.* (*Can. J. Pl. Path.* 12: 376, 1990; *R. solani* group 2 relationships by isozyme analysis), Burpee & Martin (*Pl. Dis.* 76: 112, 1991; spp. associated with turfgrasses), Cubeta *et al.* (*Phytopathology* 81: 1395, 1991; anastomosis groups characterized by RA analysis of amplified rRNA gene), Kellens & Peumans (*MR* 95: 1235, 1991; biochemistry and serology of lectins), Sneh *et al.* (*Identification of Rhizoctonia species*, 1991), Wako *et al.* (*J. Gen. Microbiol.* 137: 2817, 1991; unique DNA plasmid pRS64 associated with chromosomal DNA), Johnk & Jones (*Phytopathology* 83: 278, 1993; analysis of fatty acids), Andersen & Stalpers (*Mycotaxon* 51: 437, 1994; check list of 119 names), Vilgalys & Cubeta (*Ann. Rev. Phytopath.* 32: 135, 1994; molecular systematics), Sneh *et al.* (Eds) (*Rhizoctonia species: taxonomy, molecular biology, ecology, pathology and disease control*, 1996), Roberts (*Rhizoctonia-forming fungi*, 1999), Weerasena *et al.* (*MR* 108: 649, 2004; DNA probe and a PCR based diagnostic assay), Matsumoto (*Mycoscience* 46: 319, 2005; fatty acids and anastomosis relationships), González *et al.* (*Mol. Phylogen. Evol.* 40: 459, 2006; ribosomal DNA and β -tubulin sequences).
- Rhizodiscina** Hafellner (1979), Patellariaceae. 1 (on wood), widespread (temperate). See Kutorga & Hawksworth (*SA* 15: 1, 1997).
- Rhizogaster** Reinsch (1875) nom. dub., ? Fungi.
- Rhizogene** Syd. & P. Syd. (1921), Venturiaceae. 1 (on *Symphoricarpos*), N. America. See Hafellner (*Nova Hedwigia* 27: 903, 1976).
- Rhizohypha** Chodat & Sigr. (1911), anamorphic *Pezizomycotina*, Sc.-.-. 1 (mycorrhizal), Europe.
- rhizoid**, a root-like structure consisting of anucleate filaments; branched, extension of a chytrid thallus acting as a feeding organ (Karling, *Am. J. Bot.* 19: 44, 1932), cf. haustorium, rhizina, and holdfast; -al, having, or made up of, rhizoids.
- Rhizolecia** Hertel (1984), ? Lecideaceae (L). 1, New Zealand. See Hertel (*Nova Hedwigia Beih.* 79: 427, 1984).
- Rhizomarasmius** R.H. Petersen (2000), Physalacriaceae. 2. See Petersen (*Mycotaxon* 75: 333, 2000).
- rhizomorph**, a root-like aggregation of hyphae having a well-defined apical meristem (cf. mycelial cord) and frequently differentiated into a rind of small dark-coloured cells surrounding a central core of elongated colourless cells. See Snider (*Mycol.* 51: 693, 1961; *Armillaria mellea*), Jacques-Felix (*BSMF* 83: 1, 1967; *Marasmius*, 84: 161, 1969; agarics).
- Rhizomorpha** Ach. (1809) nom. dub., Fungi (?L).
- Rhizomorpha** Roth (1791) nom. dub. ? = *Armillaria* fide Donk (*Taxon* 11: 97, 1962; rhizomorphs of *Armillaria mellea*).
- Rhizomorpaceae** Chevall. (1826) = Marasmiaceae.
- Rhizomorphites** Göpp. (1848), Fossil Fungi. 3 (Carboniferous, Jurassic), Europe; USA.

- Rhizomucor** Lucet & Costantin (1900), Mucoraceae. 6, widespread. See Schipper (*Stud. Mycol.* 17: 53, 1978), Zheng & Chen (*Mycosystema* 4: 45, 1991; key), Deploey (*Mycol.* 84: 77, 1992; spore germination), Rajak *et al.* (*Mycopathologia* 118: 109, 1992; keratinolysis), Zheng & Chen (*Mycosystema* 6: 1, 1993; key), Zheng & Hu (*Mycotaxon* 56: 455, 1995; endophyte), Zheng & Jiang (*Mycotaxon* 56: 455, 1995), Roux *et al.* (*Proc. Microsc. Soc. S. Afr.* 26: 42, 1996; ultrastr.), Vastag *et al.* (*J. Clin. Microbiol.* 36: 2155, 1998; identification), Vágvölgyi *et al.* (*MR* 103: 318, 1999; status of *R. tauricus*), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny), Iwen *et al.* (*J. Clin. Microbiol.* 43: 5819, 2005; molecular identification), Molecular identification), Nyilasi *et al.* (*Clin. Microbiol. Infect.* 14: 393, 2008; molecular identification), Richardson & Lass-Flörl (*Clin. Microbiol. Infect.* 14 Suppl. 4: 5, 2008; mucormycosis, review).
- rhizomycelium**, a rhizoidal system which resembles mycelium, e.g. thallus of the *Cladochytriaceae* (Karling, *Am. J. Bot.* 19: 53, 1932).
- Rhizomyces** Thaxt. (1896), Laboulbeniaceae. 10, Africa. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- Rhizonema** Thwaites (1849) = Dictyonema C. Agardh ex Kunth fide Parmasto (*Nova Hedwigia* 29: 99, 1978).
- Rhizophagites** Rosend. (1943), Fossil Fungi. 3 (Cretaceous, Pleistocene), N. America. See Butler (*TBMS* 22: 274, 1939) = Glomus (Glom.) fide, Yao *et al.* (*Kew Bull.* 50: 349, 1995).
- Rhizophagus** P.A. Dang. (1896) ? = Glomus fide Gerdemann & Trappe (*Mycol. Mem.* 5, 1974).
- Rhizophidites** Daugherty (1941), Fossil Fungi, Chytridiomycetes. 1 (Triassic), USA.
- Rhizophila** K.D. Hyde & E.B.G. Jones (1989), Pezizomycotina. 1 (marine), Seychelles. See Hyde & Jones (*Mycotaxon* 34: 527, 1989), Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 34: 1, 1991).
- Rhizophlyctidaceae** H.E. Petersen (1909) = Spizellomycetaceae.
- Rhizophlyctis** A. Fisch. (1892), ? Spizellomycetaceae. c. 10, widespread. See Sparrow (*Aquatic Phycomycetes* Edn 2: 438, 1960; key), Barr & Désaulniers (*CJB* 64: 561, 1986), Blackwell & Powell (*Mycotaxon* 70: 213, 1999).
- Rhizophoma** Petr. & Syd. (1927) = Rhizosphaera fide Kobayasi (*Bull. Govt For. Exp. Stn* 204: 91, 1969).
- Rhizophydiaceae** Letcher (2006), Rhizophydiales. 1 gen. (+ 6 syn.), 100 spp.
- Rhizophydiales** Letcher (2006). Chytridiomycetes. 3 fam., 5 gen., 104 spp. Fams:
- (1) Kappamycetaceae
 - (2) Rhizophydiaceae
 - (3) Terramycetaceae
- Lit.*: Letcher *et al.* (*MR* 110: 898, 2006), James *et al.* (*Mycol.* 98: 860, 2006; molecular phylogeny), Hibbett *et al.* (*MR* 111: 109, 2007), and see under Families.
- Rhizophydium** Schenk (1858), Rhizophydiaceae. c. 100, widespread. See Sparrow (*Aquatic Phycomycetes* Edn 2: 231, 1960; key), Chen & Chien (*Taiwania* 41: 105, 1996; zoospore ultrastr.), Letcher *et al.* (*Mycol.* 96: 162, 2004; North America, Australia).
- Rhizophyton** Zopf (1887) = Rhizophydium fide Min-den (*Krypt.-Fl. Brandenburg augr. Gebiete*, 1911).
- Rhizoplaca** Zopf (1905), Lecanoraceae (L.). 11, widespread. See Leuckert *et al.* (*Nova Hedwigia* 28: 71, 1977), Weber (*Mycotaxon* 8: 559, 1979), Wei (*Acta Mycol. Sin.* 3: 207, 1984; key 4 spp. China), McCune (*Bryologist* 90: 6, 1987; N. Am.), Roux *et al.* (*CJB* 71: 1660, 1993; posn), Arup & Grube (*CJB* 78: 318, 2000; polyphyly), Wei & Wei (*Mycosystema* 24: 24, 2005; *R. chrysolecua* group), Zhou & Wei (*Mycosystema* 25: 376, 2006; polyphyly, reln with *Rhizoplacopsidaceae*), Zhou *et al.* (*Mycol.* 98: 57, 2006; genetic variation).
- Rhizoplacopsidaceae** J.C. Wei & Q.M. Zhou (2006), Umbilicariales. 1 gen., 1 spp. See Wei & Zhou (*Mycosystema* 25: 381, 2006).
- Rhizoplacopsis** J.C. Wei & Q.M. Zhou (2006), Rhizoplacopsidaceae. 1, China. See Wei & Zhou (*Mycosystema* 25: 381, 2006).
- rhizoplane**, the surface of a root. See Lynch (Ed.) (*The rhizosphere*, 1990).
- rhizoplast**, see blepharoplast.
- Rhizopodella** (Cooke) Boud. (1885) = Plectania.
- rhizopodium**, a branched process (pseudopodium) from a plasmodium. Cf. filopodium.
- Rhizopodomycetes** Thaxt. (1931), Laboulbeniaceae. 7, America. See Benjamin (*Aliso* 9: 379, 1979; key), Tavares (*Mycol. Mem.* 9: 627 pp., 1985).
- Rhizopodopsis** Boedijn (1959), Mucoraceae. 1, Java. See Boedijn (*Sydowia* 12: 220, 1958).
- Rhizopogon** Fr. (1817), Rhizopogonaceae. c. 150 (ectomycorrhizal with *Pinaceae*, one with *Adenostoma* (*Rosaceae*)), widespread (north temperate; introduced with pines in southern hemisphere. See Smith & Zeller (*Mem. N. Y. bot. Gdn* 14, 1966; key N. Am. spp.), Hosford & Trappe (*TMSJ* 29: 63, 1988; Japan), Martín (*The genus Rhizopogon in Europe*, 1996), Johannesson & Martín (*Mycotaxon* 71: 267, 1999; phylogeny), Molina *et al.* (*Rhizopogon – Ectomycorrhizal fungi, key genera in profile*, 1999; ecology), Grubisha *et al.* (*Mycol.* 93: 82, 2001; phylogeny), Martín (*Mycotaxon* 78: 191, 2001), Grubisha *et al.* (*Mycol.* 94: 607, 2002), Grubisha *et al.* (*Mycotaxon* 93: 345, 2005).
- Rhizopogonaceae** Gäum. & C.W. Dodge (1928), Boletales. 3 gen. (+ 3 syn.), 152 spp.
- Lit.*: Bruns *et al.* (*Nature* 339: 140, 1989; relat. with *Suillus*), Martín (*Edic. Spec. Soc. Catalana Micol.* 5: 173 pp., 1996), Martín *et al.* (*MR* 102: 855, 1998), Johannesson & Martín (*Mycotaxon* 71: 267, 1999), Molina *et al.* (*Ectomycorrhizal Fungi*: 129, 1999), Grubisha *et al.* (*Mycol.* 93: 82, 2001), Jarosch (*Bibliotheca Mycol.* 191: 158 pp., 2001), Martín (*Karstenia* 41: 23, 2001), Grubisha *et al.* (*Mycol.* 94: 607, 2002), Martín & Raidl (*Mycotaxon* 84: 221, 2002), Kretzer *et al.* (*Mycol.* 95: 480, 2003), Kretzer *et al.* (*New Phytol.* 161: 313, 2004).
- Rhizopogoniella** Soehner (1953) = Hymenogaster fide Gross *et al.* (*Beih. Sydowia* 2: 210, 1980).
- Rhizopus** Ehrenb. (1821) nom. cons., Mucoraceae. c. 9, widespread. *R. stolonifer* (syn. *R. nigricans*) is a common saprobe and facultative parasite of mature fruits and vegetables. See Dabinett & Wellman (*CJB* 51: 2053, 1973; numerical taxonomy), Gauger (*J. Gen. Microbiol.* 101: 211, 1977; genetics), Seviour *et al.* (*CJB* 61: 2374, 1983), Schipper (*Stud. Mycol.* 25: 1, 1984), Schipper & Stalpers (*Stud. Mycol.* 25: 20, 1984), Yuan & Jong (*Mycotaxon* 20: 397, 1984), Ellis (*Mycol.* 77: 243, 1985), Schipper *et al.* (*J. Gen. Microbiol.* 131: 2359, 1985; hybridization), Seviour *et al.* (*TBMS* 84: 701, 1985), Ellis (*Mycol.* 78: 508,

- 1986; DNA), Ho (*Trans. Mycol. Soc. Rep. China* 3: 73, 1988), Huang & Yu (*Mycosystema* 1: 61, 1988; electrophoresis), Polonelli *et al.* (*Antonie van Leeuwenhoek* 54: 5, 1988; antigens), Chen & Chen (*Taiwania* 35: 191, 1990), Liou *et al.* (*Mycol. Monogr.* 3, 1990), Liou *et al.* (*TMSJ* 32: 535, 1991; SEM of sporangiospores), El Ghaouth *et al.* (*MR* 96: 769, 1992; post harvest), Frye & Reinhardt (*Mycopathologia* 124: 139, 1993), Jong & McManus (*Mycotaxon* 47: 161, 1993; computer coding), Schipper & Samson (*Mycotaxon* 50: 475, 1994), Ho (*Fung. Sci.* 10: 29, 1995), Takagi & Horiuchi (*Food Biotechnology, Microorganisms*: 535, 1995), Schipper *et al.* (*J. Med. Vet. Mycol.* 34: 199, 1996; mucormycosis & azygosporogenesis), Weitzman *et al.* (*Mycotaxon* 59: 217, 1996), Winkler *et al.* (*J. Clin. Microbiol.* 34: 2585, 1996; mucormycosis), Ho (*Bot. Bull. Acad. Sin. Taipei* 39: 269, 1998; ultrastr.), Zheng & Chen (*Mycotaxon* 69: 181, 1998), Vágvolgyi *et al.* (*Antonie van Leeuwenhoek* 86: 181, 2004; Genetic variability in *Rhizopus stolonifer*), Partida-Martinez & Hertweck (*Nature* 437: 884, 2005; endosymbiotic bacterium (*Berkholderia*) produces rhizoxin), Abe *et al.* (*Biosci., Biotechn., Biochem.* 70: 2387, 2006; phylogeny), Machouart *et al.* (*J. Clin. Microbiol.* 44: 805, 2006; PCR-restriction fragment length polymorphism), Liu *et al.* (*Sydowia* 59: 235, 2007; phylogeny), Zheng *et al.* (*Sydowia* 59: 273, 2007; monogr.), Nyilasi *et al.* (*Clin. Microbiol. Infect.* 14: 393, 2008; molecular identification), Richardson & Lass-Flörl (*Clin. Microbiol. Infect.* 14 Suppl. 4: 5, 2008; mucormycosis, review).
- Rhizopycnis** D.F. Farr (1998), anamorphic *Dothideomycetes*, Cpd.?.?. 1, USA; Europe. See Farr *et al.* (*Mycol.* 90: 291, 1998), Armengol *et al.* (*Pl. Path.* 52: 68, 2003; Spain), Ghignone *et al.* (*Eur. J. Pl. Path.* 109: 861, 2003; molecular diagnostics).
- Rhizoscyphus** W.Y. Zhuang & Korf (2004), *Helotiaceae*. 2, widespread. See Zhang & Zhuang (*Nova Hedwigia* 78: 481, 2004).
- Rhizosiphon** Scherff. (1926), *Chytridiales*. 3, Europe.
- Rhizosphaera** L. Mangin & Har. (1907), anamorphic *Phaeocryptopus*, Cpd.0eH.15. 6 (on conifers), widespread. *R. kalkhoffii* (on pine needles). See Petrak (*Annl. mycol.* 36: 9, 1938), Sutton (*The Coelomycetes*, 1980), Juzwik (*Pl. Dis.* 77: 630, 1993; *R. kalkhoffii* on *Picea*), Butin & Kehr (*MR* 104: 1012, 2000), Tsuneda *et al.* (*Mycol.* 96: 1128, 2004; phylogeny).
- Rhizosphaerella** Höhn. (1917) ? = *Phoma* Sacc. fide Sutton (*Mycol. Pap.* 141, 1977).
- Rhizosphaerina** B. Sutton (1986), anamorphic *Pezizomycotina*, St.0eP.15. 1, Australia; S.E. Asia. See Sutton (*Sydowia* 38: 332, 1985).
- rhizosphere**, the region immediately surrounding a root and influenced by its presence, particularly from proteins and sugars released by the plant; the range of fungi, bacteria and other microorganisms is frequently richer than that of the soil away from a root. See Katznelson *et al.* (*Bot. Rev.* 14: 543, 1948).
- Rhizosporium** Rabenh. (1844) ? = *Phloeconis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Rhizostilbella** Wolk (1914), anamorphic *Ascobolus*, Hsy.?0eH.?. 1, Java. See Seifert (*Stud. Mycol.* 27: 1, 1985; used for anamorph, *Sphaerostilbe repens*, of *Nectria mauritiicola*).
- Rhizostroma** Fr. (1819) nom. dub., anamorphic *Pezizomycotina*. See Donk (*Taxon* 11: 98, 1962).
- Rhizotexis** Theiss. & Syd. (1917), *Englerulaceae*. 1, Natal.
- Rhizothyriaceae** Tehon ex Bat. & Cif. (1959) = *Helotiaceae*.
- Rhizothyrium** Naumov (1915), anamorphic *Rhizocalyx*, Cpt.≡ eH.?. 2, Russia; Chile.
- Rhodactina** Pegler & T.W.K. Young (1989), *Boletaceae*. 1, India. See Yang *et al.* (*Mycotaxon* 96: 133, 2006).
- Rhodesia** Grove (1937), anamorphic *Helotiales*, Cac.0eH.15. 1, Germany.
- Rhodesiopsis** B. Sutton & R. Campb. (1979), anamorphic *Pezizomycotina*, Cac.0eH.19. 1, British Isles; Australia. See Sutton & Campbell (*Nova Hedwigia* 30: 289, 1978).
- Rhodoarrhenia** Singer (1964), *Bolbitiaceae*. 8, widespread (tropical). See Singer (*Sydowia* 17: 142, 1964; key).
- Rhodobolites** Beck (1923) = *Tylopilus* fide Singer (*Farlowia* 2: 223, 1945).
- Rhodocarpon** Lönnr. (1858) ≡ *Endocarpon*.
- Rhodocephalus** Corda (1837) ? = *Aspergillus* fide Thom (*Manual of the Aspergilli*, 1945).
- Rhodochytrium** Lagerh. (1893), ? *Chlorophyta*. 1, widespread (north temperate). Possibly a member of the Algae.
- Rhodococcus** Zopf (1891), *Actinobacteria*. q.v.
- Rhodocollybia** Singer (1939), *Marasmiaceae*. c. 20, widespread. See Antonín & Noordeloos (*Libri Botanici* 17, 1997; Eur. spp.), Antonín *et al.* (*Mycotaxon* 63: 359, 1997; taxonomy), Mata *et al.* (*Mycol. Progr.* 3: 337, 2004; neotropical montane forests spp.), Wilson & Desjardin (*Mycol.* 97: 667, 2005; phylogeny).
- Rhodocybe** Maire (1926) = *Entoloma*.
- Rhodocybella** T.J. Baroni & R.H. Petersen (1987) = *Entoloma* fide Kuyper (*in litt.*).
- Rhodocyphella** W.B. Cooke (1961) = *Stigmatolemma* fide Donk (*Beih. Nova Hedwigia* 5, 1962).
- Rhodofomes** Kotl. & Pouzar (1990) = *Fomitopsis* fide Ryvarden (*Syn. Fung.* 5: 218, 1991).
- Rhodogaster** E. Horak (1964) = *Entoloma*. *Basidioma* gasteroid. fide Kuyper (*in litt.*), Horak (*Sydowia* 17: 190, 1964), Horak & Moreno (*Sydowia* 50: 187, 1998; *Rhodogaster calongei* sp. nov. from northern Spain).
- Rhodomycetes** Wettst. (1885) = *Phaffia* fide Kreger-van Rij (Ed.) (*Yeasts, a taxonomic study* 3rd edn, 1984), Boekhout *et al.* (*Taxon* 48: 147, 1999; nomencl.) = *Sporidiobolus* (*Sporidiobol.*) fide.
- Rhodonina** Niemelä (2005), *Polyporaceae*. 1, Europe. See Niemelä (*Karstenia* 45: 79, 2005).
- Rhodopaxillus** Maire (1913) = *Lepista* fide Singer (*Agaric. mod. Tax.*, 1951).
- Rhodopeziza** Hohmeyer & J. Moravec (1995), *Pezizaceae*. 1, Tierra del Fuego. See Moravec (*Czech Mycol.* 47: 260, 1995).
- Rhodophana** Kühner (1971) = *Rhodocybe* fide Kuyper (*in litt.*).
- Rhodophyllaceae** Singer (1951) = *Entolomataceae*.
- Rhodophyllus** Qué. (1886) = *Entoloma* fide Hesler (*Entoloma in southeastern North America*, 1967; key 200 spp.), Largent & Benedict (*Madroño* 21: 32, 1971; gen. defin.), Romagnesi (*Bull. Soc. linn. Lyon* 43: 325, 1974), Singer (*Agaric. mod. Tax.* edn 3, 1975), Kühner (*BSMF* 93: 445, 1978; alpine spp.), Romagnesi & Gilles (*Beih. Nova Hedwigia* 59, 1979;

- key 200 spp. Ivory Coast etc.).
- Rhodoporus** Quél. ex Bataille (1908) = *Tylopilus*.
- Rhodoscypha** Dissing & Sivertsen (1983), Pyrenomataceae. 1, widespread. See Lohmeyer (*Z. Mykol.* 50: 147, 1984), Hohmeyer (*Mitt. Arbeitsgem. Pilzk. Niederrhein* 6: 11, 1988), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Rhodoseptoria** Naumov (1913) = *Polystigmina* fide Clements & Shear (*Gen. Fung.*, 1931).
- Rhodosporidium** Banno (1967), Sporidiobolales. Anamorph *Rhodotorula*. 6 (often from sea water), widespread. See Fell *et al.* (*Can. J. Microbiol.* 19: 643, 1973; key), Swann & Taylor (*Stud. Mycol.* 38: 147, 1995; mol. phylogeny), Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 1351, 2000; mol. phylogeny), Sampaio *et al.* (*Int. J. Syst. Evol. Microbiol.* 51: 687, 2001; polyphasic taxonomy), Aime *et al.* (*Mycol.* 98: 896, 2006; phylogeny).
- rhodosporous**, having light-red spores.
- Rhodosporus** J. Schröt. (1889) = *Pluteus*.
- Rhodosticta** Woron. (1911), anamorphic *Polystigma*, St.0eH.15. 3, Asia; USA.
- Rhodotarsetta** Dissing & Sivertsen (1983), Pyrenomataceae. 1 (on burnt ground), Europe. See Hohmeyer (*Mitt. Arbeitsgem. Pilzk. Niederrhein* 6: 11, 1988), Yao & Spooner (*MR* 106: 1243, 2002), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Rhodothallus** Bat. & Cif. (1959), anamorphic *Pezizomycotina*, Cpt.-.-. 1, Brazil. See Batista & Ciferri (*Mycopath. Mycol. appl.* 11: 96, 1959).
- Rhodothrix** Vain. (1921) = *Nectria*. Material has not been examined recently. fide Santesson (*Svensk bot. Tidskr.* 43: 547, 1949).
- Rhodotorula** F.C. Harrison (1927), anamorphic *Rhodosporidium*, *Erythrobasidium*. c. 40, widespread. See Fell *et al.* (*Stud. Mycol.* 38: 129, 1995; mol. phylogeny, 2000; mol. phylogeny), Suh *et al.* (*J. gen. appl. Microbiol.* Tokyo 42: 1, 1996; mol. phylogeny), Golubev & Churkina (*Mikrobiologiya* 66: 254, 1997; mycocons), Sampaio *et al.* (*Can. J. Microbiol.* 45: 491, 1999; utilization aromatic compounds), Gadanho *et al.* (*CJB* 47: 213, 2001; polyphasic taxonomy), Nagahama *et al.* (*Int. J. Syst. Evol. Microbiol.* 53: 897, 2003; n.sp. from deep-sea floor).
- Rhodotus** Maire (1926), Physalacriaceae. 1, Europe; N. America. See Pegler & Young (*Kew Bull.* 30: 19, 1975; spore ornament.), Kühner (*Hyménomycètes agaricoïdes*, 1980), Legon & Pegler (*Mycologist* 5: 147, 1991).
- Rhodoveronaea** Arzanlou, W. Gams & Crous (2007), anamorphic *Annulatascaceae*. 1, Germany. See Arzanlou *et al.* (*Stud. Mycol.* 58: 57, 2007).
- Rhodozyma** Phaff, M.W. Mill., Yoney. & Soneda (1972), anamorphic *Xanthophyllomyces*. 1, Alaska; Japan. See Kurtzman & Fell (*Yeasts, a taxonomic study* 4th edn, 1998).
- Rhombiella** Liro (1939), anamorphic *Thecaphora*. 1.
- rhomboidal**, resembling an equilateral not right-angled parallelogram (a rhomboid); quadrangular (Fig. 23.22).
- Rhombostilbella** Zimm. (1902), anamorphic *Pezizomycotina*, Hsy.0eH.10. 2 (on *Capnodiaceae*), Java; Brazil. See Pirozynski (*Mycol. Pap.* 90, 1963; key), Kendrick (*CJB* 81: 75, 2003).
- Rhopalidium** Mont. (1856) = *Alternaria* fide Höhnelt (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt.* 1 119: 670, 1910).
- Rhopalocladium** Schroers, Samuels & W. Gams (1999), anamorphic *Nectriopsis*, Hso.???. 1 (on myxomycete), USA. See Schroers *et al.* (*Mycol.* 91: 375, 1999), Schroers (*Stud. Mycol.* 46: 1, 2001).
- Rhopaloconidium** Petr. (1952) = *Miuraea* fide Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 1, 1995).
- Rhopalocystis** Grove (1911) = *Aspergillus* fide Raper & Fennell (*The genus Aspergillus*, 1965).
- Rhopalogaster** J.R. Johnst. (1902), Rhizopogonaceae. 1, USA.
- Rhopalomyces** Corda (1839), Helicocephalidaceae. 7, widespread. See Costantin (*Bull. Soc. bot. Fr.* 33: 489, 1886), Thaxter (*Bot. Gaz.* 16: 14, 1891), Berlese (*BSMF* 10: 94, 1892), Marchal (*Revue Mycol. Paris* 15: 7, 1893), Drechsler (*Bull. Torrey bot. Club* 82: 473, 1955), Ellis (*Mycol.* 55: 183, 1963), Barron (*CJB* 51: 2505, 1973; biology), Stalpers (*Proc. K. ned. Akad. Wet. Ser. C, Biol. Med. Sci.* 77: 383, 1974), Benjamin in Kendrick (Ed.) (*The Whole Fungus* 2: 573, 1979), Barron (*Mycol.* 72: 427, 1980; biology), Cano *et al.* (*Nova Hedwigia* 49: 427, 1989), James *et al.* (*Nature* 443: 818, 2006; phylogeny), White *et al.* (*Mycol.* 98: 872, 2006; phylogeny).
- Rhopalomyces** Harder & Sörgel (1938) [non *Rhopalomyces* Corda 1839] = *Blastocladiella* fide Couch & Whiffen (*Am. J. Bot.* 29: 582, 1942).
- Rhopalophlyctis** Karling (1945), Chytridiaceae. 1, Brazil; N. America.
- Rhopalopsis** Cooke (1883) = *Kretzschmaria*.
- Rhopalospora**, see *Ropalospora*.
- Rhopalostroma** D. Hawksw. (1977), Xylariaceae. Anamorph *Nodulisporium*-like. 11, Africa; Asia. See Hawksworth & Whalley (*TBMS* 84: 560, 1985), Whalley *et al.* (*Botanical Journal of Scotland* 50: 185, 1998; Thailand), Stadler *et al.* (*MR* 108: 239, 2004; chemistry), Triebel *et al.* (*Nova Hedwigia* 80: 25, 2005; phylogeny).
- Rhopographella** (Henn.) Sacc. & Trotter (1913), *Pezizomycotina*. 1, Brazil.
- Rhopographina** Theiss. & Syd. (1915) = *Ophiodothella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Rhopographus** Nitschke ex Fuckel (1870), ? Pleosporales. 6 (on *Pteridophyta*), widespread. See Obrist (*Phytopath. Z.* 35: 367, 1959), Barr (*Mycotaxon* 43: 371, 1992; posn).
- Rhymbocarpus** Zopf (1896), Odontotremataceae. 9 (on lichens, esp. *Rhizocarpon*), Europe. See Coppins *et al.* (*SA* 10: 51, 1991), Diederich & Etayo (*Lichenologist* 32: 423, 2000).
- Rhymovis** Pers. ex Rabenh. (1844) = *Paxillus*.
- Rhynchodiplodia** Briosi & Farneti (1906), anamorphic *Pezizomycotina*, Cpd.1eP.?. 1, Italy.
- Rhynchogastrema** B. Metzler & Oberw. (1989), Rhynchogastremataceae. 1, Europe. See Metzler & Oberwinkler (*Syst. Appl. Microbiol.* 12: 281, 1989).
- Rhynchogastremataceae** Oberw. & B. Metzler (1989), Tremellales. 1 gen., 1 spp.
Lit.: Metzler *et al.* (*Syst. Appl. Microbiol.* 12: 280, 1989), Sampaio *et al.* (*Mycol.* 94: 874, 2002).
- Rhynchomelas** Clem. (1909) = *Melanospora* Corda fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Rhynchomeliola** Speg. (1884), ? Chaetothyriomycetidae. 3, S. America; Australasia. See Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962), Lee *et al.* (*Mycol.* 95: 902, 2003).
- Rhynchomyces** Sacc. & Marchal ex Marchal (1885) =

- Mycorhynchus*.
- Rhynchomyces** Willk. (1866), anamorphic *Pezizomycotina*, Hso.≡ eP.?. 1, Europe.
- Rhynchonectria** Höhn. (1902) ? = *Pyxidiophora* fide Hawksworth & Webster (*TBMS* 68: 329, 1977), Lundqvist (*Bot. Notiser* 133: 121, 1980), Malloch & Blackwell (*CJB* 68: 1712, 1990), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999; type material no longer extant).
- Rhynchophoma** P. Karst. (1884) = *Ceratostomella* fide Petrak (*Sydowia* 7: 298, 1953), Verkley (*Nova Hedwigia* 75: 433, 2002; revision).
- Rhynchophoromyces** Thaxt. (1908), *Ceratomycetaceae*. 8, widespread. See Majewski & Sugiyama (*TMSJ* 27: 425, 1986; Borneo), Santamaría (*Nova Hedwigia* 68: 351, 1999; Iberian peninsula).
- Rhynchophorus** Hollós (1926) = *Ceratopycnis* fide Clements & Shear (*Gen. Fung.*, 1931).
- Rhynchoseptoria** Unamuno (1940), anamorphic *Pezizomycotina*, Cpd.≡ eH.?. 1, Morocco.
- Rhynchosphaeria** (Sacc.) Berl. (1891), *Pezizomycotina*. 7, widespread.
- Rhynchosporina** Arx (1957), anamorphic *Pezizomycotina*, Hso.0eH.15. 2, N. America. See von Arx (*Verh. K. ned. Akad. Wet. Amst.* C 51: 19, 1957), Wu *et al.* (*Mycoscience* 38: 11, 1997).
- Rhynchosporium** Heinsen ex A.B. Frank (1897), anamorphic *Helotiales*, Hso.1eH.19. 3, widespread (temperate). *R. secalis* (barley and rye leaf blotch). See Owen (*TBMS* 41: 99, 1958), Owen (*TBMS* 46: 604, 1963), Williams & Owen (*TBMS* 60: 223, 1973; physiol. specialization on barley), Ryan *et al.* (*Rhynchosporium secalis* A keyword index to the literature, 1987), Goodwin *et al.* (*Phytopathology* 80: 1330, 1990; nomencl. *R. secalis* pathotypes), Beer (*Zentralbl. Mikrobiol.* 146: 339, 1991; review *R. secalis*), Goodwin *et al.* (*MR* 97: 49, 1993; isozyme variation), Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 1: 254, 1995; key), McDonald *et al.* (*Phytopathology* 89: 639, 1999; genetic diversity, Australia), Robbertse & Crous (*S. Afr. J. Sci.* 96: 391, 2000; S Africa), Newton *et al.* (*Z. PflKrankh. PflPath. PflSchutz* 108: 446, 2001; UK), Goodwin (*MR* 106: 645, 2002; posn), Crous *et al.* (*Eur. J. Pl. Path.* 109: 841, 2003; phylogeny), Korff *et al.* (*J. Phytopath.* 152: 106, 2004; genetic diversity).
- rhynchosporous**, having beaked spores.
- Rhynchostoma** P. Karst. (1870), ? *Chaetothyriomycetidae*. Anamorph *Arthropycnis*. 11, widespread. See Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962), Constantinescu & Tibell (*Nova Hedwigia* 55: 169, 1992; anamorph), Lee *et al.* (*Mycol.* 95: 902, 2003; phylogeny).
- Rhynchostomopsis** Petr. & Syd. (1923) = *Amphisphaeria* fide Aptroot (*Stud. Mycol.* 37, 1995).
- Rhynchostrigula** Bat., J.L. Bezerra & Cavalc. (1966) = *Strigula* fide Lücking *et al.* (*Lichenologist* 30: 170, 1998).
- Rhynchotheca** Kleb. (1933) nom. dub., *Fungi*. See Sutton (*Mycol. Pap.* 141, 1977).
- Rhyncomeliola**, see *Rhynchomeliola*.
- Rhyparobius**, see *Ryparobius*.
- Rhytidenglerula** Höhn. (1918), *Englerulaceae*. Anamorph *Capnodiastrum*. c. 10, widespread. See Castlebury *et al.* (*Mycotaxon* 54: 461, 1995).
- Rhytidhysterium** Sacc. (1883) = *Rhytidhysterion*.
- Rhytidhysterion** Speg. (1881), *Patellariaceae*. Anamorphs *Diplodia*-like, *Aposphaeria*-like. 4, widespread (esp. tropical). See Samuels & Müller (*Sydowia* 32: 277, 1979), Kutorga & Hawksworth (*SA* 15: 1, 1997), Silva-Hanlin & Hanlin (*MR* 103: 153, 1999; DNA), Liew *et al.* (*Mol. Phylogen. Evol.* 16: 392, 2000; phylogeny).
- Rhytidiella** Zalasky (1968), ? *Cucurbitariaceae*. Anamorph *Phaeoseptoria*. 3, Canada; Sweden. See Aguirre-Hudson (*Bull. Br. Mus. nat. hist. Bot.* 21: 85, 1991), Johnston (*N.Z. J. Bot.* 45: 151, 2007).
- Rhytidocaulon** Nyl. ex Elenkin (1916) nom. rej. prop. = *Letharia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Rhytidopeziza** Speg. (1885) = *Rhytidhysterion* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Rhytidospora** Jeng & Cain (1977), *Ceratostomataceae*. 3, widespread. See Krug & Jeng (*Mycotaxon* 10: 41, 1979), Guarro (*Mycol.* 75: 927, 1983), Valldosera *et al.* (*MR* 95: 243, 1991; SEM).
- Rhytisma** Fr. (1818), *Rhytismataceae*. Anamorph *Melasmia*. 18, widespread. *R. acerinum* and *R. punctatum* (tar spot of *Acer*), *R. salicinum* (of *Salix*). See also air pollution. See Duravetz & Morgan-Jones (*CJB* 49: 1267, 1971; ontogeny), Rath (*Rivista Micol.* 35: 43, 1992; key 6 Italian spp.), Hudler & Jensen-Tracy (*Mycotaxon* 68: 405, 1998), Landvik *et al.* (*Mycoscience* 39: 49, 1998; DNA), Gernandt *et al.* (*Mycol.* 93: 915, 2001; phylogeny), Vasil'eva (*Mikol. Fitopatol.* 36: 17, 2002; E Russia), Hou & Piepenbring (*Mycopathologia* 159: 299, 2005; China), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Rhytismataceae** Chevall. (1826) nom. cons., *Rhytismatales*. 55 gen. (+ 30 syn.), 728 spp.
Lit.: Minter (*Mycol. Pap.* 147: 54 pp., 1981), Cannon & Minter (*Mycol. Pap.* 155, 1986; Indian subcont., key 14 gen.), Cannon & Minter (*Mycol. Pap.* 155: 123 pp., 1986), Minter in Peterson (Ed.) (*Recent research on conifer needle diseases*: 71, 1986; illustr. 14 gen.), Johnston (*N.Z. J. Bot.* 29: 395, 405, 1991; NZ spp.), Johnston (*Mycotaxon* 52: 221, 1994; ascospore sheaths), Johnston (*Aust. Syst. Bot.* 13: 199, 2000), Stone *et al.* (*Microbial Endophytes*: 3, 2000), Gernandt *et al.* (*Mycol.* 93: 915, 2001), Johnston (*Mycol. Pap.* 176: 239 pp., 2001), Johnston (*Aust. Syst. Bot.* 14: 377, 2001), Deckert & Melville (*MR* 105: 991, 2002), Ortiz-García *et al.* (*Mycol.* 95: 846, 2003), Ganley *et al.* (*Proc. natn Acad. Sci. U.S.A.* 101: 10107, 2004), Sokolski *et al.* (*Mycol.* 96: 1261, 2004), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Rhytismatales** M.E. Barr ex Minter (1986). *Leotiomycetes*. 3 fam., 83 gen., 795 spp. Ascomata apothecial, immersed, sometimes erumpent, opening by longitudinal or radial splits, often within black clypeate pseudostromatic tissue. Interascal tissue of simple paraphyses, often anastomosing near the base, often with mucous coating, often swollen at the apices. Asci cylindrical, thin-walled, usually not differentiated at the apex, rarely blueing in iodine, often releasing spores through an irregular split. Ascospores usually hyaline and aseptate, often elongated, often with a mucous sheath. Anamorphs coelomycetous. Saprobes and necrotrophic parasites, sometimes endophytic, on leaves, also on bark and wood, mainly temp. Fams:
 (1) *Ascodichaenaceae*
 (2) *Cudoniaceae*

(3) **Rhytismataceae** (syn. *Phacidiaceae* auct.)

Lit.: Cannon & Minter (*Mycol. Pap.* 155: 1986; Indian subcont.), Darker (*Contr. Arnold Arb.* 1, 1932; on conifers, *CJB* 45: 1399, 1967; gen. revis.), Hunt & Ziller (*Mycotaxon* 6: 481, 1978; host-gen. keys on conifers), Livsey & Minter (*CJB* 72: 549, 1994; circumscription, fams), Minter (*in Capretti et al.* (Eds), *Shoot and foliage diseases in forest trees*: 65, 1995; Eur. spp. on conifers, illustr., key, 20 gen.), Minter & Cannon (*TBMS* 83: 65, 1984; ascospore discharge), Pirozynski & Weresub (*in Kendrick* (Ed.), *The whole fungus* 1: 93, 1979; biogeogr.), Sherwood (*Occ. Pap. Farlow Herb.* 15, 1980; key 13 gen.), Tehon (*Ill. Biol. Monogr.* 13 (4), 1935; *Lophodermium* s.l.).

Rhytismella P. Karst. (1884) = *Cliostomum*.

Rhytismites Mesch. (1892), *Fossil Fungi*. 27 (Cretaceous, Tertiary), Europe.

Rhytismopsis Geyl. (1887), *Fossil Fungi*. 1 (Eocene), Indonesia. = *Rhytismites* (*Fossil fungi*) fide Meschinelli (1892).

Ribaldia Cif. (1954) = *Asteroma* fide Sutton (*Mycol. Pap.* 141, 1977).

Ricasolia A. Massal. (1855) = *Solenopsora* fide Aptroot (*in litt.*).

Ricasolia De Not. (1846) = *Lobaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Ricasoliomyces E.A. Thomas ex Cif. & Tomas. (1953) = *Ricasolia* De Not.

Riccia L. (1753), Hepaticae. Hepaticae.

Riccoa Cava (1903) = *Heydenia* fide Höhnelt (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt. 1* 124: 56, 1915).

Richonia Boud. (1885), *Zopfiaceae*. 1, France. See Hawksworth (*CJB* 57: 91, 1979).

Richoniella Costantin & L.M. Dufour (1916) = *Entoloma*. *Basidioma gasteroid.* fide Kuyper (*in litt.*), Dring & Pegler (*Kew Bull.* 32: 563, 1978; key), Sarasini (*Rivista di Micologia* 37: 19, 1994).

Richoniellaceae Jülich (1982) = *Entolomataceae*.

Rick (Johann; 1869-1946; Austria, later Brazil). School teacher, Feldkirch (1894-1898); theological student, Valkenburg, Netherlands (1899-1902) [priest]; teacher (1903-1915) then social worker (1915-1929) then Professor of Theology (1929-1942), São Leopoldo, Rio Grande do Sul; in São Salvador, Rio Grande do Sul (1942-1946). With Theissen (q.v.) a pioneer explorer of the mycota of Brazil. Collections are widely distributed (B, BPI, CUP, FH, IAC, IACM, K, MICH, PACA, R, RB, S, SFPA and SI). *Publs.* His publications are distributed in *Annales Mycologici*, *Broteria* and *Iheringia. Biogs, obits etc.* Lloyd (*Mycological Notes by C.G. Lloyd* 72: 1286, 1924); Stafleu & Cowan (*TL-2* 4: 780, 1983); Torrend, in Lloyd (*Mycological Notes by C.G. Lloyd* 53: 749, 1918).

Rickella Locq. (1952) = *Volvolepiota*.

Rickenella Raithel. (1973), *Agaricomycetes*. 5, widespread. *Hymenochaetales* or *Agaricales* (*Rickenella* clade). See Kost (*La Famiglia delle Tricholomataceae*, 1986; perforate parenthosome), Moncalvo *et al.* (*Syst. Biol.* 49: 278, 2000; possible posn. in russuloid clade), Redhead *et al.* (*Mycotaxon* 82: 151, 2002; posn. in hymenochaetoid clade), Redhead *et al.* (*Mycotaxon* 83: 19, 2002; posn. in hymenochaetoid clade), Antonín & Noordeloos (*A monograph of the genera Hemimycena*, □, 2004).

Rickia Cava (1899), *Laboulbeniaceae*. 132, widespread (esp. tropical). See Tavares (*Mycol. Mem.* 9:

627 pp., 1985), Weir (*MR* 102: 327, 1998; Sulawesi).

Rickiella Syd. (1904) = *Phillipsia* fide Korf (*Aust. J. Bot. Suppl. Ser.* 10: 77, 1983), Pfister (*Mycotaxon* 29: 329, 1987).

Riclaritia Peyronel (1915), anamorphic *Pezizomycotina*, Hsp.0eH.15. 1, Europe.

Ricnophora Pers. (1825) = *Phlebia* fide Donk (*Taxon* 6: 113, 1957).

Riddlea C.W. Dodge (1953) = *Laurera* fide Harris (*Acta Amazon. Supl.* 14: 55, 1984).

RIEC (Revised Index of Ecological Continuity). The percentage occurrence of up to a maximum of 20 out of a total list of 30 selected old-forest indicator lichens that require a continuity of mature trees to persist in a site. This value has proved useful in identifying woodland of particular antiquity and long environmental continuity in the UK. See Rose (*in Brown et al.* (Eds), *Lichenology: progress and problems*: 279, 1976). An **NIEC** (New Index of Ecological Continuity) for use in wider areas of W. Europe uses 'main' (counted to 70) plus 'bonus' species to give a *T* value (Rose, *in* Bates & Farmer (Eds), *Bryophytes and lichens in a changing environment*: 211, 1992).

Riedera Fr. (1849) nom. dub., ? *Helotiales*. 1, Russia.

Riessia Fresen. (1852), anamorphic *Agaricomycetes*, Hsy.1bH.1. 4, widespread. See Goos (*Mycol.* 59: 718, 1967; dikaryotic basidiomycete).

Riessiella Jülich (1985), anamorphic *Agaricomycetes*, Hso. = eP.1. 2 (with clamp connexions), S.E. Asia. See Jülich (*Int. J. Mycol. Lichenol.* 2: 127, 1985).

Rigidoporaceae Jülich (1982) = *Meripilaceae*.

Rigidoporopsis I. Johans. & Ryvarden (1979) = *Amyloporus* fide Stalpers (*Stud. Mycol.* 40: 129, 1996).

Rigidoporus Murrill (1905), *Meripilaceae*. c. 40, widespread. See Ryvarden & Johansen (*Prelim. Polyp. Fl. E. Afr.*: 537, 1980; key 6 Afr. spp.), Corner (*Beih. Nova Hedwigia* 86: 152, 1987; key Malaysia spp.), Gilbertson & Ryvarden (*N. Amer. Polyp.* 2: 693, 1987; key temp. spp.), Corner (*Mycologist* 9: 127, 1995; gen. concept), Legon (*Mycologist* 17: 156, 2003), Ryvarden & Iturriaga (*Mycol.* 95: 1066, 2003; Venezuela) See also record fungi.

Rikatlia P.F. Cannon (1993), ? *Phyllachoraceae*. 1 (from living leaves), E. Africa. See Cannon (*SA* 11: 83, 1993).

Rileya A. Funk (1979), anamorphic *Pezizomycotina*, Cpd/St. = eH.19. 1, Canada. See Funk (*CJB* 57: 7, 1979).

Rimaconus Huhndorf, F.A. Fernández, J.E. Taylor & K.D. Hyde (2001), *Sordariomycetes*. 1. Perhaps belonging to the *Pleurotremataceae* sensu Barr (q.v.). See Huhndorf *et al.* (*Mycol.* 93: 1073, 2001), Huhndorf *et al.* (*Fungal Diversity* 20: 59, 2005).

Rimbachia Pat. (1891), *Tricholomataceae*. c. 10, widespread (tropical). See Singer (*Boln Soc. argent. Bot.* 10: 210, 1963; key), Redhead (*CJB* 62: 865, 1984; key), Redhead *et al.* (*Mycotaxon* 83: 19, 2002; posn. in hymenochaetoid clade), Senn-Irlet & Moreau (*Czech Mycol.* 54: 145, 2003; alpine spp.).

Rimelia Hale & A. Fletcher (1990) = *Parmotrema* fide Hale & Fletcher (*Bryologist* 93: 23, 1990), Czezug & Kashiwadani (*Bull. natn. Sci. Mus. Tokyo*, B 19: 113, 1993; chemistry), Eliasaro & Adler (*Mycotaxon* 66: 127, 1998; Brazil), Louwhoff (*Biblhca Lichenol.* 78: 223, 2001; biogeography), Thell *et al.* (*Mycol. Progr.* 3: 297, 2004; phylogeny), Blanco *et al.* (*Mycol.* 97: 150, 2005; phylogeny), Carbonero *et al.* (*Phytochem.* 66: 929, 2005; chemistry), Divakar *et*

- al.* (*Lichenologist* 37: 55, 2005; phylogeny), Blanco *et al.* (*Mol. Phylogen. Evol.* 39: 52, 2006; phylogeny).
- Rimeliella** Kurok. (1991) = *Canomaculina* fide Elix (*Mycotaxon* 65: 475, 1997).
- Rimella** Raf. (1819) nom. dub., ? Agaricomycetes. ? 'gasteromycetes'.
- rimose** (1) cracked; (2) (of a pileus surface), cracked; originally, cracked in all directions (the recommended usage); frequently, cracked by radial fissures as in *Inocybe*. Cf. *rimulose*.
- Rimula** Velen. (1934), ? Helotiales. 1, former Czechoslovakia.
- Rimularia** Nyl. (1868), Trapeliaceae (L). 13, widespread (temperate). See Muhr & Tønsberg (*Nordic J Bot.* 8: 649, 1989), Hertel & Rambold (*Bibliotheca Lichenol.* 38: 145, 1990; key), Rambold & Printzen (*Mycotaxon* 44: 453, 1992; N America), Lumbsch (*J. Hattori bot. Lab.* 83: 1, 1997), Coppins & Kantvilas (*Bibliotheca Lichenol.* 78: 35, 2001), Timdal (*Bryologist* 105: 219, 2002), Coppins & Fryday (*Lichenologist* 38: 93, 2006), Lumbsch *et al.* (*MR* 111: 1133, 2007).
- Rimulariaceae** Hafellner (1984) = Trapeliaceae.
Lit.: Lumbsch *et al.* (*MR* 105: 265, 2001), Lumbsch *et al.* (*MR* 111: 1133, 2007).
- rimulose**, having small cracks. Cf. *rimose*.
- rind**, sometimes used for the firm outer layer of a rhizomorph or other organ; cortex (q.v.).
- ring** (1) see annulus (Fig. 4C); (2) (of liquid cultures, esp. of bacteria), growth at the surface, sticking to the glass; - **wall building**, see wall building.
- Ringueletium** J.J. Garcia (1990), Microsporidia. 1.
- ringworm**, see *tinea*.
- Rinia** Penz. & Sacc. (1901) = *Erikssonina* fide Petrak (*Annls mycol.* 29: 390, 1931).
- Rinodina** (Ach.) Gray (1821), Physciaceae (L). c. 265, widespread. See Sheard (*Lichenologist* 3: 328, 1967; Brit. spp.), Lamb (*Br. Antarct. Surv. Sci. Rep.* 61, 1968; Antarctica), Mayrhofer & Poelt (*Bibliotheca Lichenol.* 12, 1979; Eur. saxic. spp.), Poelt & Mayrhofer (*Beih. Sydowia* 8: 312, 1979; spore types), Hecklau *et al.* (*Herzogia* 5: 489, 1981; chemistry), Mayrhofer (*J. Hattori bot. Lab.* 55: 327, 1984; Eur., key 95 spp.), Mayrhofer (*Beih. Nova Hedwigia* 79: 571, 1984; key 20 spp. Austral.), Giralt & Matzer (*Lichenologist* 26: 319, 1994; S. Eur.), Giralt *et al.* (*Mycotaxon* 50: 47, 1994; pannarin-cont. spp.), Giralt *et al.* (*Lichenologist* 27: 3, 1995; S. Eur.), Sheard (*Herzogia* 11: 115, 1995; disjunct distr.), Matzer & Mayrhofer (*Bothalia* 26: 11, 1996; S. Afr.), Giralt & Llimona (*Mycotaxon* 62: 175, 1997; Iberian spp.), Giralt *et al.* (*Mycotaxon* 61: 103, 1997; Benelux), Sarv (*Folia Cryptog. Estonica* 31: 30, 1997; Estonia), Matzer *et al.* (*N.Z. J Bot.* 36: 175, 1998), Grube & Arup (*Lichenologist* 33: 63, 2001; phylogeny), Nordin & Mattsson (*Lichenologist* 33: 3, 2001; polyphyly), Sheard & Mayrhofer (*Bryologist* 105: 645, 2002; N America), Wedin *et al.* (*Taxon* 51: 655, 2002; phylogeny), Helms *et al.* (*Mycol.* 95: 1078, 2003; phylogeny, polyphyly), Simon *et al.* (*J. Mol. Evol.* 60: 434, 2005; introns), Kaschik (*Bibliotheca Lichenol.* 93, 2006; S hemisphere), Lendemer & Sheard (*Bryologist* 109: 562, 2006), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Mayrhofer & Sheard (*Bibliotheca Lichenol.* 96: 229, 2007; *R. archaea* group).
- Rinodinella** H. Mayrhofer & Poelt (1978), Physciaceae (L). 2, Europe. See Giralt & Llimona (*Mycotaxon* 62: 175, 1997; Iberian spp.), Grube & Arup (*Lichenologist* 33: 63, 2001; morphology, phylogeny), Helms *et al.* (*Mycol.* 95: 1078, 2003; phylogeny), Kaschik (*Bibliotheca Lichenol.* 93, 2006).
- Rinomia** Nieuwl. (1916) = *Morinia*.
- Riopa** D.A. Reid (1969) = *Perenniporia* fide Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974).
- Ripartitella** Singer (1947), Agaricaceae. 1, America (tropical). Probably a separate family is justified. See Singer (*Mycol.* 39: 85, 1947), Halling & Franco-Molano (*Mycol.* 88: 666, 1996; Costa Rica), Hofstetter (*MR* 106: 1043, 2002; posn.).
- Ripartites** P. Karst. (1879), Tricholomataceae. 5, widespread. See Huijsman (*Persoonia* 1: 335, 1960), Pegler & Young (*Kew Bull.* 29: 659, 1974; spores), Urbonas (*Fungi and Lichens in the Baltic Region Abstracts*, Twelfth International Conference on Mycology and Lichenology: 130, 1993; posn.).
- Ripexicium** Hjortstam (1995), Corticiaceae. 1, Solomon Islands. See Hjortstam (*Mycotaxon* 54: 191, 1995).
- rishitin** (**rishitinol**), terpenoid phytoalexins (q.v.) from potato (*Solanum tuberosum*).
- Rivilata** Kohlm., Volkm.-Kohlm. & O.E. Erikss. (1998), Saccardiaceae. 1, USA. See Kohlmeyer *et al.* (*CJB* 76: 470, 1998).
- Rivulicola** K.D. Hyde (1997), ? Lasiosphaeriaceae. 2, Australia. See Hyde *et al.* (*Mycol.* 92: 1019, 2000), Ranghoo *et al.* (*Mycol.* 92: 1019, 2000).
- rivulose**, marked with lines like little rivers.
- Rizalia** Syd. & P. Syd. (1914), Sordariomycetes. 2 (on *Meliolaceae*), widespread (tropical). See Pirozynski (*Kew Bull.* 31: 595, 1977).
- Rizaliopsis** Bat., Castr., J.L. Bezerra & Matta (1964) = *Rizalia* fide Pirozynski (*Kew Bull.* 31: 595, 1977).
- RNA**, see Molecular biology.
- Roannaisia** T.N. Taylor, Galtier & Axsmith (1994), Fossil Fungi. 1 (Carboniferous), France. See Taylor *et al.* (*Review of Palaeobotany and Palynology* 83: 256, 1994).
- Robakia** Petr. (1952), anamorphic *Pezizomycotina*, St.0eH.?. 1, Norway. See Petrak (*Sydowia* 6: 372, 1952).
- Robergea** Desm. (1847), Stictidaceae. 8, widespread. See Sherwood (*Mycotaxon* 5: 1, 1977).
- Robertomyces** Starbäck (1905) = *Bagnisiella* fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).
- Robillarda** Castagne (1845) nom. rej. = *Pestalotiopsis* fide Nag Raj & Morgan-Jones (*Taxon* 21: 535, 1972), Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993).
- Robillarda** Sacc. (1882) nom. cons., anamorphic *Pezizomycotina*, Cpd.1eP.10. 5, widespread. See Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993).
- Robilliardiella** S. Takim. (1943) nom. dub., ? Dothideales.
- Robincola** Velen. (1947), ? Helotiales. 1, former Czechoslovakia.
- Robledia** Chardón (1929) = *Botryostroma* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Roburnia** Velen. (1947), ? Helotiales. 1, former Czechoslovakia.
- Roccella** DC. (1805) nom. cons., Roccellaceae (L). 26, widespread. See Tavares (*Revta Fac. Cienc. Lisb. sect. C* 6: 125, 1958; dyeing), Tehler (*CJB* 68: 2458, 1990; cladistics), Follmann *et al.* (*J. Hattori bot. Lab.* 75: 345, 1994), Myllys *et al.* (*Mol. Phylogen. Evol.*

- 12: 295, 1999), Myllys *et al.* (*Curr. Genet.* 36: 79, 1999; DNA), Follmann & Werner (*Bibliotheca Lichenol.* 75: 1, 2000; evolution), Follmann (*J. Hattori bot. Lab.* 90: 251, 2001; key S American spp.), Follmann (*Mitteilungen aus dem Institut für Allgemeine Botanik Hamburg* 30-32: 61, 2002; biogeography), Tehler *et al.* (*Symb. bot. upsal.* 34 no. 1: 405, 2004; phylogeny, Europe, Macaronesia, Mediterranean), Lumbsch *et al.* (*Mol. Phylog. Evol.* 34: 512, 2005; phylogeny), Tehler (*Bibliotheca Lichenol.* 95: 517, 2007), Tehler & Irestedt (*Cladistics* 23: 432, 2007).
- Roccellaceae** Chevall. (1826), Arthoniales ($\pm$ L). 46 gen. (+ 62 syn.), 779 spp.
Lit.: Darbishire (*Bibl. bot.* 45, 1898), Follmann (*Nova Hedwigia* 31: 285, 1979), Torrente & Egea (*Bibliotheca Lichenol.* 32, 1989; Mediterranean, N. Afr.), Torrente & Egea (*Bibliotheca Lichenol.* 32: 282 pp., 1989), Tehler (*CJB* 68: 2458, 1990), Thor (*Op. bot.* 103: 92 pp., 1991), Egea *et al.* (*Pl. Syst. Evol.* 187: 103, 1993), Feige *et al.* (*Cryptog. bot.* 3: 101, 1993), Follman *et al.* (*Herzogia* 9: 653, 1993; chemistry), Lücking & Matzer (*Nova Hedwigia* 63: 109, 1996), Tehler & Egea (*Lichenologist* 29: 397, 1997), Tehler *et al.* (*Symb. bot. upsal.* 32: 255, 1997), Grube (*Bryologist* 101: 377, 1998), Henssen & Thor (*Nordic J. Bot.* 18: 95, 1998), Lohtander *et al.* (*Bryologist* 101: 404, 1998), Lohtander *et al.* (*Lichenologist* 30: 341, 1998), Myllys *et al.* (*Bryologist* 101: 70, 1998), Follmann & Peine (*J. Hattori bot. Lab.* 87: 259, 1999), Myllys *et al.* (*Lichenologist* 31: 461, 1999; DNA), Sparrius (*Bibliotheca Lichenol.* 89: 141 pp., 2004), Tehler *et al.* (*Symb. bot. upsal.* 34 no. 1: 405, 2004), Ertz *et al.* (*Bibliotheca Lichenol.* 91: 155 pp., 2005).
- Roccellaria** Darb. (1897) nom. rej. prop. = Roccellina
 See Tehler (*CJB* 68: 2458, 1990; cladistics), Grube (*Bryologist* 101: 377, 1998), Follmann (*Mitteilungen aus dem Institut für Allgemeine Botanik Hamburg* 30-32: 61, 2002; biogeography), Tehler (*Taxon* 56: 254, 2007; nomencl.).
- Roccellina** Darb. (1898) nom. cons. prop., Roccellaceae (L). 32, widespread. See Tehler (*Op. Bot.* 70, 1983; key), Tehler (*CJB* 68: 2458, 1990; cladistics), Tehler (*Acta Bot. Fenn.* 150: 185, 1994; phylogeny), Lohtander *et al.* (*Lichenologist* 30: 341, 1998; dispersal), Myllys *et al.* (*Lichenologist* 31: 461, 1999; phylogeny), Follmann (*J. Hattori bot. Lab.* 90: 251, 2001; key S American spp.), Follmann (*Mitteilungen aus dem Institut für Allgemeine Botanik Hamburg* 30-32: 61, 2002; biogeography), Tehler (*Taxon* 56: 254, 2007; nomencl.), Tehler & Irestedt (*Cladistics* 23: 432, 2007).
- Roccellinastraceae** Hafellner (1984) = Pilocarpaceae.
- Roccellinastrum** Follmann (1968), ? Pilocarpaceae (L). 3, Chile; Tasmania. See Kantvilas (*Lichenologist* 22: 79, 1990), Andersen & Ekman (*MR* 109: 21, 2005; phylogeny).
- Roccellodea** Darb. (1932) = Roccella fide Weber (*Mycotaxon* 27: 451, 1986), Follmann (*Akt. lichenol. Mitt. Essen* 5: 20, 1994), Follmann (*J. Hattori Bot. Lab.* 85: 257, 1998), Follmann *et al.* (*J. Hattori bot. Lab.* 85: 245, 1998).
- Roccellographa** J. Steiner (1902), Roccellaceae (L). 1, Socotra. See Tehler (*CJB* 68: 2458, 1990; cladistics), Myllys *et al.* (*Lichenologist* 31: 461, 1999; phylogeny).
- Roccellographomyces** Cif. & Tomas. (1953) $\equiv$ Roccellographa.
- Roccellomyces** E.A. Thomas ex Cif. & Tomas. (1953) $\equiv$ Roccella fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Roccellopsis** Elenkin (1929) = Roccella fide Eriksson & Hawksworth (*SA* 6: 150, 1987).
- Rocellinastrum** (orthographic variant), see *Roccellinastrum*.
- rock hair**, pendent brown, grey to black species of *Bryoria* which resemble human hair.
- rock tripe**, edible lichens of the genus *Umbilicaria*; *U. esculenta*, 'Iwatake', is still eaten in Japan; for details of its use see Sato (*Nova Hedw.* 16: 505, 1969), Mattick (*Nova Hedw.* 16: 511, 1969).
- rodlet**, structural unit of conidial and some hyphal walls composed of particles c. 50 Å diam. arranged in linear series (Hess *et al.*, *Mycol.* 60: 290, 1968).
- Rodríguez Hernández** (Miguel; 1949-2003; Cuba). Lecturer, Universidad Central de Las Villas (1973-1974); Lecturer, Universidad de la Habana and mycologist, then Head of the Mycological Laboratory, then Scientific Director, Jardín Botánico Nacional, Havana (1974-2003). An expert on tropical epiphyllous ascomycetes. As first and second President of the Asociación Latino-Americana de Micología (1990-1993, 1993-1996), and as organizing committee chairman for the first and second Congreso Latino-Americano de Micología (Havana, 1993, 1996), he played a pivotal role in developing an infrastructure for Latin American mycology. His later collaboration in digitizing fungal records from the Caribbean resulted in production of one of the largest regional checklists ever produced in mycology. *Publs.* (with Minter & Mena Portales) *Fungi of the Caribbean, an Annotated Checklist* (2001). *Biogs, obits etc.* Guzmán (*Inoculum* 55: 43, 2004).
- Rodwaya** Syd. & P. Syd. (1901) = Gyrodon fide Singer (*Farlowia* 2: 223, 1945).
- Rodwayella** Spooner (1986), Hyaloscyphaceae. 4, widespread (temperate). See Spooner in Dennis (*Fungi Hebrid.*: 383, 1986), Spooner (*Bibliotheca Mycol.* 116, 1987).
- Roesleria** Thüm. & Pass. (1877), Roesleriaceae. 1 (on *Vitis* roots), Europe; N. America. See Arnaud (*Annls Épiphyt.* 16: 235, 1930), Redhead (*CJB* 62: 2514, 1985), Nieder (*Pflanzensch.* 3: 24, 1987), Yao & Spooner (*Kew Bull.* 54: 683, 1999).
- Roesleriaceae** Y.J. Yao & Spooner (1999), Pezizomycotina (inc. sed.). 2 gen. (+ 1 syn.), 3 spp.
Lit.: Redhead (*CJB* 62: 2514, 1984), Véghelyi (*Acta phytopath. entom. Hung.* 24: 293, 1989), Yao & Spooner (*Kew Bull.* 54: 683, 1999).
- Roeslerina** Redhead (1985), Roesleriaceae. 2, Europe; N. America. See Redhead (*CJB* 62: 2514, 1985), Yao & Spooner (*Kew Bull.* 54: 683, 1999).
- Roestelia** Rebent. (1804), anamorphic *Gymnosporangium*. 14, widespread. Anamorph name for (I). See Kern (*Revised taxonomic account of Gymnosporangium*, 1973), Lee & Kakishima (*Mycoscience* 40: 109, 1999; ultrastr.).
- roestelioid** (of an aecium), long and tube-like, as in *Gymnosporangium*.
- Rogellia** Döbbeler (1999), Odontotremataceae. 1, Tierra del Fuego. See Döbbeler (*Haussknechtia Beih.* 9: 79, 1999), Döbbeler (*MR* 111: 1406, 2007).
- Rogergoosiella** A. Hern. Gut. & J. Mena (1996), anamorphic *Pezizomycotina*, Hso.???. 1, Cuba. See Hernández Gutiérrez & Mena Portales (*MR* 100:

- 1483, 1996).
- Rogersella** Liberta & A.J. Navas (1978), Schizoporaaceae. 1, widespread. See Langer (*Bibliotheca Mycol.* 154, 1994; sub *Hyphodontia*).
- Rogersia** Shearer & J.L. Crane (1976) = *Filospora* fide Crane & Shearer (*Mycotaxon* 6: 27, 1977).
- Rogersiomyces** J.L. Crane & Schokn. (1978), Sporidiobolaceae R.T. Moore. 1, USA; Taiwan. See Crane & Schoknecht (*Am. J. Bot.* 65: 903, 1978), Kirschner & Chen (*Sydowia* 55: 86, 2003; Taiwan).
- Rogerson** (Clark Thomas; 1918-2001; USA). Assistant in Plant Pathology, Utah State University (1938-1941); Technical Sergeant, US Army Evacuation Hospital, Solomon & Philippine Islands (1942-1945); Teaching Assistant with Fitzpatrick (q.v.), Cornell University (1946-1950); Assistant Professor then Associate Professor, Kansas State University (1950-1958); Curator of Cryptogamic Botany, New York Botanic Garden (1958 onwards). Noted for his studies of the *Hypocreales* where he was a pioneer in 'whole fungus' studies, assiduously connecting anamorphs with their teleomorphs; also contributed greatly to knowledge of the mycota of Utah. *Publs. The hypocrealean fungi. Mycol.* (1970); (with Samuels & Doi) *Hypocreales. Memoirs of the New York Botanic Garden* (1990); (with Rossman, Samuels & Lowen) *Genera of Bionectriaceae, Hypocreaceae, and Nectriaceae (Hypocreales, Ascomycetes). Studies in Mycology* (1999). *Biogs, obits etc.* Samuels & Fogel (*Mycol.* 95 (4): 773-779, 2003) [portrait].
- Rogersonia** Samuels & Lodge (1996), Hypocreaceae. 1, Puerto Rico. See Samuels & Lodge (*Sydowia* 48: 250, 1996), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- rohr**, extra-cellular infection apparatus of plasmodiophorids. See also *schlauch* and *stachel*.
- Roigiella** R.F. Castañeda (1984), anamorphic *Pezizomycotina*, HsyleH.10. 1, Cuba. See Castañeda (*Revta Jardín bot. Nac. Univ. Habana* 5: 62, 1984).
- Rolfidium** Moberg (1986), Ramalinaceae (L.). 1, Sri Lanka. See Moberg (*Lichenologist* 18: 305, 1986), Timdal (*Op. bot.* 110, 1991), Ekman (*Op. bot.* 127: 148 pp., 1996).
- Rollandina** Pat. (1905) = *Arachniotus* fide Roy *et al.* in Subramanian (Ed.) (*Taxonomy of fungi* 1: 215, 1978), Ghosh *et al.* (*Mycotaxon* 10: 21, 1979; SEM), Sugiyama & Mikawa (*Mycoscience* 42: 413, 2001; phylogeny).
- Rolueckia** Papong, Thammath. & Boonpr. (2008), Gomphillaceae (L.). 3. See Papong *et al.* (*Nova Hedwigia* 86: 201, 2008).
- Romanoa** Thirum. (1954), ? *Hypocreales*. 1 (in soil), Italy. See Thirumalachar (*Rendiconti Ist. Sup. Sanità* (Rome) 17: 1326, 1954).
- Romellia** Berl. (1900) = *Togninia* fide Barr (*Mycol.* 77: 549, 1985), Mostert *et al.* (*Stud. Mycol.* 54: 115 pp., 2006), Réblová & Mostert (*MR* 111: 299, 2007; phylogeny).
- Romellia** Murrill (1904) = *Phaeolus*.
- Romellina** Petr. (1955), *Pezizomycotina*. 1 (on insects), Java. See Petrak (*Sydowia* 9: 597, 1955).
- Romjularia** Timdal (2007), Porpidiaceae (L.). 1, Europe; USA. See Timdal (*Lichen Flora of the Greater Sonoran Desert Region* 3: 287, 2007).
- Ronnigeria** Petr. (1947), Leptopeltidaceae. 1, Europe. See Holm & Holm (*Bot. Notiser* 130: 115, 1977).
- root nodules**, of legumes are caused by nitrogen-fixing bacteria of the genus *Rhizobium*; those of spp. of *Alnus*, *Elaeagnus*, *Hippophaë* and *Myrica* by members of the *Plasmodiophorales* fide Hawker & Fraymouth (*J. gen. Microbiol.* 5: 369, 1951).
- Root rots of cereals**. Various fungi are implicated, including *Cochliobolus sativus*, *Fusarium graminearum*, *Gaeumannomyces graminis*, *Monographella nivalis*, *Pythium* and *Rhizoctonia* spp. Successive cropping of the same cereal may exacerbate losses which, in the case of take-all disease caused by *G. graminis*, have been reported as up to 60% of the crop. Biological control using various fungi (e.g. *Idriella bolleyi* and *Phialophora graminicola*) may be possible. See: Deacon (*Plant pathology* 22: 149, 1973), Duczek (*Can. J. Plant Path.* 19: 402, 1997), Garrett (*Root disease fungi*, 1944, *Biology of root-infecting fungi*, 1956, *Pathogenic root-infecting fungi*, 1970), Simmonds (*Bot. Rev.* 7: 308, 1941; 19: 131, 1953). See also take-all.
- Ropalospora** A. Massal. (1860), Ropalosporaceae (L.). 9, widespread (arctic-alpine). See Hertel (*Mitt. bot. StSamml., München* 17: 537, 1981), Purvis *et al.* (*Lichen Flora of Great Britain and Ireland*, 1992; synonymy with *Fuscidea*), Ekman (*Bryologist* 96: 582, 1993), Kantvilas (*Bibliotheca Lichenol.* 78: 169, 2001; Tasmania), Bylin *et al.* (*Bibliotheca Lichenol.* 96: 49, 2007; phylogeny).
- Ropalosporaceae** Hafellner (1984), Lecanoromycetidae (inc. sed.). 1 gen., 9 spp.
Lit.: Hafellner (*Beih. Nova Hedwigia* 79: 241, 1984), Bylin *et al.* (*Bibliotheca Lichenol.* 96: 49, 2007; phylogeny).
- Ropalosporia**, see *Ropalospora*.
- Roridella** E. Horak (2005) = *Roridomyces*.
- roridins**, terpinoid toxins of *Myrothecium roridum* and *M. verrucaria*; the cause of dendrochiotoxycosis (ill-thrift) in sheep, pigs, and humans.
- Roridomyces** Rexer (1994), Mycenaceae. 7, widespread (temperate). See Rexer (*Die Gattung Mycena s.l., Studien zu Ihrer Anatomie, Morphologie und Systematik*: [322] pp., 1994), Horak (*Röhrlinge und Blätterpilze in Europa, Fussend auf Moser, 5 Aufl.* (1983): *Kleine Kryptogamenflora Band 2, Teil b2. Gustav Fischer Verlag Bestimmungsschlüssel für Polyporales (p.p.), Boletales, Agaricales, Russulales*, 2005; as *Roridella*).
- roridous**, covered with drops of liquid like dew.
- Rosaria** N. Carter (1922), *Fungi*. 1.
- Rosasporina** Beneš (1956), *Fossil Fungi*. 1 (Carboniferous), former Czechoslovakia.
- Roscoepoundia** Kuntze (1898), anamorphic *Pezizomycotina*, St.0eH.?. 1, Europe.
- Rosellinia** De Not. (1844), Xylariaceae. Anamorphs *Dematophora*, *Geniculosporium*. 130, widespread. Root rots caused by *R. aquila* (mulberry, *Morus*), *R. arcuata* (tea), *R. bunodes* (tropical crops), *R. necatrix* (with *Dematophora* state) (apple, vine (*Vitis*), etc.), *R. pepo* (cacao), *R. quercina* (oak, *Quercus*). See Dargan & Thind (*Mycol.* 71: 1010, 1979; key Indian spp.), Francis (*Sydowia* 38: 75, 1985), Petrini *et al.* (*Sydowia* 41: 257, 1989), Ju & Rogers (*Mycol.* 82: 342, 1990), Matzer & Hafellner (*Bibliotheca Lichenol.* 37, 1990; lichenicolous taxa, now excluded), Ofong *et al.* (*MR* 95: 189, 1991; biology, pathogenicity), Sousa & Whalley (*Beih. Sydowia* 43: 281, 1991), Bermúdez & Carranza-Morse (*Revta Biol. trop.* 40: 43, 1992; anamorph), Petrini (*Sydowia* 44: 169, 1992; temperate spp.), Læssøe & Spooner

- (*Kew Bull.* 49: 1, 1993), Pande & Rao (*Czech Mycol.* 48: 177, 1995; India), San Martín González & Rogers (*Mycotaxon* 53: 115, 1995; Mexico), Stadler *et al.* (*MR* 105: 1191, 2001; chemistry), Schena *et al.* (*Eur. J. Pl. Path.* 108: 355, 2002; molecular diagnostics), Petrini (*N.Z. Jl Bot.* 41: 71, 2003; New Zealand), Schena & Ippolito (*Journal of Plant Pathology* 85: 15, 2003; rtPCR), Petrini & Petrini (*MR* 109: 569, 2005; morphology), Bahl *et al.* (*Mycol.* 97: 1102, 2005; phylogeny), Ju *et al.* (*Mycol.* 99: 612, 2007; phylogeny).
- Roselliniella** Vain. (1921), Sordariomycetidae. 12 (lichenicolous), widespread. See Matzer & Hafellner (*Biblthca Lichenol.* 37, 1990), Hoffmann & Hafellner (*Biblthca Lichenol.* 77: 1, 2000).
- Roselliniomyces** Matzer & Hafellner (1990), Sordariomycetidae. 1 (on lichens, *Trichothelium*), Costa Rica. See Matzer (*Cryptog. Mycol.* 14: 11, 1993), Matzer (*Mycol. Pap.* 171: 202 pp., 1996).
- Roselliniopsis** Matzer & Hafellner (1990), Sordariomycetidae. 5 (on lichens), Africa; north temperate. See Matzer & Hafellner (*Biblthca Lichenol.* 37, 1990), Matzer (*Cryptog. Mycol.* 14: 11, 1993).
- Rosellinites** Mesch. (1892), Fossil Fungi. 2 (Tertiary), Europe.
- Rosellinites** R. Potonié (1893), Fossil Fungi. 1 (Oligocene), Germany.
- Rosellinula** R. Sant. (1986), Dothideomycetes. 3 (on lichens), widespread. See Santesson (*SA* 5: 311, 1986).
- Rosenscheldia** Speg. (1885), Dothideomycetes. 3 or 4, widespread. See Holm (*Svensk bot. Tidskr.* 62: 217, 1968).
- Rosenscheldiella** Theiss. & Syd. (1915), Venturiaceae. c. 13, widespread (tropical). See Hansford (*Mycol. Pap.* 15, 1946), Swart (*TBMS* 58: 417, 1972), Sivanesan & Shivas (*Fungal Diversity* 11: 151, 2002).
- Rosenschoeldia** L. Holm (1968) = *Rosenscheldia*.
- Roseodiscus** Baral (2006), Helotiaceae. 3, widespread. See Baral & Krieglsteiner (*Acta Mycologica Warszawa* 41: 11, 2006).
- Roseofavolus** T. Hatt. (2003), Polyporaceae. 1, Singapore. See Stalpers (*in litt.*), Hattori (*Mycoscience* 44: 457, 2003) = *Grifola* fide.
- Roseograndinia** Hjortstam & Ryvarden (2005), Phanerochaetaceae. 1, widespread. See Hjortstam & Ryvarden (*Syn. Fung.* 20: 40, 2005).
- Rossiomyces** R.K. Benj. (2001), Laboulbeniaceae. 1, Poland. See Benjamin (*Aliso* 19: 132, 2000).
- Rossmania** Lar.N. Vassiljeva (2001) = *Tunstallia* fide Vasilyeva (*Mycoscience* 42: 401, 2001).
- Rostafiński** (Józef Thomasz; 1850-1928; Poland). Born in Warsaw; student (under E.A. Strasburger), Jena; student under de Bary (q.v.), Halle; Lecturer (1876-1881) then Professor of Botany (1881-1924), Cracow University. Noted for his work on *Mycetozoa*; also worked with Algae. *Publs. Śluzowce (Mycetozoa) Monografia* (1874) [re-issued with supplement, 1875]. *Biogs, obits etc.* Kulczynski (*Acta Societatis Botanicorum Poloniae* 6: 391, 1929); Stafleu & Cowan (*TL-2* 4: 908, 1983).
- Rostafinskia** Speg. (1880) nom. dub., ? Dothideomycetes.
- Rostania** Trevis. (1880) = *Collema* F.H. Wigg. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Rostkovites** P. Karst. (1881) = *Suillus* Gray fide Singer (*Farlowia* 2: 223, 1945).
- rostrate** (1) beaked; (2) (of asci), see ascus; bent tip of macroconidia of *Microsporium canis* and other anamorphic fungi.
- Rostraureum** Gryzenh. & M.J. Wingf. (2005), Cryphonectriaceae. 2, widespread. See Gryzenhout *et al.* (*MR* 109: 1039, 2005), Gryzenhout *et al.* (*Mycol.* 98: 239, 2006; phylogeny).
- Rostrella** Fabre (1879) = *Ceratocystis* fide de Hoog (*Stud. Mycol.* 7, 1974).
- Rostrella** Zimm. (1900) = *Ceratocystis* fide Bakshi (*Mycol. Pap.* 35, 1951).
- Rostrocoronophora** Munk (1953) = *Gnomonia* fide Bolay (*Ber. schweiz. bot. Ges.* 81, 1972).
- Rostronitschkia** Fitzp. (1919), Diatrypaceae. 1, Puerto Rico. See Petrak (*Sydowia* 5: 169, 1951), Rappaz (*Mycol. Helv.* 2: 285, 1987).
- Rostrosphaeria** Tehon & E.Y. Daniels (1927) = *Botryosphaeria* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Rostrospora** Subram. & K. Ramakr. (1952) = *Colletotrichum* fide Nag Raj (*CJB* 51: 2463, 1973).
- rostrum**, any beak-like process.
- Rostrup** (Emil; 1831-1907; Denmark). School teacher at Skaarup, southern Funen (1858-1883); lecturer (1883-1902) then Professor and Chief Consulting Pathologist (1902-1907), Royal Veterinary and Agricultural College, Copenhagen. Made significant contribution to knowledge of the fungi of Denmark; also a pioneer plant pathologist, particularly in forest pathology. Collections in Botanical Museum, Copenhagen (C) [catalogued by Lind, *Danish Fungi, as Represented in the Herbarium of E. Rostrup*, 1913]. *Publs. Plantepatologi. Haandbog i Læren om Plantesygdomme for Landbrugere Havebrugere og Skovbrugere* (1902). *Biogs, obits etc.* Grummann (1974: 679); Lind (*Danish Fungi, as Represented in the Herbarium of E. Rostrup*, pp. 1-9, 1913); Ravn (*Bericht der Deutschen Botanischen Gesellschaft* 26A: (47), 1909); Rosenvinge (*Botanisk Tidsskrift* 28: 185, 1908) [portrait]; Shear (*Phytopathology* 12: 1, 1922) [portrait]; Stafleu & Cowan (*TL-2* 4: 912, 1983).
- Rostrupia** Lagerh. (1889) = *Puccinia* fide Berndt (*in litt.*).
- Rostrupiella** Jørg. Koch, K.L. Pang & E.B.G. Jones (2007), Lulworthiaceae. 1, Denmark; USA. See Koch *et al.* (*Bot. Mar.* 50: 294, 2007).
- rostrupioid** (of *Pucciniales*), having teliospores as in *Rostrupia*.
- rosulate**, in a rosette.
- Rosulomyces** S. Marchand & Cabral (1976), anamorphic *Pezizomycotina*, Hso.0eH.39. 1, Argentina. See de Hoog (*Stud. Mycol.* 15, 1977).
- Rota** Bat., Cif. & Nascim. (1959), anamorphic *Pezizomycotina*, Cpt.1eH.?. 1, Brazil. See Batista *et al.* (*Mycopath. Mycol. appl.* 11: 58, 1959).
- Rotaea** Ces. ex Schltdl. (1851), anamorphic *Pezizomycotina*, Hsy. = eH.?. 1, Europe.
- Rotiferophthora** G.L. Barron (1991), anamorphic *Cordycipitaceae*, Hso.0eH.15/16. 22 (on rotifers), widespread. See Glockling & Dick (*MR* 98: 833, 1994), Glockling (*MR* 102: 1142, 1998; Japan), Zare *et al.* (*Nova Hedwigia* 73: 51, 2001).
- rots** (types of), see Wood-attacking fungi.
- Rotula** (Müll. Arg.) Müll. Arg. (1890) [non *Rotula* Lour. 1790, *Boraginaceae*] = *Mazosia*.
- Rotula** Raf. (1815) nom. dub., Agaricales. See Merrill

- (*Index Rafinesq.*, 1949).
- Rotularia** (Vain.) Zahlbr. (1923) [non *Rotularia* Sternb. 1825, fossil *Phanerogamae*] = *Mazosia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Roumegueria** (Sacc.) Henn. (1908), Dothideomycetes. c. 2, widespread (tropical).
- Roumegueriella** Speg. (1880), Bionectriaceae. Anamorph *Gliocladium*-like. 3 (coprophilous and in mushroom beds), widespread (temperate). See Malloch & Cain (*CJB* 50: 61, 1972), Udagawa *et al.* (*Mycoscience* 35: 409, 1994), Rehner & Samuels (*CJB* 73 Suppl. 1: S816, 1995; phylogeny), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Rossman *et al.* (*Mycol.* 93: 100, 2001; rDNA phylogeny), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Roumeguerites** P. Karst. (1879) = *Hebeloma* fide Singer (*Agaric. mod. Tax.*, 1951).
- Roussoella** Sacc. (1888), Didymosphaeriaceae. Anamorph *Cytoplea*. 20 (mostly on *Palmae* and bamboos), widespread (tropical). See Aptroot (*Nova Hedwigia* 60: 325, 1995; key), Hyde *et al.* (*MR* 100: 1522, 1996), Ju *et al.* (*Mycotaxon* 58: 419, 1996), Hyde (*MR* 101: 609, 1997), Kang *et al.* (*Fungal Diversity* 1: 147, 1998; DNA), Zhou *et al.* (*Cryptog. Mycol.* 24: 191, 2003; China).
- Roussoellopsis** I. Hino & Katum. (1965), Dothideomycetes. 3 (on bamboo), Japan. See Hino & Katumoto (*J. Jap. Bot.* 40: 86, 1965).
- Royella** R.S. Dwivedi (1960) nom. nud. = *Dichotomomyces* fide Scott (*TBMS* 55: 313, 1970).
- Royoporus** A.B. De (1996), Polyporaceae. 3, widespread. See De (*Mycotaxon* 60: 143, 1996).
- Royoungia** Castellano, Trappe & Malajczuk (1992), Boletaceae. 1, Australia. Basidioma gasteroid. See Castellano *et al.* (*Aust. Syst. Bot.* 5: 613, 1992).
- Rozella** Cornu (1872), Fungi. 22, widespread. Possible the earliest diverging lineage of the *Fungi*. See Sparrow (*Aquatic Phycomycetes* Edn 2: 167, 1960; key), Held (*Bot. Rev.* 47: 451, 1981), James *et al.* (*Mycol.* 98: 860, 2006; phylogeny).
- Roza** Cornu (1872) [non *Rozea* Besch. 1872, *Musci*] = *Rozella*.
- Rozites** P. Karst. (1879) = *Cortinarius* fide Peintner *et al.* (*Mycotaxon* 83: 447, 2002).
- r-selection**, adaptation to the rapid colonization and exploitation of newly opened or uncolonized habitats; in fungi generally involving large numbers of usually small and asexually produced and short-lived propagules, e.g. conidia, soredia; cf. K-selection. See Andrews, in Carroll & Wicklow (1992: 119), Armstrong (*Ecology* 57: 953, 1976), Boyce (*Ann. Rev. Ecol. Syst.* 15: 427, 1984), population biology, secondary species.
- Rubelia** Nieuwl. (1916) = *Sphaerosporula*.
- Rubeolarius** Raith. (1981) = *Clitocybe* fide Kirk (*in litt.*).
- Rubetella** Tuzet, Rioux & Manier ex Manier (1964) = *Smittium* fide Lichtwardt (*Am. J. Bot.* 51: 836, 1964).
- Rubigo** (Pers.) Roussel (1806) = *Uredo* fide Berndt (*in litt.*).
- Rubikia** H.C. Evans & Minter (1985), anamorphic *Pezizomycotina*, St.#eP.1. 1, pantropical. See Evans & Minter (*TBMS* 84: 57, 1985), Dulymamode *et al.* (*MR* 102: 1242, 1998; Mauritius).
- Rubinoboletus** Pilát & Dermek (1969) = *Chalciporus* fide Kuyper (*in litt.*).
- rubratoxin B**, a toxic metabolite of *Penicillium rubrum* P-13 (Hayes & Wilson, *Appl. Microbiol.* 16: 1163, 1968) causing hepatitis in cattle and pigs.
- Rubrinectria** Rossman & Samuels (1999), Nectriaceae. Anamorph *Nalanthamala*. 1 (dead wood etc.), widespread (pantropical). See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Schroers *et al.* (*Mycol.* 97: 375, 2005; phylogeny, anamorph).
- Rubromadurella** Talice (1935) = *Madurella* fide Ciferri & Redaelli (*Mycopathologia* 3: 182, 1941).
- Rubroporus** Log.-Leite, Ryvarden & Groposo (2002), Polyporaceae. 1, Brazil. See Loguercio-Leite *et al.* (*Mycotaxon* 83: 224, 2002).
- Rubrotricha** Lücking, Sérus. & Vězda (2005), Gomphillaceae (L.). 1, Ecuador. See Lücking *et al.* (*Lichenologist* 37: 165, 2005).
- ruderal** (1) living in waste places; (2) (of fungi) having a high growth rate, rapidly germinating spores, and a short life expectancy due to exhaustion of the available nutrients; cf. zymogenous (see autochthonous), sugar fungus.
- Rudetum** Lloyd (1919) = *Septobasidium* fide Stevenson & Cash (*Bull. Lloyd Libr. Mus.* 35: 47, 1936).
- Ruggieria** Cif. & Montemart. (1958), anamorphic *Pezizomycotina*, St.0fH.?. 1, Italy. *R. glaucescens* on *Citrus* (melanose).
- Rugosaria** Raf. (1833) nom. inval. = *Gemmularia*.
- rugose**, wrinkled (Fig. 20.14). Cf. rugulose.
- Rugosomyces** Raithelh. (1979) = *Calocybe* fide Kuyper (*in litt.*).
- Rugosopora** Heinem. (1973), Agaricaceae. 2, widespread (tropical). See Heinemann (*Bull. Jard. Bot. Nat. Belg.* 43: 12, 1973).
- rugulose**, delicately wrinkled. Cf. rugose.
- Ruhlandiella** Henn. (1903), Pezizaceae. 1, widespread (probably native to Australia). See also *Muciturbo*. See Dissing & Korf (*Mycotaxon* 12: 290, 1980), Warcup & Talbot (*MR* 92: 95, 1989), Galán & Moreno (*Mycotaxon* 68: 265, 1998; Europe), Hansen *et al.* (*Mycol.* 93: 958, 2001; phylogeny), Hansen *et al.* (*Mol. Phylogen. Evol.* 36: 1, 2005; phylogeny), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- rum**, see spirits.
- rumen fungi**, see anaerobic fungi.
- Ruminomyces** Y.W. Ho (1990) = *Anaeromyces* fide Letcher (*in litt.*).
- Rumpomycetes**. Class within the *Chytridiomycota* distinguished by the presence of a rumposome (q.v.) and including *Chytridiales* and *Monoblepharidales* but excluding *Spizellomycetales* (Cavalier-Smith, in Rayner *et al.* (Eds), *Evolutionary biology of the fungi*: 339, 1987). See James *et al.* (2000).
- rumposome**, an organelle in zoospores of certain *Chytridiomycota* located close to the cell wall; tooth-like in section and honey-comb like in surface view; see *Rumpomycetes*.
- rupestral (rupestrine)**, living on walls or rocks; cf. saxicolous.
- Rupinia** Speg. & Roum. (1879) [non *Rupinia* L. f. 1782, *Hepaticae*] = *Heydenia* fide Saccardo (*Syll. fung.* 4: 625, 1886).
- Rusavskia** S.Y. Kondr. & Kärnefelt (2003) = *Xanthoria* fide Kondratyuk & Kärnefelt (*Ukrainian Jour. Bot.* 60: 427, 2003), Gaya *et al.* (*MR* 112: 528, 2008).
- Ruspoliella** Sambo (1937) = *Solorina* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Russula** Pers. (1796), Russulaceae. c. 750, widespread. Gastroid forms are polyphyletic and have formerly been morphologically recognised as a separate genus.

See Crawshaw (*The spore ornamentation of the Russulas*, 1930), Pearson (*Naturalist Hull*: 85, 1948; key Brit. spp.), Schaeffer (*Russula Monographie*, 1951), Hesler (*Mem. Torrey bot. Club* 21, 1960), Blum (*Les Russules*, 1962; France), Hesler (*Mycol.* 53: 605, 1962; N. Am. types), Smith (*Mycol.* 55: 435, 1963; key), Watson (*TBMS* 49: 11, 1966; pigments), Romagnesi (*Les Russules d'Europe et Afrique du Nord*, 1967), Rayner (*Bull. BMS* 2: 76, 1968; keys Brit. spp.), Rayner (*Bull. BMS* 3: 59, 1969; keys Brit. spp.), Rayner (*Bull. BMS* 3: 89, 1969; keys Brit. spp.), Rayner (*Bull. BMS* 4: 19, 1970; descr. Brit. spp.), Burge (*Mycol.* 71: 977, 1979; spore structure), Pegler & Young (*TBMS* 72: 353, 1979), Rayner (*Keys to British species of Russula* edn 3, 1985), Sarnari (*Monografia illustrata del genere Russula in Europa*, 1998), Miller *et al.* (*Mycol.* 93: 344, 2001; phylogeny), Lebel (*N.Z. J. Bot.* 40: 489, 2002; New Zealand gasteroid spp.), Miller & Buyck (*MR* 106: 259, 2002; phylogeny European spp.), Lebel (*Aust. Syst. Bot.* 16: 401, 2003; australasian spp.), Moënne-Loccoz & Reumaux (*Les Russules Émétiques, Prolégomènes à Une Monographie des Emeticinae d'Europe et d'Amérique du Nord*: 264 pp., 2003), Miller (*Mycotaxon* 89: 283, 2004; southeastern USA), Buyck (*Cryptog. Mycol.* 26: 85, 2005; African spp.), Buyck *et al.* (*Boll. Gruppo Micol. 'G. Bresadola'* 46: 57, 2003; Costa Rica).

Russulaceae Lotsy (1907), Russulales. 5 gen. (+ 18 syn.), 1243 spp.

Lit.: Singer & Smith (*Mem. Torrey bot. Club* 21, 1960), Smith (*Mycol.* 54: 626, 1962), Pegler & Young (*TBMS* 72: 353, 1973), Beaton *et al.* (*Kew Bull.* 33: 669, 1984; Austr. spp.), Mueller & Gardes (*MR* 95: 592, 1991), Mueller (*Fieldiana, Bot.* 30: 158 pp., 1992), Bougher *et al.* (*MR* 97: 613, 1993; generic delimitation), Mueller & Ammirati (*Am. J. Bot.* 80: 322, 1993), Henrion *et al.* (*Mol. Ecol.* 3: 571, 1994), Mueller *et al.* (*Mycol.* 85: 890, 1993), Buyck (*Russulales News* 3: 3, 1995), Sweeney *et al.* (*MR* 100: 1515, 1996), Mueller (*Revta Biol. trop.* 44: 131, 1996), Mueller (*Mycotaxon* 61: 205, 1997), Buyck & Horak (*Mycol.* 91: 532, 1999), Gherbi *et al.* (*Mol. Ecol.* 8: 2003, 1999), Kropp & Mueller (*Laccaria – Ectomycorrhizal fungi, key genera in profile*, 1999; generic classification), Martin *et al.* (*MR* 103: 203, 1999), Martin *et al.* (*Microbiology (Reading)* 145: 1605, 1999), Hibbett *et al.* (*Nature* 407: 506, 2000), Moncalvo *et al.* (*Syst. Biol.* 49: 278, 2000), Bougher & Lebel (*Aust. Syst. Bot.* 14: 439, 2001), Fiore-Donno & Martin (*New Phytol.* 152: 533, 2001), Miller *et al.* (*Mycol.* 93: 344, 2001; phylogeny), Binder & Bresinsky (*Mycol.* 94: 85, 2002), Binder & Hibbett (*Mol. Phylogen. Evol.* 22: 76, 2002), Eberhardt (*Mycol. Progr.* 1: 201, 2002), Miller & Buyck (*MR* 106: 259, 2002), Moncalvo *et al.* (*Mol. Phylogen. Evol.* 23: 357, 2002), Desjardin (*Mycol.* 95: 148, 2003), Larsson & Larsson (*Mycol.* 95: 1037, 2003), Lebel (*Aust. Syst. Bot.* 16: 401, 2003), Miller & Henkel (*Mem. N. Y. bot. Gdn* 89: 297, 2004), Shimonono *et al.* (*Mycoscience* 45: 303, 2004), Wang *et al.* (*Nova Hedwigia* 79: 511, 2004).

Russulales Kreisel ex P.M. Kirk, P.F. Cannon & J.C. David (2001). Agaricomycetes. 12 fam., 80 gen., 1767 spp. Ectomycorrhizal, saprobic or pathogenic on trees, basidiomata epigeous or partly hypogeous, cosmopolitan.

The order *Russulales* has the same circumscription

as the russuloid clade in Hibbett & Thorn (*The Mycota* 7B, 2001). It contains lamellate, poroid, hydroid and gasteroid representatives. The classification is based on Miller *et al.* (*Mycol.* 98: 960, 2006). Fams:

- (1) **Albatrellaceae**
- (2) **Amylostereaceae**
- (3) **Auriscalpiaceae**
- (4) **Bondarzewiaceae**
- (5) **Echinodontiaceae**
- (6) **Hericiaceae**
- (7) **Hybogasteraceae**
- (8) **Lachnocladiaceae**
- (9) **Peniophoraceae**
- (10) **Russulaceae**
- (11) **Stephanosporaceae**
- (12) **Stereaceae**

Lit.: Heim (*TBMS* 30: 161, 1948; phylogeny and classification), Malençon (*Recueil trav. crypt. L. Mangin*: 377, 1931), Pegler & Young (*TBMS* 72: 353, 1979; classification, spore structure), Singer *et al.* (*Beih. Nova Hedw.* 77, 1983), Singer & Smith (*Mem. Torrey bot. Cl.* 21: 1, 1960; gasteroid genera), Reijnders (*Persoonia* 9: 65, 1976; development), Beaton *et al.* (*Kew Bull.* 39: 669, 1984; Austral. gasteroid spp.), Bourdot & Galzin (1927), Donk (1964: 255), Hjortstam & Ryvarde (*Corticaceae of North Europe*, 8 vols., 1973-88), Jülich (*Willdenowia Beih.* 7, 1972; *Athelieae*), Parmasto (*Conspectus Systematis Corticacearum*, 1968; 11 subfam.), Hjortstam (*Windahlia* 17: 55, 1987; gen. & spp. checklist), Maekawa (*Rep. Tottori Mycol. Inst.* 31: 1, 1993; Japanese spp.), and under fams.

Russulina J. Schröt. (1889) = *Russula* fide Singer & Smith (*A monograph on the genus Galerina* Earle, 1964).

Russuliopsis J. Schröt. (1889) = *Laccaria*.

rust (1) a disease caused by one of the *Pucciniales*; (2) one of the *Pucciniales*; (3) a disease with 'rusty' symptoms; **black (stem)** - of cereals, *Puccinia graminis*; **blister** - of *Pinus* and *Ribes*, *Cronartium ribicola*; **brown (leaf)** - of barley, *P. hordei*; of rye and wheat, *P. recondita*; **crown** - of oats, *P. coronata*; **red** -, (1) urediniospore state of cereal rusts, esp. *Puccinia graminis*; (2) (of tea) the alga *Cephaleuros*; **white** - (1) (esp *Cruciferae*) = white blister; (2) (of *Chrysanthemum*) = *P. horiana*; **yellow (stripe)** - of cereals, *P. striiformis*.

Ruthea Opat. (1836) = *Paxillus*.

Ruthiaceae Bat., J.A. Lima & M.A. Tatlasse{?} (1962) = *Strigulaceae*.

Rutola J.L. Crane & Schokn. (1978), anamorphic *Pezizomycotina*, Hso. = eP.1. 1, widespread. See Crane & Schoknecht (*CJB* 55: 3015, 1977).

Rutstroemia P. Karst. (1871) nom. cons., Rutstroemiaceae. Anamorphs *Myrioconium*, *Phialophora*-like. c. 75, widespread. See Holm (*TBMS* 67: 333, 1976), Korf & Dumont (*Mycotaxon* 5: 517, 1977; status), Holm (*Mycotaxon* 7: 139, 1978; status), Kohn & Schumacher (*Mycotaxon* 18: 531, 1983), Kohn & Schumacher (*Taxon* 33: 507, 1984; nomencl.), Baral (*SA* 13: 113, 1994; concept), Holst-Jensen *et al.* (*Mycol.* 89: 885, 1997; phylogeny), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006; phylogeny).

Rutstroemiaceae Holst-Jensen, L.M. Kohn & T. Schumach. (1997), Helotiales. 7 gen. (+ 8 syn.), 223 spp.

Lit.: Korf & Zhuang (*Mycotaxon* 24: 361, 1985),

- Baral (Z. Mykol. 53: 119, 1987), Spooner (*Bibliotheca Mycol.* 116: 711 pp., 1987), Kohn & Grenville (*CJB* 67: 371, 1989; anatomy), Zhuang (*Mycosystema* 8-9: 15, 1995), Holst-Jensen *et al.* (*Mycol.* 89: 885, 1997; phylogeny), Schumacher & Holst-Jensen (*Mycoscience* 38: 55, 1997), Zhuang & Wang (*Mycotaxon* 64: 449, 1997), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006).
- Ruzenia** O. Hilber ex A.N. Mill. & Huhndorf (2004), Lasiosphaeriaceae. Anamorph *Selenosporella*-like. 2. See Miller & Huhndorf (*MR* 108: 26, 2004; separation from *Lasio-sphaeria*).
- Ryparobius** Boud. (1869) = *Thelebolus* fide Kimbrough & Korf (*Am. J. Bot.* 54: 9, 1967).
- Ryssospora** Fayod (1889) = *Pholiota* fide Kuyper (*in litt.*).
- Ryvardenia** Rajchenb. (1994), Polyporaceae. 2, widespread. See Rajchenberg (*Nordic J Bot.* 14: 436, 1994).
- SA, see Media.
- Saagaromyces** K.L. Pang & E.B.G. Jones (2003), Halosphaeriaceae. 3, widespread. See Pang *et al.* (*Mycol. Progr.* 2: 35, 2003).
- Sabalicola** K.D. Hyde (1995), ? Xylariaceae. 1, USA. See Hyde (*Nova Hedwigia* 60: 596, 1995).
- Sablicola** E.B.G. Jones, K.L. Pang & Vrijmoed (2004), Halosphaeriaceae. 1, China. See Pang *et al.* (*CJB* 82: 486, 2004).
- Sabouraud** (Raymond; 1864-1938; France). Voluntary military service, Lille (1885); student, Hôpital Cochin, Paris (1887); intern, Hôpital St Louis, Paris (1889-1890); medic, Hôpital St Antoine, Paris (1891-1894); Head of Laboratory (1894-1897) then Head of the Ecole Lailler (1897-1928), Hôpital St Louis, Paris. A dermatologist of Paris who revived and amplified the work of Gruby (q.v.); noted for his monumental researches on the dermatophytes; introduced procedures which shortened the treatment period for *tinea capitis* from 2 years to 3 months removing the need for segregated schools for infected children; his name is familiar to mycologists through 'Sabouraud agar'; also an amateur sculptor. *Publs. Les Teignes* (1910). *Biogs, obits etc.* Grigoraki (*Mycopathologia et Mycologia Applicata* 2: 171, 1939) [bibliography, portrait]; Pautrier (*Annales de Dermatologie, Série 7*, 9: 275, 1938) [portrait]; Pignot (*Mycopathologia et Mycologia Applicata* 7: 348, 1956) [portrait].
- Sabouraudiella** Boedijn (1953) = *Trichophyton* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Sabouraudites** M. Ota & Langeron (1923) = *Microsporum*.
- Saccardaea** Cavares (1894) nom. dub., anamorphic *Pezizomycotina*. See Tulloch (*Mycol. Pap.* 130: 36, 1972).
- Saccardia** Cooke (1878), Saccardiaceae. 3, widespread (subtropical). See von Arx (*Persoonia* 2: 421, 1963).
- Saccardiaceae** Höhn. (1909), ? Dothideomycetes (inc. sed.). 11 gen. (+ 7 syn.), 35 spp.
Lit.: Barr (*Mycotaxon* 29: 501, 1987), Hsieh *et al.* (*MR* 101: 897, 1997), Inácio & Dianese (*MR* 102: 695, 1998).
- Saccardinula** Speg. (1885), Elsinoaceae. 5, widespread (tropical). See Barr (*Mem. N. Y. bot. Gdn* 62, 1990).
- Saccardo** (Pier Andrea; 1845-1920; Italy). Doctorate, University of Padua (1867); Professor of Natural History (1869) then Professor of Botany and Prefect of the Botanic Gardens (1879), University of Padua. Established *Michelia* (1877-1881), a short-lived journal important for the number of new fungal taxa described in it; distributed exsiccata, prepared an early mycological colour chart (see Colour) and made a special study of pyrenomycetes and anamorphic fungi; his outstanding contribution was the *Sylloge Fungorum Omnium hucusque Cognitorum*, a huge compendium on which all systematic mycology rests. By Saccardo's time the amount of printed work on systematic mycology was great; much was hard to obtain, and it was in no order; for these reasons, Saccardo took up the work of listing with Latin descriptions, all the genera and species of fungi of which there was then knowledge; to do this it was frequently necessary to make new arrangements of old groups, and 'emendations' of numbers of genera and species; he made special use of his system of 'spore groups' (see Anamorphic fungi) and his classification has had to be taken into account by all later systematic mycologists; most of the genera and species of non-lichen-forming fungi described up to 1920 are listed [these volumes are freely available on-line; see Internet: catalogues & thesauri]. His specimens are in the fungal reference collection at Padua (PAD) [see Gola, *L'erbario di P.A. Saccardo, Catalogo*, 1930]. *Publs. Fungi Veneti Novi vel Critici* (1873-1878) [a series of individual papers published in *Atti della Società Veneto-Trentina di Scienze Naturali, Nuovo Giornale Botanico Italiano* and *Michelia*]; *Fungi Italici Autographice Delineati* (1877-1886) [1,500 small coloured figs]; (with P. Sydow (q.v.), A.N. Berlese (q.v.), G.B. de Toni, Mussat, D. Saccardo [his sone], Traverso & others) *Sylloge Fungorum Omnium hucusque Cognitorum* vols 1-23 (1882-1925) [vols 24-26 were issued after his death, between 1926 and 1972]. *Biogs, obits etc.* Grummann (1974: 521); Paganelli, *in* Minelli [ed.] (*The Botanical Garden of Padua 1545-1995*: 118, 1995); Stafleu & Cowan (*TL-2* 4: 1023, 1983); Zalin & Lazzari (*Carteggio Bresadola-Saccardo*, 1987) [correspondence].
- Saccardoia** Trevis. (1869) nom. rej. = *Pseudocyphellaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Saccardoella** Speg. (1879), Sordariomycetes. 2 or 19, widespread. See Hawksworth & Eriksson (*SA* 10: 52, 1991), Hyde (*Mycol.* 84: 803, 1992), Barr (*Mycotaxon* 51: 191, 1994; posn), Fallah & Shearer (*Mycol.* 93: 566, 2001), Cai *et al.* (*Mycotaxon* 84: 255, 2002; Philippines).
- Saccardomyces** Henn. (1904) = *Schweinitziella* fide Pirozynski (*Kew Bull.* 31: 595, 1977).
- saccate**, like a sac or bag.
- Saccharata** Denman & Crous (2004), Botryosphaeriaceae. Anamorphs *Fusicoccum*-like, *Diplodia*-like. 1, S. Africa. See Crous *et al.* (*CBS Diversity Ser.* 2: 104, 2004).
- Saccharicola** D. Hawksw. & O.E. Erikss. (2003), Masarinaceae. 2, Africa; S.E. Asia. See Eriksson & Hawksworth (*Mycol.* 95: 431, 2003).
- Saccharomyces** Meyen ex E.C. Hansen (1838), Saccharomycetaceae. 26, widespread. *S. cerevisiae* (with 25 races), 'brewer's yeast', is used in beer- and bread-making, and other fermentations. See von Arx *et al.* (*Stud. Mycol.* 14: 1, 1977), Martini & Kurtzman (*Int. J. Syst. Bacteriol.* 35: 508, 1985; DNA homol-

ogy), Stewart & Russell in Demain & Solomon (Eds) (*Biology of industrial micro-organisms*: 511, 1985; review biology), Kock *et al.* (*Appl. Microbiol. Biotechn.* 23: 499, 1986; fatty acids), Martini & Martini (*Antonie van Leeuwenhoek* 53: 77, 1987; DNA reassociation), Herskowitz (*Microbiol. Rev.* 52: 536, 1988; *S. cerevisiae* life-cycle, 166 refs.), Martini & Martini in Cantarelli & Lanzarini (Eds) (*Biotechnology applications in beverage production*: 1, 1989; nomencl. domesticated spp.), Tuite & Oliver (Eds) (*Saccharomyces* [Biotech. Handb.] 4, 1991), Barnett (*Yeasts* 8: 1, 1992; review taxonomy), Vaughan-Martini (*Syst. Appl. Microbiol.* 16: 113, 1993; key), Dujon *et al.* (*Nature* 369: 371, 1994; complete DNA sequence chromosome XI, and refs others), Ando *et al.* (*Biosc., Biotechn., Biochem.* 60: 1070, 1996; rDNA), Hampsey (*Yeast Chichester* 13: 1099, 1997; phenotypes), James *et al.* (*Int. J. Syst. Bacteriol.* 47: 453, 1997; phylogeny), Naumov *et al.* (*Syst. Appl. Microbiol.* 20: 595, 1997; biological species), Oda *et al.* (*Yeast Chichester* 13: 1243, 1997), Rinaldi *et al.* (*Mol. Biol. Evol.* 14: 200, 1997; mitochondria), Cherry *et al.* (*Nucl. Acids Res.* 26: 73, 1998; genome database), Cohn *et al.* (*Curr. Genet.* 33: 83, 1998; telomere sequences), Gouliamova & Hennebert (*Myco-taxon* 66: 337, 1998; phylogeny), McCullough *et al.* (*J. Clin. Microbiol.* 36: 1035, 1998; ITS), Montrocher *et al.* (*Int. J. Syst. Bacteriol.* 48: 295, 1998; phylogeny), Vaughan-Martini & Martini in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 358, 1998), Dlauchy *et al.* (*Syst. Appl. Microbiol.* 22: 445, 1999; restriction analysis), Duarte *et al.* (*Int. J. Syst. Bacteriol.* 49: 1907, 1999; enzymes), Mäntynen *et al.* (*Syst. Appl. Microbiol.* 22: 87, 1999; sour dough yeasts), Oda *et al.* (*Curr. Microbiol.* 38: 61, 1999; rDNA sequence), Petersen *et al.* (*Int. J. Syst. Bacteriol.* 49: 1925, 1999; karyotypes), Casaregola *et al.* (*Int. J. Syst. Evol. Microbiol.* 51: 1607, 2001; genome analysis), Hansen & Jakobsen (*Int. J. Food Microbiol.* 69: 59, 2001; in cheese), Hennequin *et al.* (*J. Clin. Microbiol.* 39: 551, 2001; microsatellite strain typing), Oda & Fujisawa (*Biosc., Biotechn., Biochem.* 65: 164, 2001; genetic variation), Pérez *et al.* (*FEMS Microbiol. Lett.* 205: 375, 2001; molecular techniques), Pérez *et al.* (*Lett. Appl. Microbiol.* 33: 461, 2001; microsatellites), Lopes *et al.* (*FEMS Yeast Res.* 1: 323, 2002; hybridisation), Mitterdorfer *et al.* (*Proteomics* 2: 1532, 2002; proteomics), Sebastiani *et al.* (*Research in Microbiology* 153: 53, 2002; hybridisation), Cliften *et al.* (*Science* N.Y. 300 no. 5629: 71, 2003; functional genomics), Kurtzman (*FEMS Yeast Res.* 4: 233, 2003; phylogeny), Kurtzman & Robnett (*FEMS Yeast Res.* 3: 417, 2003; phylogeny), Špírek *et al.* (*FEMS Yeast Res.* 3: 363, 2003; chromosomal evolution), Christie *et al.* (*Nucl. Acids Res.* 32 Database issue: D311, 2004; genome database), Kellis *et al.* (*Nature* Lond. 428 no. 6983: 617, 2004; evolution), Llanos *et al.* (*Syst. Appl. Microbiol.* 27: 427, 2004; clinical strains), Fay & Benavides (*PLoS Genetics* 1: e5 [66, 2005; population biology), Legras *et al.* (*Int. J. Food Microbiol.* 102: 73, 2005; microsatellites), Aa *et al.* (*FEMS Yeast Res.* 6: 702, 2006; population structure), Fares *et al.* (*Mol. Biol. Evol.* 23: 245, 2006; phylogenetic methodology), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).

Saccharomycetaceae G. Winter (1881), Saccharomycetales. 14 gen. (+ 14 syn.), 121 spp.

Lit.: von Arx (*Antonie van Leeuwenhoek* 38: 289,

1972), Kreger-van Rij in Ainsworth *et al.* (Eds) (*The Fungi* 4A, 1973), Redhead & Malloch (*CJB* 55: 1701, 1977), von Arx *et al.* (*Stud. Mycol.* 14: 1, 1977; gen. names), Batra in Subramanian (Ed.) (*Taxonomy of fungi* 1: 187, 1978), Gams *et al.* (*CBS Course of Mycology* edn 2: 59 pp., 1980), Kreger-van Rij (Ed.) (*Yeasts, a taxonomic study* 3rd edn, 1984), Viljoen *et al.* (*Antonie van Leeuwenhoek* 52: 45, 1986; fatty acid composition) and also under Yeasts (q.v.), Ando *et al.* (*Biosc., Biotechn., Biochem.* 60: 1063, 1996), Ando *et al.* (*Biosc., Biotechn., Biochem.* 60: 1070, 1996), Hudson *et al.* (*Genome Res.* 7: 1169, 1997), James *et al.* (*Int. J. Syst. Bacteriol.* 47: 453, 1997), James *et al.* (*Int. J. Syst. Bacteriol.* 48: 591, 1998), Kurtzman in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 111, 1998; key), Kurtzman & Blanz in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 69, 1998; rDNA), Kurtzman & Fell (*Yeasts, a taxonomic study* 4th edn: 3, 1998), Belloch *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 405, 2000), Fischer *et al.* (*Nature* Lond. 405: 451, 2000), Mortimer (*Genome Res.* 10: 403, 2000), Cliften *et al.* (*Science* N.Y. 300 no. 5629: 71, 2003), Kurtzman & Robnett (*FEMS Yeast Res.* 3: 417, 2003), Dujon *et al.* (*Nature* Lond. 430: 35, 2004), Edwards-Ingram *et al.* (*Genome Res.* 14: 1043, 2004), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny), Wu *et al.* (*FEMS Yeast Research* 8: 641, 2008; phylogeny, hybridization).

Saccharomycetales Kudryavtsev (1960). Saccharomycetidae. 13 fam., 88 gen., 906 spp. Mycelium absent or poorly developed, where present usually with septa which have a series of minute pores rather than a single simple pore; vegetative cells proliferating by budding (blastically) or by fission (thallically), the walls usually lacking chitin except around bud scars, sometimes with J+ gel; ascumata absent; asci formed singly or in chains, sometimes not strongly differentiated morphologically from vegetative cells, usually at least eventually evanescent; ascospores varied in shape, sometimes with equatorial or asymmetric thickenings. The teleomorphic ascomycetous yeasts, cosmop. in a very wide range of habitats. Fams:

- (1) **Ascoideaceae**
- (2) **Cephaloascaceae**
- (3) **Dipodascaceae**
- (4) **Endomycetaceae**
- (5) **Eremotheciaceae**
- (6) **Lipomycetaceae**
- (7) **Metschnikowiaceae**
- (8) **Phaffomycetaceae**
- (9) **Pichiaceae**
- (10) **Saccharomycetaceae**
- (11) **Saccharomycodaceae**
- (12) **Saccharomycopsidaceae**
- (13) **Trichomonascaceae**

Lit.: Eriksson *et al.* (*SA* 11: 119, 1993), Kurtzman (*in The Yeasts, a taxonomic Study*: 111, 1998; key), Kurtzman & Blanz (*in Kurtzman & Fell (Eds) The Yeasts, a taxonomic Study*: 69, 1998; rDNA), Viljoen & Kock (*Syst. Appl. Microbiol.* 14: 178, 1991; pyrolysis g.l.c. identification of yeasts).

Saccharomycetes Grüss (1928), Fossil Fungi ? Fungi. 915 (Devonian), Spitsbergen.

Saccharomycetes G. Winter (1880), Saccharomycotina. 1 ord., 13 fam., 95 gen., 915 spp. Subcl.:

Saccharomycetidae

Almost all of the non-filamentous (yeast-forming) *Ascomycota* are placed here.

- Lit.*: Barnett *et al.* (*Yeasts: Characteristics and Identification* edn 3, 2000), Kurtzman & Fell (Eds, *The Yeasts. A Taxonomic Study* edn 4, 1998), Kurtzman & Sugiyama (*in* McLaughlin *et al.* (Eds), *The Mycota* 7A: 179, 2001), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Saccharomycetidae** Tehler (1988), see *Saccharomycetes*.
- Saccharomycodaceae** Kudrjanzev (1960), *Saccharomycetales*. 3 gen. (+ 8 syn.), 18 spp.
- Lit.*: Simmons & Ahearn (*Mycol.* 77: 660, 1985), Tredoux *et al.* (*Syst. Appl. Microbiol.* 9: 299, 1987), Golubev *et al.* (*Antonie van Leeuwenhoek* 55: 369, 1989), Yamada *et al.* (*J. gen. appl. Microbiol.* Tokyo 38: 585, 1992), Boekhout *et al.* (*Int. J. Syst. Bacteriol.* 44: 781, 1994), Mikata & Nakase (*Microbiol. Culture Coll.* 13: 97, 1997), Miller & Phaff *in* Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 268, 1998), Miller & Phaff *in* Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 372, 1998), Phaff & Miller *in* Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 409, 1998), Smith *in* Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 214, 1998), Esteve-Zarzoso *et al.* (*Int. J. Syst. Bacteriol.* 49: 329, 1999), Cadez *et al.* (*FEMS Yeast Res.* 1: 279, 2002), Cadez *et al.* (*Int. J. Syst. Evol. Microbiol.* 53: 1671, 2003), Kurtzman & Robnett (*FEMS Yeast Res.* 3: 417, 2003), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Saccharomycodes** E.C. Hansen (1904), *Saccharomycodaceae*. 2, widespread (north temperate). See Yamada *et al.* (*J. gen. appl. Microbiol.* Tokyo 38: 585, 1992; phylogeny), Miller & Phaff *in* Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 372, 1998), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Saccharomycopsidaceae** Arx & Van der Walt (1987), *Saccharomycetales*. 1 gen. (+ 5 syn.), 13 spp.
- Lit.*: Ota & Morishita (*Microbios* 73: 149, 1993), Kurtzman & Robnett (*CJB* 73: S824, 1995), Yamada *et al.* (*Biosc., Biotechn., Biochem.* 60: 1303, 1996), Kurtzman & Smith *in* Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 374, 1998), Esteve-Zarzoso *et al.* (*Int. J. Syst. Bacteriol.* 49: 329, 1999), Kurtzman (*Mycotaxon* 71: 241, 1999), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Saccharomycopsis** Guilierm. (1912) = *Cyniclomyces*.
- Saccharomycopsis** Schiønning (1903), *Saccharomycopsidaceae*. 13, widespread (temperate). See Yamada *et al.* (*Biosc., Biotechn., Biochem.* 60: 1303, 1996; phylogeny), Kurtzman & Smith *in* Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 374, 1998), Kurtzman (*Mycotaxon* 71: 241, 1999), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Saccharomycotina** Schiønning (1903), *Saccharomycopsidaceae*. 13, widespread (temperate). See Yamada *et al.* (*Biosc., Biotechn., Biochem.* 60: 1303, 1996; phylogeny), Kurtzman & Smith *in* Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 374, 1998), Kurtzman (*Mycotaxon* 71: 241, 1999), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Saccharopolyspora** J. Lacey & Goodfellow (1975), *Actinobacteria*. q.v.
- Saccisporonites** Kalgutkar & Janson. (2000), Fossil Fungi, anamorphic *Ascomycota*. 1, USA. See Kalgutkar & Jansonius (*AASP Contributions Series* 39: 266, 2000).
- Saccoblastia** Möller (1895), *Saccoblastiaceae*. c. 3. See Jülich (*Persoonia* 9: 39, 1976).
- Saccoblastiaceae** Jülich (1982), *Atractiellales*. 2 gen., 4 spp.
- Lit.*: Bauer *et al.* (*Mycol. Progr.* 5: 41, 2006).
- Saccobolus** Boud. (1869), *Ascobolaceae*. 27, widespread. See van Brummelen (*Persoonia* Suppl. 1: 1, 1967; key), van Brummelen (*Persoonia* 8: 421, 1976), Kaushal & Viridi (*Willdenowia* 16: 269, 1986; Himalayan spp.), Dissing (*Op. Bot.* 100: 43, 1989), Landvik *et al.* (*Nordic J. Bot.* 17: 403, 1997; DNA), Ramos *et al.* (*Mycotaxon* 74: 447, 2000; isozymes), Giménez *et al.* (*Cryptog. Mycol.* 26: 3, 2005; Argentina), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny).
- Saccomorpha** Elenkin (1912) = *Placynthiella* Elenkin fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Saccomyces** Serbinow (1907), ? *Chytridiaceae*. 2, Europe.
- Saccopodium** Sorokīn (1877), ? *Cladochytriaceae*. 1, former USSR.
- Sacotheciaceae** Bonord. (1864) = *Dothioraceae*.
- Sacothecium** Fr. (1836), *Dothioraceae*. Anamorph *Aureobasidium*-like. c. 9, widespread. See Froidevaux (*Nova Hedwigia* 23: 679, 1973; key), Holm (*Taxon* 24: 475, 1975; status).
- Sachsia** Bay (1894), ? *Saccharomycetales*. 1, Europe.
- Sachsia** Lindner (1895) nom. dub., *Pezizomycotina*.
- Sacidium** Nees (1823) = *Pilobolus* fide von Höhnelt (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt. 1* 119: 617, 1910).
- Sacidium** Sacc. (1880) = *Pilobolus* fide Höhnelt (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt. 1* 119: 617, 1910) See, Sutton (*Mycol. Pap.* 141, 1977).
- Sackea** Rostk. (1844) = *Bovista* fide Stalpers (*in litt.*).
- Sadasivanella** Agnihothr. (1964) = *Neottiosporina* fide Sutton & Alcorn (*Aust. J. Bot.* 22: 517, 1974).
- Sadasivania** Subram. (1957), anamorphic *Pezizomycotina*, Hso.0eP.3. 3, widespread. See Sundberg & Wicklow (*Mycol.* 65: 925, 1973), Markovskaya & Treigienė (*Mikol. Fitopatol.* 38: 52, 2004).
- saddle fungus**, ascomata of *Helvella* spp.
- saddle-back fungus (dryad's saddle)**, basidioma of *Polyporus squamosus*.
- Saenkia** Kudrjanzev (1960) = *Saccharomycodes* fide Lodder (*Yeasts, a taxonomic study* 2nd edn, 1970).
- Safety, Laboratory**. Health & Safety legislation for places of work appropriate to the country in which the laboratory is operating should always be consulted. In addition to normal good laboratory practice (for example wearing suitable protective clothing, and prohibition of eating and smoking), further precautions should be taken to avoid laboratory hazards specific to mycology (e.g. see the European Community Directive 2000/54/CE on protection of workers from risks related to exposure to biological agents at work, website: http://europa.eu/eur-lex/pri/en/oj/dat/2000/l_262/l_26220001017en00210045.pdf; the UK Advisory Committee on Dangerous Pathogens, website: www.hse.gov.uk/aboutus/meetings/acdp).
- It must be remembered that many fungi pathogenic for humans are 'opportunistic', widespread saprobes, and their full potential to effect human health is rarely known (see Smith, *Opportunistic mycoses of man and other animals*, 1989). Fungi and other organisms can enter the body through the mouth, lungs, broken or unbroken skin, and the conjunctiva. However, in a laboratory the route of infection may not be

the same as when the disease is acquired elsewhere. Potential hazards may be greater in the laboratory than in nature if fungi are being grown in substantial numbers, transferred from one container to another, and manipulated, increasing the risk of infection. The main routes of infection are accidental inoculation, accidental ingestion, splashing into the face and eyes, spillage and direct contact. Good laboratory practice to keep cultures pure normally prevents their escape to cause infection, but note that the conditions provided for the growth of a particular fungus may also be suitable for the growth of a potentially hazardous contaminant.

Special precautions should be taken when harvesting bulk cultures or large quantities of spores. Fungi may also cause allergic reactions or mycotoxicoses (poisoning) and therefore contact with them and the materials or equipment they have been in contact with must be avoided.

Great care must be taken in handling the pathogens of coccidioidomycosis, histoplasmosis, and other systemic mycoses for there are many instances of laboratory infections by these fungi resulting in illness or even death (see Hanel & Kruse, *Misc. Publ. Fort Detrich, Dept. Army* 27, 1967; laboratory acquired mycoses).

In the European Community, the European Directive 2000/54/CE allocates fungi (and other organisms) to four hazard groups. Similar categories exist in other countries. See also *Biosafety in microbiological and biomedical laboratories* edn 4, 1999; downloadable in PDF format from www.cdc.gov/od/ohs/biosfty/bmbl4/bmbl4toc.htm; *Categorization of pathogens according to hazard and categories of containment*, edn 2, 1990): **Group 1:** A biological agent that is most unlikely to cause human disease.

Group 2: A biological agent that may cause human disease and which might be a hazard to laboratory workers but is unlikely to spread in the community. Laboratory exposure rarely produces infection and effective prophylaxis or treatment is available.

Group 3: A biological agent that may cause severe human disease and present a serious hazard to laboratory workers. It may present a risk of spread in the community but there is usually effective prophylaxis or treatment.

Group 4: A biological agent that causes severe human disease and is a serious hazard to laboratory workers. It may present a high risk of spread in the community and there is usually no effective prophylaxis or treatment.

Most fungi belong to category 1. The European Union directive (see above) lists the following species in category 2: *Aspergillus fumigatus*, *Candida* spp., *Cryptococcus neoformans*, *Emmonsia parva*, *Epidermophyton floccosum*, *Fonsecaea* spp., *Madurella* spp., *Microsporum* spp., *Neotestudina rosatii*, *Penicillium marneffii*, *Scedosporium apiospermum*, *Sporothrix schenckii* and *Trichophyton* spp. Only 5 fungi are included in category 3: *Blastomyces dermatitidis*, *Cladophialophora bantiana*, *Histoplasma capsulatum*, *Coccidioides immitis* and *Paracoccidioides brasiliensis* [Note: teleomorph names only listed where the fungi are pleomorphic; see generic entries for those of the anamorphs]. No fungi are placed in category 4. Other classifications of hazardous organisms are available (e.g. US Public

Health Service, *Classification of etiologic agents on the basis of hazard*, 1974 [also as an appendix to *Biosafety in microbiological and biomedical laboratories*, see above]; World Health Organization, *Laboratory biosafety manual*, edn 3, 2004; as a downloadable PDF file from www.who.int/csr/delibepidemics/WHO_CDS_CSR_LYO_2004_11/en/).

Increasing containment levels are prescribed by Health and Safety regulations for these hazard categories in most countries, and information on those which apply should be sought from appropriate national agencies before starting work with listed organisms.

Lit.: Collins (*Biologist* 23: 83, 1976; biological hazards), Fuscaldo *et al.* (*Laboratory safety. Theory and practice*, 1980; general, biological, medical), Collins (*Laboratory-acquired infections*, 1983), Miller (*Laboratory safety: principles and practices*, 1986), Simpson & Simpson (*The COSHH regulations: a practical guide*, 1991), Stricoff & Walters (*Handbook of laboratory health and safety*, edn 2, 1995).

See also Allergy, Human and veterinary mycology, Mycetism, Mycotoxins.

saffron milk-cap, basidioma of the edible *Lactarius deliciosus*.

Sagedia A. Massal. (1852) nom. rej. prop. = Porina Müll. Arg. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Sagedia Ach. (1809) nom. rej. = *Aspicilia* fide Laundon & Hawksworth (*Taxon* 37: 478, 1988).

Sagediomyces Cif. & Tomas. (1953) = *Strigula* fide Harris (*in litt.*).

Sagediopsis (Sacc.) Vain. (1921), Adelococcaceae. 7 (on lichens), widespread (esp. temperate). See Alstrup & Hawksworth (*Meddr Grønland Biosc.* 31, 1990; nomencl.), Hafellner (*Herzogia* 9: 749, 1993), Hoffmann & Hafellner (*Biblthca Lichenol.* 77: 1, 2000).

Sagema Poelt & Grube (1993), Lecanoraceae (L). 1, Nepal. See Grube & Poelt (*Graphis Scripta* 5: 69, 1993).

sagenetosome, see sagenogen.

Sagenidiopsis R.W. Rogers & Hafellner (1987), Arthoniaceae (L). 2, Australia; S. America. See Egea *et al.* (*Lichenologist* 27: 351, 1995; posn), Grube (*Bryologist* 101: 377, 1998; phylogeny).

Sagenidium Stirt. (1877), Roccellaceae (L). 3, S. America; Australia. See Henssen *et al.* (*Lichenologist* 11: 263, 1979), Grube (*Bryologist* 101: 377, 1998; phylogeny), Kantvilas (*Symb. bot. upsal.* 34 no. 1: 183, 2004; Tasmania).

sagenogen (sagenetosome), see bothrosome.

sagenogenetosome, see bothrosome.

sagenogens, Olive's (1975) modification of Porter's (1972) 'sagenogenetosomes', organelles from which the ectoplasmic nets of *Labyrinthulales* are produced. **Sagenoma** Stolk & G.F. Orr (1974), Trichocomaceae. Anamorph *Sagenomella*. 2, Australia; Japan. See Ueda & Udagawa (*Mycotaxon* 20: 499, 1984), Malloch in Samson & Pitt (Eds) (*Advances in Penicillium and Aspergillus systematics* 102: 365, 1985).

Sagenomella W. Gams (1978), anamorphic *Sagenoma*, Hso.0eH/1eP.3. 11, widespread. See Gams (*Persoonia* 10: 100, 1978), Gené *et al.* (*J. Clin. Microbiol.* 41: 1722, 2003; infection of dog).

Sageria A. Funk (1975), Helotiaceae. Anamorph *Ascoconidium*. 1 (on *Tsuga*), Canada. See Funk (*CJB* 53:

- 1196, 1975), Verkley (*Stud. Mycol.* 44: 180 pp., 1999; ultrastr.).
- Sagiolechia** A. Massal. (1854), ? Gomphillaceae (L). 6, Europe. See Vězda (*Folia geobot. phytotax.* 2: 383, 1968), Henssen (*Bibliotheca Lichenol.* 58: 123, 1995).
- Sagittospora** Lubinsky (1955), Chytridiales. 1 (on *Eudiplodinium* Protozoa in goat rumen), Pakistan. See Lubinsky (*Can. J. Microbiol.* 1: 683, 1955).
- Sagrahamala** Subram. (1972), anamorphic *Pezizomycotina*, Hso.0eH/1eP.15. 10, widespread. See Subramanian (*Curr. Sci.* 41: 48, 1972).
- Saitoa** Rajendran & Muthappa (1980) = *Neosartorya* fide Samson in Samson & Pitt (Eds) (*Advances in Penicillium and Aspergillus systematics* 102: 365, 1985; coenzyme-Q system).
- Saitoella** Goto, Sugiy., Hamam. & Komag. (1987), anamorphic *Protomycetaceae*, Hso.0eH.3/10. 1 (from soil), Himalaya. See Goto *et al.* (*J. gen. appl. Microbiol.* Tokyo 33: 76, 1987), Nishida & Sugiyama (*Mol. Biol. Evol.* 10: 431, 1993), Sjamsuridzal *et al.* (*Mycoscience* 38: 267, 1997), Ahearn *et al.* in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 600, 1998), Sugiyama *et al.* (*Mycol.* 98: 996, 2006; phylogeny).
- Saitomyces** Ricker (1906) = *Actinocephalum*.
- Sakaguchia** Y. Yamada, K. Maeda & Mikata (1994), *Cystobasidiomycetes*. 1 (from sea water), Antarctica. See Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 1351, 2000; mol. phylogeny), Scorzetti *et al.* (*FEMS Yeast Research* 2: 495, 2002).
- Sakireeta** Subram. & K. Ramakr. (1957) = *Tiarospora* fide Sutton (*Mycol. Pap.* 141, 1977).
- Saksenaea** S.B. Saksena (1953), *Radiomycetaceae*. 1, widespread. See Ellis & Hesseltine (*Mycol.* 66: 85, 1974), Ajello *et al.* (*Mycol.* 68: 53, 1976; on humans), Ellis & Ajello (*Mycol.* 74: 144, 1982), Chien *et al.* (*TMSJ* 33: 443, 1992), Mathews *et al.* (*J. Mycol. Médic.* 3: 95, 1993; causing zygomycosis, lit. review), Pillai & Ahmed (*Curr. Sci.* 65: 291, 1993), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny), Prabhu & Patel (*Clin. Microbiol. Infect.* 10 Suppl. 1: 31, 2004; zygomycosis, review).
- Saksenaeaceae** Hesselt. & J.J. Ellis (1974) = *Radiomycetaceae*.
Lit.: Kirk (*in litt.*).
- Saliastrum** Kujala (1946), anamorphic *Pezizomycotina*, Hso.0bP.1. 1, Europe; Canada. See Redhead & Perrin (*CJB* 50: 2083, 1972), Sutton (*Mycol. Pap.* 141, 1977).
- Salmonia** S. Blumer & E. Müll. (1964) = *Brasiliomyces* fide Braun (*Nova Hedwigia* 34: 704, 1981).
- Salmonomyces** Chidd. (1959) = *Erysiphe* fide Zheng (*Mycotaxon* 22: 209, 1985).
- Salsuginea** K.D. Hyde (1991), *Dothideomycetes*. 1 (marine), Thailand. See Eriksson & Hawksworth (*SA* 11: 73, 1992; posn).
- saltation** (of fungi), mutation; dissociation; see Variation in fungi.
- Samarospora** Rostr. (1892), ? *Eurotiales*. 1, Europe.
- Samarosporella** Linder (1944) nom. dub., *Fungi*. See Kohlmeyer (*CJB* 50: 1951, 1972).
- Samboa** Tomas. & Cif. (1952) nom. dub. ? = *Buellia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Samboamyces** Cif. & Tomas. (1953) = *Samboa*.
- Sambucina** Velen. (1947), ? *Helotiales*. 1, former Czechoslovakia.
- sambucinin**, see enniatin.
- Sampaioa** Gonz. Frag. (1923) = *Mycoglaena* fide Checa (*Mycotaxon* 63: 467, 1997).
- Samuelsia** Chaverri & K.T. Hodge (2008), *Clavicipitaceae*. 5, neotropics. See Chaverri *et al.* (*Stud. Mycol.* 60, 2008; phylogeny).
- Samukuta** Subram. & K. Ramakr. (1957) = *Neottiospora* fide Nag Raj (*CJB* 51: 2463, 1973).
- Sand dune fungi**. Sand dunes have a characteristic mycota of both microfungi (Moreau & Moreau, *Rev. Mycol.* 6: 49, 1941, Dickinson & Kent, *TBMS* 58: 269, 1972) and macrofungi (Andersson, *Op. bot. Soc. bot. Lund* 2, 1950, Bon, *BSMF* 86: 79, 1970, Picardy; 88: 15, 1972; *Lepiota*, Courtecuisse, *Docums Mycol.* fasc. 57-58, 66, 1984-1986, Høiland, *Blyttia* 33: 127, 1975, 35: 139, 1977, 36: 69, 1978, Jaiswal & Rodrigues (*Curr. Sci.* 80: 827, 2001; mycorrhizal fungi in coastal dunes of Goa, India), Singer (*Mycopathologia* 34: 129, 1968; on south Atlantic coast from Uruguay to Bahía Blanca, Argentina), Watling & Rotheroe, *Proc. R. Soc. Edinb.* 96: 111, 1989) which, like that of flowering plants, exhibits a zonation from the shore sand to fixed dune (Wallace, *Trans. Devon. Ass. Advmt Sci.* 86: 201, 1954; Cordoba *et al.* (*Mycoscience* 42: 379, 2001; diversity gradients of mycorrhizal fungi in coastal dunes of Brazil)). Macrofungi play a role in facilitating dune colonization by flowering plants and in sustaining coastal dune systems (Logan *et al.*, *Aust. J. Pl. Physiol.* 16: 141, 1989; mycorrhizal fungi enhancing Australian coastal dune ecosystems), both by the action of fungal hyphae in accretion of sand particles and as mycorrhizal symbionts (see Rotheroe, in Pegler *et al.* (Eds), *Fungi of Europe*, 1993). Characteristic lichen communities frequently develop on stable sand dunes and are usually dominated by species of *Cladonia*; succession in the lichen communities is correlated with the stability of the substratum (see James *et al.*, in Seaward (Ed.), *Lichen ecology*: 400, 1977). See also Ecology, Marine fungi.
- Sandersoniomyces** R.K. Benj. (1968), *Laboulbeniaceae*. 1, USA. See Benjamin (*Aliso* 10: 345, 1983), Tavares (*Mycol. Mem.* 9: 627 pp., 1985).
- sandimmum**, see cyclosporin A.
- Sanjuanomyces** R.F. Castañeda & W.B. Kendr. (1991), anamorphic *Pezizomycotina*, Hso. = eP.24. 1, Cuba. See Castañeda Ruiz & Kendrick (*Univ. Waterloo Biol. Ser.* 35: 93, 1991).
- Santapauella** Mundk. & Thirum. (1945) = *Phragmidella* fide Thirumalachar & Mundkur (*Indian Phytopath.* 2: 193, 1949).
- Santapauinda** Subram. (1994), anamorphic *Pezizomycotina*, Hso.#eP.1. 1, India. See Subramanian (*Kavaka* 20/21: 58, 1992/1993).
- Santessonia** Hale & Vobis (1978), *Caliciaceae* (L). 6, Africa; S. America. See Sérusiaux & Wessels (*Mycotaxon* 19: 479, 1984; key), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998; DNA), Nordin & Mattsson (*Lichenologist* 33: 3, 2001; phylogeny), Helms *et al.* (*Mycol.* 95: 1078, 2003; phylogeny), Follmann (*J. Hattori bot. Lab.* 100: 651, 2006; revision, S America).
- Santessoniella** Henssen (1997), ? *Pannariaceae* (L). 11, widespread (temperate). See Henssen (*Symb. bot. upsal.* 32: 75, 1997), Henssen (*Lichenologist* 32: 57, 2000; S America), Henssen & Kantvilas (*Lichenologist* 32: 149, 2000; Tasmania), Jørgensen (*Bibliotheca Lichenol.* 88: 229, 2004), Spribille *et al.* (*Bibliotheca Lichenol.* 96: 287, 2007; N America).

- Santessoniolichen** Tomas. & Cif. (1952) = *Naetrocymbe* Körb. fide Harris (*More Dematiaceous Hyphomycetes*, 1995).
- Santessoniomycetes** Cif. & Tomas. (1953) = *Santessoniolichen*.
- Santiella** Tassi (1900) = *Passeriniella* fide Sutton & Sellar (*CJB* 44: 1505, 1966).
- Sappinia** P.A. Dang. (1896) nom. dub., Protozoa. Excluded from *Mycetozoa* by Olive (1975: 6).
- saprobe** (**saprogen**, **saprotroph**), an organism using dead organic material as food, and commonly causing its decay (saprobe is the preferred term for fungi); **saprobic**, **saprogen-ic** (-ous), **saprophilous**, **saprotrophic** (adj.). See Hudson (*Fungal saprophytism*, edn 2, 1980), saprophyte.
- Saprochaetaceae** Coker & Shanor ex D.T.S. Wagner & Dawes (1970) = *Dipodascaceae*.
- Saprochaete** Coker & Shanor (1939), anamorphic *Magnusiomyces*, Hso.0fH.10. 14, widespread. See Wagner & Dawes (*J. Elisha Mitchell scient. Soc.* 55: 163, 1939), Hoog & Smith (*Stud. Mycol.* 50: 489, 2004; revision, phylogeny).
- Saprogaster** Fogel & States (2001), Phallales. 1, USA. See Fogel & States (*Mycotaxon* 80: 317, 2001).
- saprogen**, a saprobe (q.v.).
- Saprophragma** K.B. Deshp. & K.S. Deshp. (1966), anamorphic *Pezizomycotina*, Hso.≡ eH.?. 1, India. See Deshpande & Deshpande (*Mycopathologia* 30: 200, 1966).
- saprophyte**, a plant feeding by external digestion of dead organic matter; commonly misapplied to fungi where saprobe (q.v.) is the preferred term.
- Saprotaphrina** Verona & Rambelli (1962) nom. nud., anamorphic *Pezizomycotina*. Used for the yeast phase of *Taphrina*.
- saprotroph** (1) a saprobe (q.v.); (2) a necrophyte on dead material which is not part of a living host (Münch), cf. perthophyte.
- Sapucchaka** K. Ramakr. (1956), ? *Microthyriaceae*. 1, India. See von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Sarawakus** Lloyd (1924), *Hypocreaceae*. Anamorphs *Gliocladium*-like, *Trichoderma*-like, *Verticillium*-like. 11 (from wood and bark), widespread (tropical). See Samuels & Rossman (*Mycol.* 84: 26, 1992; key), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Sarbhoy** (Ashok Kumar; 1939-2006; India). BSc (1956), MSc (1959), PhD (1963), Assistant Professor of Botany (1962-1965), Allahabad University; Commonwealth Mycological Institute (1965-1967); Mycologist (1969-1972), Senior Mycologist (1972-1986), Principal Scientist (1986-1997), Professor (1997-1999), Emeritus Scientist (2000-2003), Indian Agricultural Research Institute, New Delhi. Responsible for development of the *Indian Type Culture Collection*. *Principal mycological publications*. (with L.V. Gangawane & D.K. Agarwal) *Compendium of Soil Borne Plant Pathogens* (1987); (with S.P. Raychaudhuri & A. Johnston) *History of Plant Pathology of South East Asia* (1996); *Textbook of Mycology* (2006). *Biogs, obits etc.* Smith (*World Federation for Culture Collections Newsletter* January 2007) [portrait].
- Sarbhoyomyces** Saikia (1981), anamorphic *Pezizomycotina*, Hsy.0eH.?. 1, India. See Saikia (*Curr. Sci.* 50: 949, 1981).
- Sarcanthia** Raf. (1817) nom. dub., Fungi. No spp. included.
- Sarcinella** Sacc. (1880), anamorphic *Schiffnerula*, Hso.#eP.1. 27, widespread. See Hughes (*CJB* 61: 1727, 1984), Hughes (*Mycol.* 82: 657, 1990), Hosagoudar (*Zoos' Print Journal* 18: 1071, 2003).
- Sarcinellaceae** Nann. (1934) = *Englerulaceae*.
- sarciniform**, bundle-like, as the dictyospore of *Stemphylium botryosum*.
- Sarcinodochium** Höhn. (1905), anamorphic *Pezizomycotina*, Hsp.#eH.?. 1, Europe.
- Sarcinomyces** Lindner (1898), anamorphic *Eurotiomycetes*, Hso.#eH.21. 2, widespread. See Jong & King (*Mycotaxon* 3: 397, 1976), Hermanides-Nijhof (*Stud. Mycol.* 15: 173, 1977), Wollenzien *et al.* (*Antonie van Leeuwenhoek* 71: 281, 1997; Mediterranean), Uijthoff *et al.* (*Medical Mycology* 36: 143, 1998; phylogeny), Sterflinger *et al.* (*Stud. Mycol.* 43: 5, 1999; phylogeny, ecology), Sterflinger & Prillinger (*Antonie van Leeuwenhoek* 80: 275, 2001; Austria), Bogomolova & Minter (*Mycotaxon* 86: 195, 2003).
- Sarcinomyces** Oho (1926) = *Sarcinosporon* fide Jong & King (*Mycotaxon* 3: 397, 1976).
- Sarcinosporon** D.S. King & S.C. Jong (1975), anamorphic *Pezizomycotina*, Hso.0eH.10. 1 (from humans), widespread. See King & Jong (*Mycotaxon* 3: 92, 1975).
- Sarcinulella** B. Sutton & Alcorn (1983) = *Anisomeridium* fide Purvis *et al.* (*Lichen Flora of Great Britain and Ireland*, 1992).
- sarcodimitic**, see Hyphal analysis.
- Sarcodon** Qué. ex P. Karst. (1881), *Bankeraceae*. 36, widespread. See Maas Geesteranus & Nannfeldt (*Svensk bot. Tidskr.* 63: 401, 1969), Singer (*Beih. Nova Hedwigia* 77, 1983), Stalpers (*Stud. Mycol.* 35: 168 pp., 1993; key), Schmidt-Stohn (*Boletus* 24: 48, 2000; *Sarcodon imbriatus* and *S. squamosus*).
- Sarcodontaceae** Bondartsev & Singer ex Singer (1983) = *Bankeraceae*.
- Sarcodontia** Schulzer (1866), *Meruliaceae*. 2, widespread (boreal). See Stalpers (*Folia Cryptog. Estonica* 33: 133, 1998).
- Sarcographa** Fée (1824), *Graphidaceae* (L.). c. 74, widespread (tropical). See Pant (*Geophytology* 20: 48, 1991; 3 spp., India), Nakanishi *et al.* (*Bull. natn. Sci. Mus. Tokyo*, B 28: 107, 2002; Vanuatu), Staiger (*Biblthca Lichenol.* 85, 2002; monogr.), Archer (*Telopea* 10: 589, 2004; Australia), Archer (*Biblthca Lichenol.* 94, 2006; Australia), Staiger *et al.* (*MR* 110: 765, 2006; phylogeny), Archer (*Systematics & Biodiversity* 5: 9, 2007; Solomon Is).
- Sarcographina** Müll. Arg. (1887), *Graphidaceae* (L.). 2, widespread. See Pant (*Geophytology* 20: 48, 1991; India), Archer (*Telopea* 10: 589, 2004; Australia), Archer (*Biblthca Lichenol.* 94, 2006; Australia), Staiger *et al.* (*MR* 110: 765, 2006; phylogeny), Lücking *et al.* (*Biblthca Lichenol.* 95: 429, 2007; Costa Rica).
- Sarcographomyces** Cif. & Tomas. (1953) = *Sarcographa* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Sarcogyne** Flot. (1850) nom. rej. = *Polysporina* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Sarcogyne** Flot. (1851) nom. cons., *Acarosporaceae* (L.). 30, widespread. See Jørgensen & Santesson (*Taxon* 42: 881, 1993; nomencl.), Seppelt *et al.* (*Lichenologist* 30: 249, 1998), Lutzoni *et al.* (*Am. J. Bot.* 91: 1446, 2004; phylogeny), Reeb *et al.* (*Mol. Phylogen. Evol.* 32: 1036, 2004; phylogeny), Crewe *et al.* (*MR* 110: 521, 2006; phylogeny), Miad-

- likowska *et al.* (*Mycol.* **98**: 1088, 2006; phylogeny, polyphyly).
- Sarcoleotia** S. Ito & S. Imai (1934), ? Geoglossaceae. 1, widespread. See Schumacher & Sivertsen in Laursen *et al.* (Eds) (*Arctic and Alpine Mycology* **2**: 163, 1987), Jumpponen *et al.* (*CJB* **75**: 2228, 1998), Wang *et al.* (*Mycol.* **98**: 1065, 2006; phylogeny).
- Sarcoloma** Locq. (1979) = Hebeloma fide Kuyper (*in litt.*).
- Sarcomelas** Raf. (1817) nom. dub., Fungi.
- Sarcomyces** Masee (1891), Helotiales. 1, America.
- Sarcomyxa** P. Karst. (1891), Marasmiaceae. 1, widespread.
- Sarconemus** Raf. (1815) nom. dub., ? Fungi.
- Sarconiptera** Raitv. (2003), Dermateaceae. 1, Greenland. See Raitviir (*Mycotaxon* **87**: 363, 2003).
- Sarcopaxillus** Zmitr., V. Malysheva & E. Malysheva (2004), Paxillaceae. 1, Europe (northern). See Zmitrovich *et al.* (*Folia Cryptogamica Petropolitana* **1**: 52, 2004).
- Sarcophoma** Höhn. (1916), anamorphic *Discosphaerina*, St.0eH.15. 1, widespread. See van der Aa (*Persoonia* **8**: 283, 1975).
- Sarcopodium** Ehrenb. (1818), anamorphic *Pezizomycotina*, Hsp.0-1eH.15. 11, widespread. See Ellis (*More Dematiaceous Hyphomycetes*, 1976), Sutton (*TBMS* **76**: 97, 1981), Watanabe (*Mycol.* **85**: 520, 1993; Japan), Guarro *et al.* (*J. Clin. Microbiol.* **40**: 3071, 2002; from human).
- Sarcoporia** P. Karst. (1894), Fomitopsidaceae. 7, widespread. See Ko *et al.* (*Mycol.* **93**: 270, 2001; misapplied), Niemelä & Kinnunen (*Karstenia* **45**: 77, 2005; correct name for *Parmastomyces*) see *Erastia*.
- Sarcopyrenia** Nyl. (1858), ? Verrucariaceae ($\pm$ L). 3 (on lichens), widespread (northern hemisphere). See Navarino-Rosinés & Hladún (*Candollea* **45**: 469, 1990), Aguirre-Hudson (*Bull. Br. Mus. nat. hist. Bot.* **21**: 85, 1991).
- Sarcopyreniaceae** Nav.-Ros. & Cl. Roux (1998) = Verrucariaceae.
- Sarcopyreniomyces** Cif. & Tomas. (1953) $\equiv$ *Sarcopyrenia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Sarcopyreniopsis** Cif. & Tomas. (1953) $\equiv$ *Sarcopyrenia*.
- Sarcorhopalum** Rabenh. (1851) = *Taphrina* fide Mix (*Kansas Univ. Sci. Bull.* **33**: 1, 1949).
- Sarcosagium** A. Massal. (1856), Thelocarpaceae (L). 1, widespread (temperate). See Poelt & Vězda (*Best. europ. Flecht.*, 1977), Reeb *et al.* (*Mol. Phylogen. Evol.* **32**: 1036, 2004; phylogeny).
- Sarcoscypha** (Fr.) Boud. (1885), Sarcoscyphaceae. Anamorph *Molliardiomyces*. c. 28, widespread (north temperate). See Denison (*Mycol.* **64**: 609, 1972), Baral (*Z. Mykol.* **50**: 117, 1984; key 5 spp.), Harrington (*Mycotaxon* **38**: 417, 1990; 3 spp. N. Am.), Benkert (*Gleditschia* **19**: 173, 1991), Zhuang (*Mycosystema* **5**: 65, 1993; SEM), Harrington (*Harvard Pap. Bot.* **10**: 53, 1997; 5 spp.), Harrington & Potter (*Mycol.* **89**: 258, 1997; ITS), Harrington (*Mycol.* **90**: 235, 1998; DNA), Harrington *et al.* (*Mycol.* **91**: 41, 1999; phylogeny), Zhuang (*Mycotaxon* **76**: 1, 2000; distrib.), Weinstein *et al.* (*Mycol.* **94**: 673, 2002; phylogeny), Hansen *et al.* (*Mol. Phylogen. Evol.* **36**: 1, 2005; phylogeny), Hansen & Pfister (*Mycol.* **98**: 1029, 2006; phylogeny), Perry *et al.* (*MR* **111**: 549, 2007; phylogeny).
- Sarcoscyphaceae** Le Gal ex Eckblad (1968), Pezizales. 13 gen. (+ 8 syn.), 102 spp.
- Lit.*: Paden (*Mycotaxon* **25**: 165, 1986), Cabello (*Boln Soc. argent. Bot.* **25**: 395, 1988; numerical taxonomy), Pfister (*Mem. N. Y. bot. Gdn* **49**: 339, 1989), Bellemère *et al.* (*Cryptog. Mycol.* **11**: 203, 1990; ultrastr.), Benkert (*Gleditschia* **19**: 173, 1991; keys German spp.), Butterfill & Spooner (*Mycologist* **9**: 20, 1995), Li & Kimbrough (*Int. J. Pl. Sci.* **156**: 841, 1995; septa), Li & Kimbrough (*CJB* **74**: 10, 1996), Wang & Zhuang (*Mycosystema* **8-9**: 39, 1995), Durrieu *et al.* (*Acta Bot. Yunn.* **19**: 128, 1997), Harrington & Potter (*Mycol.* **89**: 258, 1997), Landvik *et al.* (*Nordic Jl Bot.* **17**: 403, 1997; DNA), Harrington (*Mycol.* **90**: 235, 1998), Hansen *et al.* (*Mycol.* **91**: 299, 1999), Harrington *et al.* (*Mycol.* **91**: 41, 1999; phylogeny), Weinstein *et al.* (*Mycol.* **94**: 673, 2002), Hansen & Pfister (*Mycol.* **98**: 1029, 2006; phylogeny), Iturriaga & Pfister (*Mycotaxon* **95**: 137, 2006).
- Sarcosoma** Casp. (1891), Sarcosomataceae. Anamorph *Verticicladium*. 5, widespread (north temperate and tropical). See Korf (*Mycol.* **49**: 102, 1957), Landvik *et al.* (*Nordic Jl Bot.* **17**: 403, 1997; DNA), Harrington *et al.* (*Mycol.* **91**: 41, 1999; phylogeny), Köpcke *et al.* (*Phytochem.* **60**: 709, 2002; chemistry), Cittadini & Lunghini (*Micologia e Vegetazione Mediterranea* **20**: 155, 2005; conservation), Hansen & Pfister (*Mycol.* **98**: 1029, 2006; phylogeny).
- Sarcosomataceae** Kobayasi (1937), Pezizales. 10 gen. (+ 8 syn.), 57 spp.
- Lit.*: Otani (*TMSJ* **21**: 149, 1980; key Jap. spp.), Paden (*Fl. Neotrop. Monogr.* **37**, 1983; key), Donadini (*Mycol. helv.* **2**: 217, 1987), Bellemère *et al.* (*Cryptog. Mycol.* **11**: 203, 1990), Benkert (*Gleditschia* **19**: 173, 1991; keys E. German spp.), Cao *et al.* (*Mycol.* **84**: 261, 1992), Li & Kimbrough (*Int. J. Pl. Sci.* **156**: 841, 1995; septa), Li & Kimbrough (*CJB* **73**: 1761, 1995), Li & Kimbrough (*CJB* **74**: 1651, 1996), Landvik *et al.* (*Nordic Jl Bot.* **17**: 403, 1997; DNA), Zhuang & Wang (*Mycotaxon* **67**: 355, 1998), Harrington *et al.* (*Mycol.* **91**: 41, 1999; phylogeny), Köpcke *et al.* (*Phytochem.* **60**: 709, 2002), Hansen & Pfister (*Mycol.* **98**: 1029, 2006; phylogeny).
- Sarcosphaera** Auersw. (1869), Pezizaceae. 1 (hypogeous), N. America; Europe. See Trappe (*Mycotaxon* **2**: 109, 1975), Brandrud *et al.* (*Blyttia* **44**: 113, 1986), Landvik *et al.* (*Nordic Jl Bot.* **17**: 403, 1997; DNA), Hansen *et al.* (*Mycol.* **93**: 958, 2001; phylogeny), Bohlin (*MR* **108**: 3, 2004; phylogeny), Hansen & Pfister (*Mycol.* **98**: 1029, 2006; phylogeny), Tedersoo *et al.* (*New Phytol.* **170**: 581, 2006; ectomycorrhiza).
- Sarcostroma** Cooke (1871), anamorphic *Griphosphaerioma*. 1, widespread. See Sutton (*Mycol. Pap.* **138**, 1975), Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993), Jeewon *et al.* (*Mol. Phylogen. Evol.* **25**: 378, 2002; phylogeny), Ono & Kobayashi (*Mycoscience* **44**: 109, 2003; Japan, teleomorph), Lee *et al.* (*Stud. Mycol.* **55**: 175, 2006; S Africa).
- Sarcostromella** Boedijn (1959) = *Camarops* fide Nannfeldt (*Svensk bot. Tidskr.* **66**: 335, 1972).
- Sarcostromellaceae** Boedijn (1959) = *Boliniaceae*.
- sarcotrimitic**, see Hyphal analysis.
- Sarcotrochila** Höhn. (1917), Hemiphacidiaceae. Anamorph *Rhabdogloeopsis*. 4 (on conifers), N. America; Europe. See Korf (*Mycol.* **54**: 12, 1962), Dennis (*British Ascomycetes, addenda and corrigenda*: 22, 1981), Gernandt *et al.* (*Mycol.* **93**: 915, 2001; phy-

- logeny), Stone & Gernandt (*Mycotaxon* 91: 115, 2005).
- Sarcoxydon** Cooke (1883), Xylariaceae. 2, Asia; Africa. See Rogers (*Mycol.* 73: 28, 1981), Læssøe (*SA* 8: 25, 1989).
- Sarcoxydon** Clem. & Shear (1931) nom. nud. $\equiv$ *Sarcoxydon*.
- Sarea** Fr. (1825), ? Leotiomyces. Anamorphs *Epithyrium*, *Pycnidiella*. 2 (on resin), widespread (temperate). See Hawksworth & Sherwood (*CJB* 59: 357, 1981), Reeb *et al.* (*Mol. Phylogen. Evol.* 32: 1036, 2004; phylogeny), Lumbsch *et al.* (*MR* 111: 1133, 2007).
- Sarocladium** W. Gams & D. Hawksw. (1976), anamorphic *Hypocreales*, Hso.0eH.15. 3 (on *Oryza*), Asia; USA. See Boa & Brady (*TBMS* 89: 161, 1987), Chen *et al.* (*Acta Mycol. Sin.* Suppl. 1: 318, 1987; purple sheath disease of rice), Bridge *et al.* (*Pl. Path.* 38: 239, 1989; *Bambusa* blight), Joe & Manibhushanrao (*Z. PflKrankh. PflPath. PflSchutz* 102: 291, 1995; chemistry), Bills *et al.* (*MR* 108: 1291, 2004; chemistry, phylogeny), Ayyadurai *et al.* (*Curr. Microbiol.* 50: 319, 2005; genetic variation).
- Sarophorum** Syd. & P. Syd. (1916), anamorphic *Penicillium*. See Malloch & Cain (*CJB* 50: 2613, 1972), Pitt & Samson (*Regnum veg.* 128: 13, 1993), Ogawa & Sugiyama (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 149, 2000; phylogeny), Hsieh & Ju (*Mycol.* 94: 539, 2002; teleomorph).
- Sarrameana** Vězda & P. James (1973), ? Fuscideaceae (L). 3, widespread. See Vězda & Kantvilas (*Lichenologist* 20: 179, 1988), Aptroot & Sipman (*Willdenowia* 20: 221, 1991), Kantvilas & Vězda (*Nordic J Bot.* 16: 325, 1996).
- Sarrameanaceae** Hafellner (1984), Ostropomycetidae (inc. sed.). 1 gen., 5 spp. See Lumbsch *et al.* (*Lichenologist* 39: 509, 2007; Australia), Lumbsch *et al.* (*Nova Hedwigia* 86: 105, 2008).
- Sartorya** Vuill. (1927) nom. dub., Pezizomycotina. See also *Neosartorya*. See Malloch & Cain (*CJB* 50: 61, 1972).
- Sartvella** Berk. (1857) $\equiv$ *Dasyscypha*.
- Satchmopsis** B. Sutton & Hodges (1975), anamorphic *Pezizomycotina*, Ccu.0eH.15. 3, widespread. See Sutton & Pascoe (*TBMS* 88: 169, 1987), Crous *et al.* (*Stud. Mycol.* 55: 53, 2006).
- Sathropeltis** Bat. & Matta (1959) = *Myriangiella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- satratoxins**, toxins of *Stachybotrys atra* (syn. *S. alternans*); the cause of stachybotryotoxicosis in farm animals and humans.
- saturnine** (of ascospores), having a flat edge round the middle (as in some *Hansenula* spp.).
- Saturnispora** Z.W. Liu & Kurtzman (1991), Pichiaceae. 4, widespread. See Kurtzman in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 387, 1998), Morais *et al.* (*Int. J. Syst. Evol. Microbiol.* 55: 1725, 2005), Kurtzman (*FEMS Yeast Res.* 6: 288, 2006), Suh *et al.* (*Mycol.* 98: 1006, 2006).
- Saturnomyces** Cain (1956) = *Emericellopsis* fide Gilman (*Manual of soil fungi*, 1956).
- Satwalekera** D. Rao, V.G. Rao & P.Rag. Rao (1970) = *Torula* fide Kendrick & Carmichael in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 390, 1973).
- Satyrus** Bosc (1811) = *Phallus* fide Stalpers (*in litt.*).
- Sauvageautia** Har. (1892) = *Urosporella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Savile** (Douglas Barton Osborne; 1909-2000; Ireland). BA & MSc, Macdonald College, Quebec, Canada (1928-1934); PhD, University of Michigan (1935-1939); Royal Canadian Airforce (1939-1943); Division of Botany and Plant Pathology, Ottawa, 1943-1974; Fellow of the Royal Society of Canada; DSc, McGill University (1978); MSA Distinguished Mycologist (1988). Pioneer exploring the mycota of northern Canada, making major contributions on rust biodiversity and co-evolution of fungi and plants. *Publs.* An extensive series of papers on rusts and co-evolution, mainly in *CJB*, *Canadian Field Naturalist* and *Mycol.*, with many contributions to *Fungi Canadenses*. *Biogs, obits etc.* Parmelee (*Mycol.* 93: 807, 2001).
- Savoryella** E.B.G. Jones & R.A. Eaton (1969), ? Sordariomycetidae. 11, Europe; Asia. See Jones & Hyde (*Bot. Mar.* 35: 83, 1992; posn), Read *et al.* (*CJB* 71: 273, 1993; ultrastr.), Hyde (*Mycoscience* 35: 59, 1994), Ho *et al.* (*MR* 101: 803, 1997), Chang *et al.* (*MR* 102: 709, 1998; Taiwan).
- Săvulescu** (Traian; 1889-1963; Romania). Professor of Systematic Botany and Phytopathology, Agricultural College, Herastrau-Bucarest (1922). Mycologist and plant pathologist, noted for his studies on rusts and smuts. *Publs.* *Monographia Uredinalelor din R.P.R.* 2 vols (1953); *Ustilaginele din R.P.R.* 2 vols (1957). *Biogs, obits etc.* Urban (*Česká Mykologie* 17: 163, 1963); Bontea (*Review of Tropical Plant Pathology* 7: 35, 1993); Sandu-Ville (*Sydowia* 18: 1, 1965) [bibliography, portrait]; Stafleu & Cowan (*TL-2* 5: 91, 1985).
- Savulescua** Petr. (1959), Diaporthales. 1, Puerto Rico. See Petrak (*Acad. Republ. Pop. Romine*: 591, 1959).
- Savulescuella** Cif. (1959), anamorphic *Doassansiaceae*. 3.
- Sawada** (Kaneyoshi; 1888-1950; Japan). Pioneer of Asian mycology. Described over 2500 species of fungi from Taiwan. *Publs.* [Descriptive Catalogue of Formosan Fungi] [*Special Bulletin of the Agricultural Experiment Station of the Government of Formosa*], 10 vols (1919-1944) [in Japanese]. *Biogs, obits etc.* Stafleu & Cowan (*TL-2* 5: 92, 1985).
- Sawadaea** Miyabe (1914), Erysiphaceae. Anamorph *Oidium* subgen. *Octagoidium*. 9, widespread. *S. bicornis* (syn. *Uncinula aceris*; powdery mildew of sycamore, *Acer*). See Zheng & Chen (*Acta Microbiol. Sin.* 20: 35, 1980), Braun (*Beih. Nova Hedwigia* 89, 1987), Mori *et al.* (*Mycoscience* 41: 437, 2000; phylogeny), Cunnington *et al.* (*Australas. Mycol.* 23: 37, 2004; Australia), Hirose *et al.* (*MR* 109: 912, 2005; phylogeny), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Sawadaia**, see *Sawadaea*.
- saxicolous**, growing on rocks. A few fungi are able to live on saxicolous substrata (Kobluk & Kahle, *Bull. Can. Pet. Geol.* 25: 208, 1977; bibliogr.); *Lichenothelia* (q.v.) is primarily saxicolous. Rocks are one of the main substrata for lichens and the lit. on the latter is vast, see refs. cited under Ecology. Lichens can also change the mineral composition of rocks through the action of oxalic acid, etching being visible by SEM (see Syers & Iskandar, in Ahmadjian & Hale (Eds), *The Lichens*: 225, 1974, Jones *et al.*, *Lichenologist* 12: 277, 1980). See also Biodeterioration.
- scab**, as delimited by Jenkins (*Phytopath.* 23: 389, 1933), a plant disease having hyperplastic scab-like lesions; cf. anthracnose. - of apple (*Venturia in-*

- aequalis*), cherry (*V. cerasi*), pear (*V. pirina*); cereals (*Gibberella zeae*, frequently as *G. saubinetii*, and *Fusarium* spp.), citrus (*Elsinoë fawcettii*), peach (*Fusicladium carpophilum*); powdery - of potato (*Spongospora subterranea*).
- Scabradiporites** Y.K. Mathur (1966), Fossil Fungi. 1 (Paleocene), India. See Mathur (*Quarterly Journal of the Geological, Mining & Metallurgical Society of India* 38: 43, 1966).
- scabrid**, rough with delicate and irregular projections.
- Scabropezia** Dissing & Pfister (1981), Pezizaceae. 3. See Hirsch (*Agarica* 6: 241, 1985; key Eur. spp.), Norman & Egger (*Mycol.* 91: 820, 1999; phylogeny), Hansen *et al.* (*Mycol.* 93: 958, 2001; phylogeny), Spooner (*Czech Mycol.* 52: 259, 2001; as *Plicariella*), Hansen *et al.* (*Mol. Phylogen. Evol.* 36: 1, 2005; phylogeny), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- scabrous**, rough.
- Scalaria** Lázaro Ibiza (1916) = *Phellinus* fide Wagner & Fischer (*MR* 105: 777, 2001).
- Scalarispora** Buriticá & J.F. Hennen (1994), Phakopsoraceae. 1 (on *Ampelopsis* (*Vitaceae*)), Taiwan. See Buriticá & Hennen (*Revta Acad. colomb. cienc. exact. fis. nat.* 19: 61, 1994) Cf. *Pucciniostele*.
- Scalenomyces** I.I. Tav. (1985), Laboulbeniaceae. 1, Sardinia. See Tavares (*Mycol. Mem.* 9: 313, 1985).
- Scalidium** Hellb. (1867) = *Scoliciosporum* fide Poelt & Vězda (*Biblthca Lichenol.* 16, 1981), Santesson (*Lichens of Norway and Sweden*, 1984).
- Scanning electron microscopy (SEM)**. The scanning electron microscope images a sample surface by scanning it with a high-energy beam of electrons in a raster scan pattern; the electrons interact with the sample surface to produce signals with information about its topography. The resulting images are at much higher magnification and resolution than possible with light microscopy, and with much greater depth of field. Samples are coated prior to examination with a thin layer of gold, palladium or aluminium, or with more recent technology may be examined frozen and even uncoated. When linked to a computer, the analogue signal can be converted to digital form, allowing specimens to be measured, counted and mapped. The technique has been very widely used in mycology to resolve fungal structures, particularly appressoria, asci, basidia, conidiogenous cells, hyphae, fruitbodies and spores.
- Lit.*: Heywood (Ed.) (*Scanning electron microscopy: systematic and evolutionary applications*, 1971), Claugher (Ed.) (*Scanning electron microscopy in taxonomy and functional morphology*, 1990). See Microscopy, Ultrastructure.
- Scaphidiomyces** Thaxt. (1912), Laboulbeniaceae. 4, S. America; West Africa. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- Scaphidium** Clem. (1901), anamorphic *Pezizomycotina*, St.1eH.19. 1, USA.
- Scaphis** Eschw. (1824) = *Graphis* fide Staiger (*Biblthca Lichenol.* 85, 2002).
- Scaphophoeum** Ehrenb. ex Wallr. (1833) ≡ *Schizophyllum*.
- scar** (1) (of yeasts), **bud** -, on parent cell; **birth** -, on daughter cell; (2) (of anamorphic fungi), at conidiogenous locus and conidial base/apex, left after secession of conidium.
- scariose**, thin; paper-like.
- scarlet (elf) cup**, the ascoma of *Sarcoscypha coccinea*.
- Scedosporium** Sacc. ex Castell. & Chalm. (1919), anamorphic *Pseudallescheria*, Hso.0eH.19. 4 (on humans, other animals and from hay), widespread (subtropical). See Kendrick & Carmichael in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 390, 1973), Salkin *et al.* (*J. Clin. Microbiol.* 26: 498, 1988; *S. inflatum*, an emerging pathogen), Dykstra *et al.* (*Mycol.* 81: 896, 1989; TEM of conidiogenesis), Issakainen *et al.* (*J. Med. Vet. Mycol.* 35: 389, 1997; SSU rDNA), Wedde *et al.* (*Medical Mycol.* 36: 61, 1998; PCR-based identification), Issakainen *et al.* (*MR* 103: 1179, 1999; relationship with *Petriella*), Okada *et al.* (*CJB* 76: 1495, 1998; phylogeny), Rainer *et al.* (*J. Clin. Microbiol.* 38: 3267, 2000; molecular variability), Zouhair *et al.* (*Journal of Medical Microbiology* 50: 925, 2001; strain typing), Solé *et al.* (*Medical Mycology* 41: 293, 2003; strain typing), Gilgado *et al.* (*J. Clin. Microbiol.* 43: 4930, 2005; phylogeny), Guarro *et al.* (*Medical Mycology* 44: 295, 2006; review), Rainer & Hoog (*MR* 110: 151, 2006; phylogeny).
- Scelobelonium** (Sacc.) Höhn. (1905) = *Crocicreas* fide Carpenter (*Mem. N. Y. bot. Gdn* 33: 1, 1981).
- Scelophoromyces** Thaxt. (1912), Laboulbeniaceae. 1, America. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- Scenidium** (Klotzsch) Kuntze (1898) = *Hexagonia* Fr. fide Jülich (*Persoonia* 12: 107, 1984).
- Scenomyces** F. Stevens (1927), anamorphic *Pezizomycotina*, Cpt.-.-. 1, Panama.
- Scepastocarpus** Santam. (2004), Laboulbeniaceae. 1, Spain. See Santamaría (*Mycol.* 96: 764, 2004).
- Sceptrifera** Deighton (1965), anamorphic *Pezizomycotina*, Hsy.1eP.10/12. 1, Philippines. See Deighton (*Mycol. Pap.* 101: 37, 1965).
- Sceptromyces** Corda (1831) = *Aspergillus* fide Engelke (*Hedwigia* 41: 219, 1902).
- Schachtia** Schulzer (1866) [non *Schachtia* H. Karst. 1859, *Rubiaceae*] = *Fenestella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Schadonia** Körb. (1859), Ramalinaceae (L). 3, widespread (north temperate). See Ekman (*Op. bot.* 127: 148 pp., 1996), Upreti & Nayaka (*Mycotaxon* 97: 275, 2006; India).
- Schadoniaceae** Hafellner (1984) = Ramalinaceae.
- Schaereria** Körb. (1855) nom. cons., Schaereriaceae (L). 11, widespread (esp. temperate). See Schneider (*Biblthca Lichenol.* 13, 1980), Eriksson & Hawksworth (*SA* 12: 42, 1993; posn), Lunke *et al.* (*Bryologist* 99: 53, 1996), Kantvilas (*Lichenologist* 31: 231, 1999; Tasmania), Fryday & Common (*Bryologist* 104: 109, 2001; Falkland Is), Lumbsch *et al.* (*Mol. Phylogen. Evol.* 31: 822, 2004; phylogeny), Schmult & Spribille (*Lichenologist* 37: 527, 2005), Wedin *et al.* (*MR* 109: 159, 2005; phylogeny).
- Schaereriaceae** M. Choisy ex Hafellner (1984), Ostropomycetidae (inc. sed.). 1 gen. (+ 1 syn.), 11 spp.
- Lit.*: Lumbsch *et al.* (*MR* 111: 257, 2007; phylogeny), Lumbsch *et al.* (*MR* 111: 1133, 2007).
- Scharifia** Petr. (1955), *Pezizomycotina*. 1, Iran. See Petrak (*Sydowia* 9: 448, 1955).
- Schasmaria** (Ach.) Gray (1821) = *Cladonia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- scheda** (pl. -ae), **schedula** (pl. -ae), (Latin), label(s), esp. printed labels relating to sets of dried specimens (exsiccati; q.v.).
- Scheleobrachea** S. Hughes (1958) = *Pithomyces* fide

- Ellis (*Dematiaceous Hyphomycetes*, 1971).
- Schenckia** Henn. (1893), Saccardiaceae. 1, S. America.
- Schenella** T. Macbr. (1911), Geastraceae. 4, widespread. See Estrada-Torres *et al.* (*Mycol.* 97: 139, 2005).
- Scherffelia** Sparrow (1933) [non *Scherffelia* Pascher 1911, *Algae*] = *Scherffeliomyces*.
- Scherffeliomyces** Sparrow (1934), Chytridiaceae. 1, Europe; N. America.
- Scherffeliomycopsis** Geitler (1962), Chytridiaceae. 1 (on *Coleochaete*), Austria; Poland. See Skirgiełło & Szymańska (*Feddes Repert.* 113: 128, 2002; Poland).
- Schiffnerula** Höhn. (1909), Englerulaceae. Anamorphs *Questieriella*, *Sarcinella*. c. 36, widespread (esp. warmer areas). See Hansford (*Mycol. Pap.* 15, 1946), Hughes (*CJB* 62: 2213, 1984), Hughes (*Mycol.* 82: 657, 1990), Hosagoudar (*Zoos' Print Journal* 18: 1071, 2003).
- Schinzia** Nägeli (1842) [non *Dennstätt*, 1818] = *Entorrhiza* fide Vánky (*Illustrated genera of smut fungi*, 1987).
- Schinzinia** Fayod (1889), Agaricaceae. 1, E. Africa.
- Schismatomma** Flot. & Körb. ex A. Massal. (1852), Roccellaceae ($\pm$ L.). 11, widespread. See Torrente & Egea (*Biblthca Lichenol.* 32, 1989), Tehler (*CJB* 68: 2458, 1990; cladistics), Tehler (*Op. Bot.* 118: 1, 1993; key), Tehler (*Mycotaxon* 51: 31, 1994), Grube (*Bryologist* 101: 377, 1998; phylogeny), Myllys *et al.* (*Lichenologist* 31: 461, 1999; phylogeny), Follmann (*Mitteilungen aus dem Institut für Allgemeine Botanik Hamburg* 30-32: 61, 2002; biogeography), Lumbsch *et al.* (*Mol. Phylogen. Evol.* 34: 512, 2005; phylogeny), Ertz & Diederich (*Bryologist* 109: 415, 2006; lichenicolous habit, Mexico), Tehler & Irestedt (*Cladistics* 23: 432, 2007).
- Schismatommatomyces** Cif. & Tomas. (1953) = *Schismatomma*.
- Schistodes** Theiss. (1918) = *Perisporiopsis* Henn. fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Schistophoron** Stirt. (1876), ? Graphidaceae (L.). 2, widespread. See Tibell (*Lichenologist* 14: 219, 1982), Tibell (*Beih. Nova Hedwigia* 79: 597, 1984), Aptroot & Sipman (*Biblthca Lichenol.* 96: 21, 2007; key).
- Schistoplaca** Brusse (1987) = *Lecanora* fide Lumbsch & Feige (*Mycotaxon* 52: 429, 1994), Ekman (*Op. bot.* 127: 148 pp., 1996).
- Schistostoma** Stirt. (1878) = *Graphis* fide Salisbury (*Lichenologist* 6: 126, 1974).
- Schizacrosprium** Henn. (1899) nom. dub., Fungi. See Walker (*Mycotaxon* 11: 1, 1980).
- schizidium**, a propagule formed by upper layers of a lichen thallus splitting off as scale-like segments from the main lobes (e.g. the lobule-like structures in *Fulgensia bracteata* subsp. *deformis*). See Poelt (*Flora, Jena* 159: 23, 1980). Fig. 22G.
- Schizmaturus** (Corda) Kalchbr. (1880) = *Lysurus* fide Dring (*Kew Bull.* 35: 1, 1980).
- schizobiont**, bacteria once considered to be additional symbionts of lichens.
- Schizoblastosporion** Cif. (1930), anamorphic *Saccharomycetales*, Hso.0eH.10. 2, widespread. See Smith in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 602, 1998), Schweigkofler *et al.* (*Organ. Divers. Evol.* 2: 1, 2002), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Schizoblastosporon** Hara (1936) = *Schizoblastosporion*.
- Schizocapnodium** Fairm. (1921), Nitschkiaceae. 1 (from wood), USA; India. See Nannfeldt (*Svensk bot. Tidskr.* 65: 49, 1971; syn. of *Nitschkia*), Subramanian & Sekar (*Kavaka* 18: 19, 1993), Huhndorf *et al.* (*MR* 108: 1384, 2004).
- Schizocephalum** Preuss (1852) = *Haplographium* fide Saccardo (*Syll. fung.* 4: 306, 1886).
- Schizochora** Syd. & P. Syd. (1913), Phyllachoraceae. 3 (from living leaves), widespread. See von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Schizochorella** Höhn. (1918) = *Hypoderma* De Not. fide Minter (*in litt.*).
- Schizoderma** Ehrenb. (1818) = *Leptostroma* fide Sutton (*Mycol. Pap.* 141, 1977).
- Schizoderma** Kunze (1825), anamorphic *Pezizomycotina*, Cac.?? 1, Germany.
- Schizodiplodia** Zambett. (1955) = *Didymosporiella* fide Sutton (*Mycol. Pap.* 141, 1977).
- Schizodiscus** Brusse (1988), Porpidiaceae (L.). 1, Natal. See Brusse (*Bothalia* 18: 94, 1988).
- schizogenous**, formed by cracking or splitting, cf. lysigenous.
- schizogony**, the process of division of a schizont.
- Schizographa** Nyl. (1857) nom. dub., Fungi.
- Schizolaboulbenia** Middelh. (1957) = *Laboulbenia* fide Benjamin in Thaxter (*Mem. Am. Acad. Arts Sci.* 1896-1931 12-16, 1971).
- schizolytic**, secession of conidia involving a splitting of the delimiting septum so that one half of the cross-wall becomes the base of the seceding conidium and the other half remains at the apex of the conidiogenous cell (Cole & Samson, *Patterns of development in conidial fungi*, 1979). Cf. rhexolytic.
- Schizoma** Nyl. ex Cromb. (1894) = *Thyrea* fide Henssen (*Symb. bot. upsal.* 18 no. 1, 1963).
- Schizomeromyces** Thaxt. (1931) = *Clematomyces* fide Tavares (*Mycol. Mem.* 9, 1985).
- Schizonella** J. Schröt. (1877), Anthracoideaceae. 4 (on *Cyperaceae*), widespread (esp. Europe; N. America). See Vánky (*Mycotaxon* 69: 102, 1998; key).
- Schizonia** Pers. (1828) = *Schizophyllum*.
- schizont**, a vegetative thallus, having no wall, which undergoes simple or multiple division.
- Schizontopeltis** Bat. & H. Maia (1962) = *Schizothyrium* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Schizoparmaceae** Rossman (2007), Diaporthales. 3 gen. (+ 5 syn.), 32 spp.
Lit.: Rossman *et al.* (*Mycoscience* 48: 135, 2007; phylogeny).
- Schizoparme** Shear (1923), Schizoparmaceae. Anamorph *Pilidiella*. 7 (from leaves), widespread. See Samuels *et al.* (*Mycotaxon* 46: 459, 1993), Van Niekerk *et al.* (*MR* 108: 283, 2004; phylogeny, anamorph), Rossman *et al.* (*Mycoscience* 48: 135, 2007; review).
- Schizopelte** Th. Fr. (1875), Roccellaceae (L.). 1, N. America. See Tehler (*CJB* 68: 2458, 1990; cladistics), Grube (*Bryologist* 101: 377, 1998), Myllys *et al.* (*Bryologist* 101: 70, 1998), Myllys *et al.* (*Lichenologist* 31: 461, 1999; phylogeny).
- Schizopeltis** Bat. & I.H. Lima (1959) = *Schizothyrium* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Schizopeltomyces** Cif. & Tomas. (1953) = *Schizopelte*.
- Schizophoma** Kleb. (1933) ? = *Sclerophoma* fide Sutton (*Mycol. Pap.* 141, 1977).
- Schizophyllaceae** Qué. (1888), Agaricales. 2 gen. (+

11 syn.), 7 spp.

Lit.: Cooke (*Mycol.* 53: 575, 1961; *Schizophyllum*), Donk (*Persoonia* 3: 199, 1964), Nuss (*Hoppea* 39: 127, 1980), Stalpers (*Persoonia* 13: 495, 1988), Sigler *et al.* (*J. Med. Vet. Mycol.* 35: 365, 1997), Ginns (*Mycol.* 90: 19, 1998), James *et al.* (*Evolution* Lancaster, Pa. 53: 1665, 1999), Buzina *et al.* (*J. Clin. Microbiol.* 39: 2391, 2001), James & Vilgalys (*Mol. Ecol.* 10: 471, 2001), Kano *et al.* (*J. Clin. Microbiol.* 40: 3535, 2002), Moncalvo *et al.* (*Mol. Phylogen. Evol.* 23: 357, 2002), Bodensteiner *et al.* (*Mol. Phylogen. Evol.* 33: 501, 2004), Larsson *et al.* (*MR* 108: 983, 2004), Wei & Dai (*Mycosystema* 23: 437, 2004).

Schizophyllales = Agaricales.

Schizophyllum Fr. (1815), Schizophyllaceae. 6 (wood rot; pathogenic for humans), widespread. See Watling & Sweeney (*Sabouraudia* 12: 214, 1974; cultural chars.), Buzina *et al.* (*J. Clin. Microbiol.* 39: 2391, 2001; molecular identification), Baron *et al.* (*J. Clin. Microbiol.* 44: 3042, 2006; diagnosis).

Schizophyllus, see *Schizophyllum*.

Schizopora Velen. (1922) nom. rej., Schizoporaceae. 4, widespread. See Ryvarden & Johansen (*Prelim. Polyp. Fl. E. Afr.*: 315, 1980), Langer (*Bibliotheca Mycol.* 154, 1994; sub *Hyphodontia*), Paulus *et al.* (*MR* 104: 1155, 2000), Lim & Jung (*Mycobiology* 29: 194, 2001; Korean spp.).

Schizoporaceae Jülich (1982), Hymenochaetales. 14 gen. (+ 6 syn.), 109 spp.

Lit.: Hallenberg (*Mycotaxon* 27: 361, 1986), Nakasone (*Mycol. Mem.* 15: 412 pp., 1990), Langer (*Bibliotheca Mycol.* 154: 298 pp., 1994), Ginns (*Mycol.* 90: 19, 1998), Langer (*Folia cryptog. Estonica* 33: 57, 1998), Paulus *et al.* (*MR* 104: 1155, 2000), Hjortstam (*Windahlia* 24: 1, 1998), Hjortstam & Ryvarden (*Syn. Fung.* 15: 8, 2002), Greslebin & Rajchenberg (*N.Z. J. Bot.* 41: 437, 2003), Larsson *et al.* (*MR* 108: 983, 2004), Martín & Montón (*Bol. Sanid. Veg. Plagas* 30: 93, 2004), Binder *et al.* (*Systematics and Biodiversity* 3: 113, 2005), Küffer & Senn-Irlet (*Mycol. Progr.* 4: 77, 2005).

Schizosaccharis Clem. & Shear (1931) = *Schizosaccharomyces*.

Schizosaccharomyces Lindner (1893), Schizosaccharomycetaceae. 1 or 4, widespread. See Bridge & May (*J. gen. Microbiol.* 130: 1921, 1984; numerical taxonomy), Kreger-van Rij (Ed.) (*Yeasts, a taxonomic study* 3rd edn, 1984; key), Mikata & Banno (*IFO Res. Comm.* 13: 45, 1987; ascospores), Barnett *et al.* (*Yeasts: Characteristics and Identification* 2nd edn, 1990), Cox in Wheals *et al.* (Eds) (*Yeast Chichester* 6: 7, 1995; genetic analysis), Munz & Kohli in Wheals *et al.* (Eds) (*Yeast Chichester* 6: 583, 1995; chromosome maps), Sipiczki (*Antonie van Leeuwenhoek* 68: 119, 1995; phylogeny), Sprague in Wheals *et al.* (Eds) (*Yeast Chichester* 6: 411, 1995; mating types), Vaughan-Martini & Martini in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 391, 1998), Wood (*Nature Lond.* 415 no. 6874: 871, 2002; genome), Lopandic *et al.* (*Mycol. Progr.* 4: 205, 2005; phylogeny), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).

Schizosaccharomycetaceae Beij. ex Klöcker (1905), Schizosaccharomycetales. 2 gen. (+ 3 syn.), 5 spp.

Lit.: Eriksson *et al.* (*SA* 11: 119, 1993), Egel in McLaughlin *et al.* (Eds) (*The Mycota A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research* 1: 251, 1994), Munz &

Kohli (*The Yeasts* Vol. 6. Yeast Genetics. Edn 2: 583, 1995), Sipiczki (*Antonie van Leeuwenhoek* 68: 119, 1995), Jeffery *et al.* (*Antonie van Leeuwenhoek* 72: 327, 1997), Kurtzman & Blanz in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 69, 1998), Sugiyama (*Mycoscience* 39: 487, 1998), Vaughan-Martini & Martini in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 391, 1998), Esteve-Zarzoso *et al.* (*Int. J. Syst. Bacteriol.* 49: 329, 1999), Mikata & Yamada (*Res. Commun. Inst. Ferm., Osaka* 19: 41, 1997), Wood (*Nature Lond.* 415 no. 6874: 871, 2002), Sugiyama *et al.* (*Mycol.* 98: 996, 2006; phylogeny).

Schizosaccharomycetales O.E. Erikss. (1994). Schizosaccharomycetidae. 1 fam., 2 gen., 5 spp. Fam.:

Schizosaccharomycetaceae

The name has been used by Prillinger *et al.* (*Z. Mykol.* 56: 219, 1990) to include *Protomycetales* and *Taphrinales* which they considered intermediate between *Ascomycota* and *Basidiomycota*.

Lit.: Eriksson *et al.* (*SA* 11: 119, 1993), Jeffery *et al.* (*Antonie van Leeuwenhoek* 72: 327, 1997; lipids), Kurtzman & Blanz (*The Yeasts, a taxonomic Study*: 69, 1998), Sjamsuridzal *et al.* (*Mycoscience* 38: 267, 1997), Sugiyama (*Mycoscience* 39: 487, 1998).

Schizosaccharomycetes O.E. Erikss. & Winka (1997), Taphrinomycotina. 1 ord., 1 fam., 2 gen., 5 spp. The fission yeasts. Ord.:

Schizosaccharomycetales

For *Lit.* see ord. and fam.

Schizosaccharomycetidae, see *Schizosaccharomycetes*.

Schizospora Dietel (1895) [non *Schizospora* Reinsch 1875, *Algae*] = *Puccinosira* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).

Schizosporaceae Dietel (1897) = *Puccinosiraceae*.

Schizostege Theiss. (1917) [non *Schizostege* W.F. Hillebr. 1888, *Pteridophyta*] = *Sacothecium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Schizostoma Ces. & De Not. ex Sacc. (1878) [non *Schizostoma* Ehrenb. ex Lév. 1846] = *Xenolophium* fide Holm & Yue (*Acta Mycol. Sin. Suppl.* 1: 82, 1986), Huhndorf (*Mycol.* 85: 490, 1993), Barr & Mathiassen (*Mycotaxon* 69: 159, 1998).

Schizostoma Ehrenb. ex Lév. (1846), Agaricaceae. 1, widespread (subtropical dry areas). See Long & Stouffer (*Mycol.* 35: 21, 1943), Lunghini (*Bollettino dell'Associazione Micologica ed Ecologica Romana* 17: 22, 2001), Sarasini (*Rivista di Micologia* 46: 7, 2003; mediterranean).

Schizothecium Corda (1838) nom. rej., Lasiosphaeriaceae. 1 (coprophilous), widespread. See Lundqvist (*Symb. bot. upsal.* 20 no. 1, 1972), Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Huhndorf *et al.* (*Mycol.* 96: 368, 2004; phylogeny), Cai *et al.* (*Fungal Diversity* 19: 1, 2005; phylogeny), Miller & Huhndorf (*Mol. Phylogen. Evol.* 35: 60, 2005; phylogeny, wall structure), Hu *et al.* (*Cryptog. Mycol.* 27: 89, 2006; China).

Schizothyra Bat. & C.A.A. Costa (1957), anamorphic *Pezizomycotina*, Cpt.0eH.?.1, Brazil. See Batista & Costa (*An. Soc. Biol. Pernambuco* 15: 409, 1957).

Schizothyrella Thüm. (1880), anamorphic *Pezizomycotina*. 5, Europe; USA.

Schizothyrellina Petr. (1922) nom. nud. = *Phacidiella* P. Karst. fide Sutton (*Mycol. Pap.* 141, 1977).

Schizothyriaceae Höhn. ex Trotter, Sacc., D. Sacc. & Traverso (1928), Capnodiales. 16 gen. (+ 28 syn.), 52 spp. More molecular data are needed, but placement of the family seems clear.

Lit.: von Arx & Müller (*Stud. Mycol.* 9, 1975), Eriksson (*Op. Bot.* 60, 1981), Farr (*Mycol.* 79: 97, 1987), Williamson & Sutton (*Pl. Dis.* 84: 714, 2000), Batzer *et al.* (*Mycol.* 100: 232, 2008; phylogeny).

Schizothyria Bat. & I.H. Lima (1959) = *Schizothyrium* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).

Schizothyrioma Höhn. (1917), Helotiales. 2, Europe. See Holm (*Svensk bot. Tidskr.* 65: 208, 1971), Nauta & Spooner (*Mycologist* 14: 65, 2000; UK).

Schizothyrium Desm. (1849), Schizothyriaceae. Anamorph *Zygophiala*. c. 13, widespread (esp. tropical). *S. pomi* (fly speck of apple and pear). See von Arx & Müller (*Stud. Mycol.* 9, 1975), Katumoto (*TMSJ* 27: 1, 1986), Petrini *et al.* (*Mycol. helv.* 3: 263, 1989), Kohlmeyer *et al.* (*CJB* 76: 467, 1998), Batzer *et al.* (*Mycol.* 97: 1268, 2005; phylogeny), Batzer *et al.* (*Mycol.* 100: 232, 2008; phylogeny).

Schizothyropsis Bat. & A.F. Vital (1960), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, Paraguay. See Batista & Vital (*Atas Inst. Micol. Univ. Recife* 1: 355, 1960).

Schizotorula Krassiln. (1954) nom. inval., Fungi. A lapsus for *Schizotorulopsis*.

Schizotorulopsis Cif. (1930) nom. dub., Bacteria. ? Based on bacteria.

Schizotrichella E.F. Morris (1956) = *Colletotrichum* fide Sutton (*Mycol. Pap.* 141, 1977).

Schizotrichum McAlpine (1903), anamorphic *Pezizomycotina*, Hso.0fH.10. 2, Australia; Bermuda.

schizotype, a syntype taken to be the type of name by the exclusion of other syntypes; an implicit lectotype, but not acceptable as a formal typification; see type.

Schizoxylon Pers. (1810), Stictidaceae. 33, widespread (esp. temperate). See Sherwood (*Mycotaxon* 6: 215, 1977; key), Johnston (*Mycotaxon* 24: 349, 1985; anamorph), Wedin *et al.* (*Lichenologist* 37: 67, 2005; phylogeny).

Schizoxylum Pers. (1822) = *Schizoxylon*.

schlauch, open-ended extension of the rohr, orientated toward the cytoplasm of encysted zoospore of plasmodiophorids. See also rohr and stachel.

Schmitzomia Fr. (1849) = *Stictis* fide Sherwood (*Mycotaxon* 6: 215, 1977).

Schnablia Sacc. & P. Syd. (1899), ? Helotiales. 1, Europe.

Schneepia Speg. (1885) = *Parmularia* Lév. fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962), Inácio & Cannon (*MR* 107: 82, 2003).

Schoenbornia Bubák (1906) = *Hymenopsis* fide Sutton (*Mycol. Pap.* 141, 1977).

Schoenleinium Johan-Olsen (1897) = *Trichophyton* fide Kendrick & Carmichael in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 390, 1973).

Schrakia Hafellner (1979), ? Patellariaceae. 1, N. & S. America. See Kutorga & Hawksworth (*SA* 15: 1, 1997).

Schroedera D.J. Morris & A. Adams (2002), Microsporidia. 2. See Morris & Adams (*Acta Protozool.* 41: 395, 2002).

Schroeterella Syd. (1922) [non *Schroeterella* Herzog 1916, *Musci*] = *Puccinia* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).

Schroeteria G. Winter (1881), anamorphic *Pezizomycotina*. 6 (in seeds of *Veronica*), Asia; Europe. smut-

like. See Vánky (*Sydowia* 34: 157, 1981; monogr.), Nagler *et al.* (*Mycol.* 81: 884, 1989; ascomycete affinities), Vánky (*Mycol. Balcanica* 1: 175, 2004).

Schroeteriaster Magnus (1896), Pucciniales. 1 (on *Ranunculus* (I) (*Ranunculaceae*); on *Rumex* (II, III) (*Polygonaceae*)), Europe. See Mains (*Annls mycol.* 32: 256, 1934) = *Uromyces* (Puccin.) fide, Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983).

Schulzeria Bres. & Schulzer (1886) nom. dub. ? = *Leucoagaricus* fide Kuyper (*in litt.*).

Schvartsman (Sofiya Ruvinovna; 1912-1975; Ukraine, later Russia, Kazakhstan). Laboratory assistant, Adamy Aul, Adygea Autonomous Region (1930); student, Moscow State University (1931-1940); Senior Lecturer in Botany, Kazakh State University, Alma Ata (1940-1961); founder (1941) then Head (1943-1961) of the Department of Lower Plants, Botanical Institute of the Kazakh SSR Academy of Sciences. Major contributions to the mycota of Kazakhstan, as initiator, organizer and editor-in-chief of the [*Flora of Cryptogamic Plants of Kazakhstan*] [in Russian]. *Publs.* (with various collaborators) [*Flora of Cryptogamic Plants of Kazakhstan*] 8 vols (1960-1973) [in Russian]. *Biogs, obits etc.* Vasyagina & Byzova [*Mikologiya i Fitopatologiya*] 12: 176, 1978 [in Russian].

Schwanniomyces Klöcker (1909), Saccharomycetales. 6. See Kurtzman & Robnett (*Yeast Chichester* 7: 61, 1991), Yamada *et al.* (*J. gen. appl. Microbiol.* Tokyo 37: 523, 1991), Nakase *et al.* in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 157, 1998).

Schwarzmannia Pisareva (1968), anamorphic *Pezizomycotina*, Cac.1eP.19. 1, Kazakhstan. See Pisareva (*Botanicheskie Materialy Gerbariya Instituta Botaniki, Akademiya Nauk Kazakhskoi SSR* 5: 72, 1968).

Schweinitz (Lewis David von; 1780-1834; USA). Born, Bethlehem, Pennsylvania; educated in Saxony, Germany (1798-1808); church administrator, Salem, North Carolina (1812 onwards). The first important mycologist of his country, Schweinitz learned mycology in Saxony with Albertini, continuing this interest on return to the USA in 1812; a careful observer who had one of the best compound microscopes of his day, he sent parts of his specimens to co-workers in Europe and America. *Publs.* (with Albertini) *Conspectus Fungorum in Lusatiae* (1805); *Synopsis Fungorum Carolinae Superioris* (1822); *Synopsis Fungorum in America Boreali* (1832) [an account of all the fungi (about 4,000) then known in North America]. *Biogs, obits etc.* Rogers (*Mycol.* 69: 223, 1977); Shear (*Plant World* 5: 45, 1902) [portrait]; Shear & Stevens (*Mycol.* 9: 191, 1917); Shear & Stevens (*Memoirs of the Torrey Botanical Club* 16: 119, 1921, Schweinitz-Torrey correspondence); Stafleu & Cowan (*TL-2* 5: 437, 1985).

Schweinitzia Grev. (1823) [non *Schweinitzia* Elliott ex Nuttall 1818, *Pyrolaceae*] = *Podaxis* fide Kuyper (*in litt.*).

Schweinitzia Massee (1895) ? = *Velutaria* fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).

Schweinitziella Speg. (1888), Sordariomycetes. 3 (on fungi), widespread (tropical). See Pirozynski (*Kew Bull.* 31: 595, 1977).

Schwendener (Simon; 1829-1919; Switzerland). Student, Geneva then Zürich (1856-1857) [under C. Nägeli]; Assistant (1857-1860), then Lecturer (1860-

- 1867) Munich; Professor of Botany, Basle (1867-1877); Professor of Botany, Tübingen (1877-1878); Professor of Botany and Director of Botanical Institute, Berlin (1878-1909). Elucidated true nature of the components of lichen symbiosis. *Publs. Verhandlungen der Schweizerischen Naturforschenden Gesellschaft in Rheinfelden Aarau* 51: 88, 1867; *Die Algentypen der Flechtengonidien*, 1869. *Biogs, obits etc.* Ainsworth (*Introduction to the History of Mycology*, 1976); Vines (*Proceedings of the Linnean Society* 1919-20: 47, 1921); Stafleu & Cowan (*TL-2* 5: 443, 1985).
- Scindalma** Hill ex Kuntze (1898) = *Phellinus* fide Pegler (*The polypores [Bull. BMS Suppl.]*, 1973).
- Sciniatosporium** Kalchbr. ex Morgan-Jones (1971) = *Seimatosporium* fide Sutton (*TBMS* 58: 164, 1972).
- Sciodothis** Clem. (1909) = *Tomasellia* fide Harris (*in litt.*).
- Scipionospora** E.K.C. Bylén & J.I.R. Larsson (1995), *Microsporidia*. 1.
- Scirrha** Nitschke ex Fuckel (1870), ? *Capnodiales*. Anamorph *Lecanosticta*. 9, widespread. *S. acicola* (brown needle blight of pine). See Siggers (*Tech. Bull. U.S. Dept. Agric.* 870, 1944), Obrist (*Phytopath. Z.* 35: 370, 1959), Barr (*Contr. Univ. Mich. Herb.* 9: 523, 1972), von Arx & Müller (*Stud. Mycol.* 9, 1975; ? = *Metameris* p.p.), Butin (*Sydowia* 38: 20, 1986; anam.), Kohlmeyer *et al.* (*CJB* 74: 1830, 1996).
- Scirrhiachora** Theiss. & Syd. (1915), *Mycosphaerellaceae*. 1, Europe. See von Arx & Müller (*Stud. Mycol.* 9, 1975), Aptroot (*CBS Diversity Ser.* 5, 2006).
- Scirrhiella** Speg. (1885) = *Apiospora* fide Barr (*Mycol.* 68, 1976).
- Scirrhiopsis** Henn. (1905) nom. dub., *Fungi*.
- Scirrhodopsis** Theiss. & Syd. (1915) = *Metameris* fide Barr (*Mycotaxon* 43: 371, 1992).
- Scirrhophoma** Petr. (1941), anamorphic *Pezizomycotina*, *St.0eH.?*. 1, Europe.
- Scirrhophragma** Theiss. & Syd. (1915) = *Metameris* fide Barr (*Mycotaxon* 43: 371, 1992).
- scissile** (of the flesh of a pileus), separating into horizontal layers.
- Scitovszkya** Schulzer (1866) = *Mucor* Fresen. fide Hesseltine (*Mycol.* 47: 344, 1955).
- Sclerangium** Lév. (1848) = *Scleroderma* fide Stalpers (*in litt.*).
- sclerobasidium**, see *basidium*.
- sclerocarps**, sclerotium-like modified ascomata permanently lacking a sexual capacity and acting as sclerotia, as in *Varicosporina ramulosa* (Kohlmeyer & Charles, *CJB* 59: 1787, 1981).
- Sclerochaeta** Höhn. (1917) = *Chaetopyrena* Pass. fide Höhnelt (*Hedwigia* 60: 129, 1918).
- Sclerochaetella** Höhn. (1917) = *Diploplenodomus* fide Petrak (*Annls mycol.* 42: 58, 1944).
- Sclerocleista** Subram. (1972), *Trichocomaceae*. Anamorph *Aspergillus*. 2. See von Arx (*Gen. Fungi Sporul. Cult.* Edn 3, 1981), Pitt & Samson (*Regnum veg.* 128: 13, 1993), Bainbridge (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 373, 2000; phylogeny), Tamura *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 357, 2000; phylogeny), Klich (*Identification of Common Aspergillus Species*: 116 pp., 2002).
- Sclerococcum** Fr. (1825), anamorphic *Pezizomycotina*, *Hsp.#eP.1/10*. 15 (on lichens), Europe. See Hawksworth (*TBMS* 65: 219, 1975), Hawksworth (*Bull. Br. Mus. nat. hist. Bot.* 6: 181, 1979), Diederich & Scholz (*Bibliotheca Lichenol.* 57: 113, 1995), Etayo & Calatayud (*Annl. naturh. Mus. Wien Ser. B, Bot. Zool.* 100: 677, 1998; Spain).
- Scleroconidioma** Tsuneda, Currah & Thormann (2000), anamorphic *Dothideomycetes*. 1, Canada. See Tsuneda *et al.* (*CJB* 78: 1295, 2000), Tsuneda *et al.* (*Mycol.* 93: 1164, 2001; ontogeny), Hambleton *et al.* (*Mycol.* 95: 959, 2003; phylogeny), Tsuneda *et al.* (*Mycol.* 96: 1128, 2004; phylogeny).
- Scleroconium** Syd. (1935), anamorphic *Pezizomycotina*, *Hsp.0eH.6*. 1, S. America.
- Sclerocrana** Samuels & L.M. Kohn (1987), *Sclerotiniaceae*. 1, New Zealand. See Samuels & Kohn (*Sydowia* 39: 202, 1987).
- Sclerocystis** Berk. & Broome (1873), *Glomeraceae*. 1, widespread (tropical). See Almeida & Schenk (*Mycol.* 82: 703, 1990; revision), Wu (*Mycotaxon* 47: 25, 1993), Wu (*Mycotaxon* 49: 327, 1993; revision), Wu & Chen (*TMSJ* 34: 283, 1993), Wang *et al.* (*Acta Mycol. Sin.* 15: 161, 1996), Yao *et al.* (*Genera of Endogonales*: 229 pp., 1996), Redecker *et al.* (*Mycol.* 92: 282, 2000; phylogeny, *S. coremioides* transferred to *Glomus*), Degawa (*Memoirs of the National Science Museum Tokyo* 37: 119, 2001; Japan).
- Sclerodepsis** Cooke (1890) = *Trametes* fide Ryvarden (*Gen. Polyp.*: 222, 1991).
- Scleroderma** Pers. (1801), *Sclerodermataceae*. c. 30, widespread. See Guzmán (*Darwiniana* 16: 233, 1970; key), Rifai (*TMSJ* 28: 97, 1987; Malesia, key), Sarasini (*Boll. Gruppo Micol. 'G. Bresadola'* 34: 119, 1991; Italy), Richter (*Mycotaxon* 45: 461, 1992; cultures), Sims *et al.* (*Mycotaxon* 56: 403, 1995; key), Jeffries (*Scleroderma – Ectomycorrhizal fungi, key genera in profile*, 1999; ecology), Poumarat (*Bulletin Semestriel de la Fédération des Associations Mycologiques Méditerranéennes* 15: 40, 1999; Europ., key), Watling (*Mycoscience* 47: 18, 2006).
- Sclerodermataceae** Corda (1842), *Boletales*. 6 gen. (+ 23 syn.), 39 spp.
- Lit.*: Dick (*TBMS* 57: 417, 1971), Gill & Watling (*Pl. Syst. Evol.* 154: 225, 1986), Richter (*Mycotaxon* 45: 461, 1992), Orlovich & Ashford (*Protoplasma* 178: 66, 1994), Pegler *et al.* (*British Puffballs, Earthstars and Stinkhorns An Account of the British Gasteroid Fungi*: 255 pp., 1995), Sims *et al.* (*Mycotaxon* 56: 403, 1995), Bruns *et al.* (*Mol. Ecol.* 5: 257, 1998), Junghans *et al.* (*Mycorrhiza* 7: 243, 1998), Sims *et al.* (*MR* 103: 449, 1999), Guzmán & Ovrebo (*Mycol.* 92: 174, 2000), Díez *et al.* (*New Phytol.* 149: 577, 2001), Binder & Bresinsky (*Mycol.* 94: 85, 2002), Cairney (*New Phytol.* 153: 199, 2002), Kasuya *et al.* (*Mycoscience* 43: 475, 2002), Martin *et al.* (*New Phytol.* 153: 345, 2002), Hitchcock *et al.* (*MR* 107: 699, 2003), Kanchanaprayudh *et al.* (*Mycoscience* 44: 287, 2003), Moyersoen *et al.* (*New Phytol.* 160: 569, 2003), Watling & Sims (*Mem. N. Y. bot. Gdn* 89: 93, 2004), Watling (*Mycoscience* 47: 18, 2006).
- Sclerodermatales** = *Boletales*.
- Sclerodermatopsis** Torrend (1923) ? = *Xylaria* Hill ex Schrank fide Læssøe (*SA* 13: 43, 1994).
- Scleroderris** (Fr.) Bonord. (1851) = *Godronia* fide Groves (*CJB* 43: 1195, 1965).
- Sclerodiscus** Pat. (1890), anamorphic *Pezizomycotina*, *St.0eP.?*. 1, Asia.
- Sclerodon** P. Karst. (1889) = *Gloiodon*.

- Sclerodothiorella** Died. (1912), anamorphic *Pezizomycotina*, St.OeH.?. 1, Europe.
- Sclerodothis** Höhn. (1918) = *Leptosphaeria* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Sclerogaster** R. Hesse (1891), Sclerogastraceae. 10, Europe; America. See Dodge & Zeller (*Ann. Mo. bot. Gdn* 23: 565, 1937), Fogel (*Mycol.* 82: 655, 1990; N. Am. key).
- Sclerogastraceae** Locq. ex P.M. Kirk (2008), Geastrales. 1 gen., 10 spp.
- Scleroglossum** Hara (1948) = *Scleromitula* fide Korf in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 249, 1973).
- Scleroglossum** Pers. (1820) = *Acrospermum* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Sclerogone** Warcup (1990), Endogonaceae. 1, Australia. See Warcup in Sanders *et al.* (Eds) (*Endomycorrhizas*: 53, 1975; culture), Warcup (*MR* 94: 173, 1990), Yao *et al.* (*Kew Bull.* 50: 349, 1995), Yao *et al.* (*Genera of Endogonales*: 229 pp., 1996).
- Sclerographa** (Vain.) Zahlbr. (1923) = *Opegrapha* Ach. fide Upreti & Singh (*Beitr. Biol. Pfl.* 62: 233, 1987).
- Sclerographiopsis** Deighton (1973), anamorphic *Pezizomycotina*, Hsy.≡ eP.3. 1, Sierra Leone. See Sutton & Pascoe (*Aust. J. Bot.* 35: 183, 1987; cf. *Tandonella*).
- Sclerographium** Berk. (1854), anamorphic *Pezizomycotina*, Hsy.#eP.10. 4, Asia; Africa. See Deighton (*Mycol. Pap.* 78, 1960).
- Scleroma** Fr. (1838) = *Pleurotus* fide Kuyper (*in litt.*) *Pleurotus* is not yet conserved against *Scleroma*.
- Scleromeris** Syd. (1926), anamorphic *Pezizomycotina*, St.OeP.?. 1, C. America.
- Scleromitra** Corda (1829) = *Pistillaria* Fr. fide Corner (*Ann. Bot. Mem.* [A monograph of *Clavaria* and allied genera] 1, 1950).
- Scleromitula** S. Imai (1941), Rutstroemiaceae. Anamorph *Myrioconium*. 6, widespread. See Kohn & Nagasawa (*TMSJ* 25: 127, 1984), Spooner (*Bibliotheca Mycol.* 116, 1987), Holst-Jensen *et al.* (*Mycol.* 89: 885, 1997; phylogeny, as *Verpatinia*), Schumacher & Holst-Jensen (*Mycoscience* 38: 55, 1997; phylogeny, syn. *Verpatinia*), Wang *et al.* (*Am. J. Bot.* 92: 1565, 2005; phylogeny), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006; phylogeny), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Scleromium** Linds. (1869) nom. inval. ≡ *Pseudographis*.
- Scleroparodia** Petr. (1934) = *Ascochytopsis* fide Sutton (*Mycol. Pap.* 141, 1977).
- Scleropezicula** Verkley (1999), Helotiales. Anamorph *Cryptosymphodula*. 1, Canada; Europe. See Verkley (*Stud. Mycol.* 44: 132, 1999), Verkley *et al.* (*MR* 107: 689, 2003; phylogeny).
- Sclerophoma** Höhn. (1909), anamorphic *Sydowia*, *Xenomeris*, St.OeH.15. 30, widespread. See Hermanides-Nijhof (*Stud. Mycol.* 15: 166, 1977; as *Dothichiza*), Müller & Hallaksela (*MR* 102: 1190, 1998).
- Sclerophomella** Höhn. (1917) = *Phoma* Sacc. fide Sutton (*Mycol. Pap.* 141, 1977).
- Sclerophomina** Höhn. (1917) = *Phoma* Sacc. fide Sutton (*Mycol. Pap.* 141, 1977).
- Sclerophora** Chevall. (1826), Coniocybaceae (L). 6, widespread (temperate). See Tibell (*Beih. Nova Hedwigia* 79: 597, 1984), Yao & Spooner (*Kew Bull.* 54: 683, 1999).
- Sclerophoraceae** Körb. (1846) = Coniocybaceae.
- Sclerophytomyces**, see *Peterjamesia*.
- Sclerophyton** Eschw. (1824), Roccellaceae (L). 27, widespread. See Egea & Torrente (*Bryologist* 98: 207, 1995; N. Am.), Makhija & Adawadkar (*Lichenologist* 34: 347, 2002; India), Archer (*Mycotaxon* 87: 85, 2003; Australasia), Sparrius (*Bibliotheca Lichenol.* 89, 2004; monogr.), Sparrius *et al.* (*Lichenologist* 37: 285, 2005; soredia), Hawksworth (*Lichenologist* 38: 187, 2006; nomencl.).
- Sclerophytonomyces** Cif. & Tomas. (1953) ≡ *Sclerophyton*.
- Sclerophytonomyces** Cif. & Tomas. ex Sparrius (2004) nom. inval. = *Peterjamesia* fide Sparrius (*Bibliotheca Lichenol.* 89: 84, 2004), Hawksworth (*Lichenologist* 38: 187, 2006).
- Scleroplea** (Sacc.) Oudem. (1900) = *Pyrenophora* fide Anon. (*Sydowia* 5: 248, 1951).
- scleroplectenchyma**, plectenchyma (q.v.) composed of very thick-walled conglutinate cells. See Yoshimura & Shimada (*Bull. Kochi Gakuen Jun. Coll.* 11: 13, 1990); stereome.
- Scleroplella** Höhn. (1918) = *Leptosphaerulina* fide Barr (*Contr. Univ. Mich. Herb.* 9, 1972).
- scleroprosoplectenchyma**, see plectenchyma.
- Scleropycnis** Syd. & P. Syd. (1911), anamorphic *Pezizomycotina*, St.OeH.15. 2, Europe. See Sutton & Livsey (*TBMS* 88: 271, 1987; gen. redescription).
- Scleropycnium** Heald & C.E. Lewis (1912) ? = *Phomopsis* (Sacc.) Bubák. fide Sutton (*Mycol. Pap.* 141, 1977).
- Scleropyrenium** H. Harada (1993), Verrucariaceae (L). 2, Japan. See Harada (*Nat. Hist. Res.* 2: 131, 1993), Harada (*Lichenology* 1: 76, 2002).
- Sclerosphaeropsis** Bubák (1914) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Sclerosporis** Stach & A. Chandra (1956), Fossil Fungi. 1 (Carboniferous, Tertiary), Europe. See Stach & Pickhardt (*Palaeontologische Zeitschrift* 31: 140, 1957).
- Sclerostagonospora** Höhn. (1917), anamorphic *Pleosporales*. See Petrak (*Annls mycol.* 23: 4, 1925), Sutton (*The Coelomycetes*, 1980), Crous & Palm (*MR* 103: 1299, 1999).
- Sclerostilbum** Povah (1932) = *Tilachlidiopsis* fide Stalpers (*CJB* 69: 6, 1990).
- Sclerotelium** Syd. (1921) = *Puccinia* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- Sclerotheca** Bubák & Vleugel (1908) [non *Sclerotheca* DC. 1839, *Campanulaceae*] = *Camarosporium* fide Sutton (*The Coelomycetes*, 1980).
- sclerotionine**, a plant growth promoting metabolic product of *Sclerotinia libertiana* (Matsu & Satomura, *Agr. biol. Chem.* 32: 611, 1968).
- Sclerothyrium** Höhn. (1918) = *Microsphaeropsis* Höhn. fide Sutton (*Mycol. Pap.* 141, 1977).
- Sclerotiaceae** Dumort. (1822) = Typhulaceae.
- sclerotic cell**, see muriform cell.
- Sclerotiella** A.K. Sarbhoy & A. Sarbhoy (1975), anamorphic *Pezizomycotina*, Sc.-. 1, India. See Sarbhoy & Sarbhoy (*Maharashtra Vidnyan Mandir, Patrika* 9: 91, 1974).
- Sclerotinia** Fuckel (1870) nom. cons., Sclerotiniaceae. Anamorphs *Myrioconium*, *Sclerotium*. 14, widespread. *S. minor* and *S. sclerotiorum* (plurivorous), *S. trifoliorum* (clover rot). See Kohn (*Mycotaxon* 9: 365, 1979; monogr., key, 259 epithets), Spooner

- (*Bibliotheca Mycol.* 116, 1987), Kohli *et al.* (*Mol. Ecol.* 4: 69, 1995; clonality), Kohli & Kohn (*Mol. Ecol.* 5: 773, 1996; mitochondrial haplotypes), Cubeta *et al.* (*Phytopathology* 87: 1000, 1997; clonality), Holst-Jensen *et al.* (*Mycol.* 89: 885, 1997; phylogeny), Willetts (*MR* 101: 939, 1997; evolution, review), Holst-Jensen *et al.* (*Nordic Jl Bot.* 18: 705, 1999; phylogeny), Gernandt *et al.* (*Mycol.* 93: 915, 2001; phylogeny), Freeman *et al.* (*Eur. J. Pl. Path.* 108: 877, 2002; molecular diagnostics), Meinhardt *et al.* (*Fitopatol. Brasil* 27: 211, 2002; genetic diversity, Brazil), Kim & Cho (*Pl. Path. J.* 19: 69, 2003; on *Cruciferae*), Viji *et al.* (*Pl. Dis.* 88: 1269, 2004; on turfgrass, N America), Ekins *et al.* (*MR* 110: 1193, 2006; homothallism), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Sclerotiniaceae** Whetzel (1945), Helotiales. 47 gen. (+ 28 syn.), 284 spp.
- Lit.*: Whetzel (*Mycol.* 37: 648, 1945; fams.), Buchwald (*Kgl. Veter. Landboh. Aarsskr.*, 1949), Dumont & Korf (*Mycol.* 63: 157, 1971; gen. nomencl.), Schwegler (*Schweiz. Z. Pilzk.* 56: 49, 1978; genetics), Kohn (*Mycotaxon* 9: 365, 1979), Schumacher & Kohn (*CJB* 63: 1610, 1985), Spooner (*Bibliotheca Mycol.* 116, 1987; gen. concepts), Kohn (*TBMS* 91: 639, 1988; protein electroph.), Kohn & Grenville (*CJB* 67: 371, 1989; anatomy, histochem.), Kohn & Grenville (*CJB* 67: 394, 1989; ultrastr.), Batra (*Mycol. Mem.* 16: 246 pp., 1991), Novak & Kohn (*Appl. Environm. Microbiol.* 57: 525, 1991; protein electrophor.), Verkley (*MR* 97: 179, 1993; ultrastr.), Zhuang (*Acta Mycol. Sin.* 13: 13, 1994; China), Anderson & Kohn (*Ann. Rev. Phytopath.* 33: 369, 1995), Cubeta *et al.* (*Phytopathology* 87: 1000, 1997), Holst-Jensen *et al.* (*Am. J. Bot.* 84: 686, 1997), Holst-Jensen *et al.* (*Mycol.* 89: 885, 1997; phylogeny), Schumacher & Holst-Jensen (*Mycoscience* 38: 55, 1997), Willetts (*MR* 101: 939, 1997; evolution, review), Anderson & Kohn (*Trends in Ecology & Evolution* 13: 444, 1998), Fulton *et al.* (*Eur. J. Pl. Path.* 105: 495, 1999), Giraud *et al.* (*Phytopathology* 89: 967, 1999), Holst-Jensen *et al.* (*Nordic Jl Bot.* 18: 705, 1998), Holst-Jensen *et al.* (*Mol. Biol. Evol.* 16: 114, 1999; evolution), Taylor *et al.* (*Ann. Rev. Phytopath.* 37: 197, 1999), Förster & Adaskaveg (*Phytopathology* 90: 171, 2000), Côté *et al.* (*Mycol.* 96: 240, 2004), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006).
- Sclerotium** Woron. (1926) ? = *Sclerotium* fide Stalpers (*in litt.*).
- Sclerotium** Speg. (1882) = *Pilidium* fide Petrak (*Sydowia* 5: 328, 1951), Palm (*Mycol.* 83: 787, 1991).
- Sclerotites** A. Massal. (1857), Fossil Fungi. 16 (Tertiary), Europe; USA.
- Sclerotites** E. Jeffrey & Chrysler (1906), Fossil Fungi. 6 (Tertiary), Europe; USA.
- Sclerotium** Tode (1790), anamorphic *Athelia*, *Myriosclerotinia*, *Sclerotinia*, *Typhula*. 100, widespread. *S. cepivorum* (onion (*Allium*) white rot), *S. oryzae* (on rice), *S. rolfsii* (plurivorous; teleomorph *Athelia rolfsii*), *S. tuliparum* (grey bulb rot of tulip), *S. delphinii*, *S. microsclerotium*. A number of the earlier spp. are anamorphs of *Basidiomycota*, *Ascomycota*, etc. See Aycock (*Tech. Bull. N. Carol. agric. Exp. Stn* 174, 1966; *S. rolfsii*), Backhouse & Stewart (*TBMS* 89: 561, 1987; histochemistry), Hanlin & Tortolero (*CJB* 67: 1852, 1989; morphology *S. coffeicola*), Punja & Damiani (*Mycol.* 88: 694, 1996), Cartwright *et al.* (*Mycol.* 89: 163, 1997; mycoparasite of *S. oryzae*), Almeida *et al.* (*J. Phytopath.* 149: 493, 2001; genotypic diversity *S. rolfsii*), Okabe & Matsumoto (*MR* 107: 164, 2003; phylogeny).
- sclerotium** (1) a firm, frequently rounded, mass of hyphae with or without the addition of host tissue or soil, normally having no spores in or on it (cf. bulbil, stroma); see Willetts (*Biol. Rev.* 46: 387, 1971; survival, 47: 515, 1972; morphogenesis), Willetts & Bullock (*MR* 96: 801, 1992; developm. biology). A sclerotium may give rise to a fruit body, a stroma (as in ergot), or mycelium. See blackfellows' bread, stone fungi, tuckahoe, Anamorphic fungi. (2) (of *Mycetozoa*), the firm, resting condition of a plasmodium.
- Sclerozythia** Petch (1937), anamorphic *Pezizomycotina*, Cpd.0eH.?. 1, British Isles.
- Sclerozythia** Petr. (1955) [non *Sclerozythia* Petch 1937] = *Neozythia*.
- scobiculate**, in fine grains, like sawdust.
- scocho**, see Fermented food and drinks.
- Scodellina** Gray (1821) = *Peziza* Fr.
- Scolecactis** Clem. (1909) = *Bactrospora* fide Egea & Torrente (*Cryptog. Bryol.-Lichénol.* 14: 329, 1993).
- Scoleciasis** Roum. & Fautrey (1889) nom. dub. = *Lep-tosphaeria* fide Sutton (*in litt.*), Pennycook & McKenzie (*Mycotaxon* 82: 145, 2002).
- Scoleciocarpus** Berk. (1843) = *Arachnion* fide Demoulin (*Nova Hedwigia* 21: 646, 1972).
- scolecite**, see Woronin's hypha.
- Scolecites** (orthographic variant), see *Skolekites*.
- Scolecobasidiella** M.B. Ellis (1971), anamorphic *Pezizomycotina*, Hso.1eP.10. 1, Somalia. See Ellis (*Mycol. Pap.* 125: 12, 1971).
- Scolecobasidium** E.V. Abbott (1927), anamorphic *Pezizomycotina*, Hso.1eP.11. 15, widespread. See Barron & Busch (*CJB* 40: 77, 1962; key), Graniti (*G. bot. ital.* n.s. 69: 364, 1963; gen. concept), de Hoog & von Arx (*Kavaka* 1: 55, 1973; monotypic), de Hoog (*Stud. Mycol.* 26: 51, 1985; key), Horré *et al.* (*Stud. Mycol.* 43: 194, 1999), Liu & Zhang (*Mycosystema* 25: 386, 2006).
- Scolecobasis** Clem. & Shear (1931) = *Scolecobasidium*.
- Scolecobonaria** Bat. (1962), *Dothideomycetes*. 2, Taiwan; USA. See Batista (*Beih. Sydowia* 3: 97, 1962).
- Scolecoccoidea** F. Stevens (1927) = *Coccodiella* fide Müller & von Arx *in* Ainsworth *et al.* (Eds) (*The Fungi* 4A: 87, 1973), Pirozynski (*Mycol.* 65: 164, 1973).
- Scolecodochium** K. Matsush. & Matsush. (1996), anamorphic *Pezizomycotina*, Hso.?.?. 1, Malaysia. See Matsushima & Matsushima (*Matsush. Mycol. Mem.* 9: 36, 1996).
- Scolecodothis** Theiss. & Syd. (1914) = *Ophiodothella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Scolecodothopsis** F. Stevens (1924) = *Diatractium* fide Cannon (*MR* 92: 327, 1989).
- Scoleconectria** Seaver (1909) = *Nectria* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Scolecopeltella** Speg. (1923) = *Micropeltis* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Scolecopeltidella** J.M. Mend. (1925) nom. dub., *Pezizomycotina*. See Petrak (*Sydowia* 5: 190, 1951), von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Scolecopeltidium** F. Stevens & Manter (1925), ? *Mi-*

- crothyriaceae. c. 80, widespread (tropical). See Reynolds & Gilbert (*Aust. Syst. Bot.* 18: 265, 2005; Australia).
- Scolecopeltis** Speg. (1889) = *Micropeltis* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Scolecopeltium** Clem. & Shear (1931) ≡ *Scolecopeltidium*.
- Scolecopeltopsis** Höhn. (1909) = *Micropeltis* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- scoleospore**, a spore resembling an amerspore (q.v.) but with or without septa and a length/width ratio > 15:1. See Anamorphic fungi.
- Scolecosporiella** Höhn. (1923) nom. nud., Fungi. 1. See Sutton (*CJB* 46: 189, 1968; key).
- Scolecosporiella** Petr. (1921), anamorphic *Phaeosphaeria*, Cpd.≡ -#eP.1. 6, widespread. See Sutton (*CJB* 46: 189, 1968; key), Sutton (*The Coelomycetes*, 1980), Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993).
- Scolecosporites** R.T. Lange & P.H. Sm. (1971), Fossil Fungi. 1 (Paleocene), Australia.
- Scolecosporium**, see *Scolicosporium*.
- Scolecostigmina** U. Braun (1999), anamorphic *Capnodiaceae*, Hso.?.?. 19, widespread. See Braun *et al.* (*N.Z. J. Bot.* 37: 323, 1999).
- Scolecostroma** Bat. & Peres (1960) = *Lophium* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Scolecotheca** Søchting & B. Sutton (1997), anamorphic *Pezizomycotina*, Cpd.?.?. 1, Europe (northern). See Søchting & Sutton (*MR* 101: 1366, 1997).
- Scolecotrichum**, see *Scolicotrichum*.
- Scolecoxyphium** Cif. & Bat. (1956), anamorphic *Capnodium*, Hsp.0eH.?. 4, widespread (tropical). See Hughes (*Mycol.* 68: 693, 1976).
- Scolecozythia** Curzi (1927), anamorphic *Pezizomycotina*, St.0fH.?. 1, Italy.
- Scoliciosporomyces** Cif. & Tomas. (1953) = *Scoliciosporum* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Scoliciosporum** A. Massal. (1852), Lecanorales (L). 13, widespread (temperate). See Vězda (*Folia geobot. phytotax.* 13: 397, 1978; key), Lumbsch *et al.* (*Mol. Phylogen. Evol.* 31: 822, 2004; phylogeny), Andersen & Ekman (*MR* 109: 21, 2005; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Scolicosporium** Lib. ex Roum. (1880), anamorphic *Asteromassaria*, Cac.≡ eP.1. 4, Europe. See Sutton (*Mycol. Pap.* 138, 1975), Spooner & Kirk (*TBMS* 78: 247, 1982; relationship with *Excipularia*), Constantinescu (*Mycotaxon* 42: 467, 1991).
- Scolicotrichum** Kunze (1817) nom. conf., anamorphic *Pezizomycotina*. See also *Passalora*. See Höhnelt (*Zbl. Bakt. Abt. II* 60: 1, 1932), Hughes (*CJB* 36: 727, 1958).
- Scoliocarpon** Nyl. (1858), *Pezizomycotina*. 1, N. America.
- Scolionema** Theiss. & Syd. (1918), *Parodiopsidaceae*. 1, S.E. Asia.
- Scoliotidium** Bat. & Cavalc. (1963), anamorphic *Pezizomycotina*, Cpt.≡ eH.?. 1, Brazil. See Batista & Cavalcanti (*Publções Inst. Micol. Recife* 395: 11, 1963).
- Scopaphoma** Dearn. & House (1925), anamorphic *Pezizomycotina*, Cpd.1eH.1. 1, USA.
- Scopella** Mains (1939) = *Maravalia* fide Ono (*Mycol.* 76: 892, 1984).
- Scopellopsis** T.S. Ramakr. & K. Ramakr. (1947) = *Maravalia* fide Thirumalachar & Mundkur (*Indian Phytopath.* 2: 193, 1949).
- Scopinella** Lév. (1849), *Sordariales*. 7, widespread (temperate). See Cannon & Hawksworth (*J. Linn. Soc. Bot.* 84: 115, 1982; key), Tsuneda (*Rep. Tottori mycol. Inst.* 22: 82, 1984; ontogeny), Tsuneda *et al.* (*TMSJ* 26: 221, 1985; SEM, posn), Stchigel *et al.* (*Mycol.* 98: 815, 2006).
- Scoptria** Nitschke (1867) nom. rej. = *Eutypella*. Anamorph links with *Phaeoisaria* require confirmation. fide Rappaz (*Mycol. Helv.* 2: 285, 1987).
- Scopula** Arnaud (1952) = *Gloiosphaera* fide Wang (*Mycol.* 63: 890, 1971).
- Scopularia** Preuss (1851) nom. dub., *Pezizomycotina*. See Kendrick (*CJB* 42: 1119, 1964).
- Scopulariella** Gjaerum (1971), anamorphic *Pezizomycotina*, Hsy.1eH.4. 1, Denmark. See Gjaerum (*Friesia* 9: 416, 1971).
- Scopulariopsis** Bainier (1907), anamorphic *Microascus*, Hso.0eH.19. 22 (saprobic and pathogenic to animals), widespread. *S. fimicola*, white plaster mould of mushroom beds; *S. brevicaulis* has been used for the detection of arsenic and was proposed as an agent of cot death (q.v.). See Raper & Thom (*Manual of the Penicillia*, 1949), Morton & Smith (*Mycol. Pap.* 86, 1963; descr. & illustr. 18 spp.), Abbott *et al.* (*Mycol.* 90: 297, 1998; teleomorph), Abbott & Sigler (*Mycol.* 93: 1211, 2001; heterothallism), Abbott *et al.* (*Mycol.* 94: 362, 2002), Issakainen *et al.* (*Medical Mycology* 41: 31, 2003; phylogeny).
- Scopulina** Lév. (1846) [non *Scopulina* Dumort. 1882, *Hepaticae*] ≡ *Scopinella*.
- Scopulodontia** Hjortstam (1998), *Russulales*. 2. See Hjortstam *et al.* (*Kew Bull.* 53: 820, 1998), Nakasone (*Cryptog. Mycol.* 24: 131, 2003).
- Scopuloides** (Masse) Höhn. & Litsch. (1908), *Meruliaceae*. 5, widespread. See Boidin *et al.* (*Cryptog. Mycol.* 14: 195, 1993; key Eur. spp.).
- Scoriadopsis** J.M. Mend. (1930), ? *Capnodiaceae*. 1, S. America.
- Scorias** Fr. (1825), *Capnodiaceae*. Anamorphs *Conidiocarpus*, *Scolecoxyphium*. 3, widespread (tropical). See Reynolds (*Mycotaxon* 8: 417, 1979), Reynolds (*Mycotaxon* 27: 377, 1986), Reynolds (*CJB* 76: 2125, 1998; phylogeny), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- scorpioid**, a branching system in which the laterals are curved so that they all appear to arise from one side of the main stem, as in *Cladonia arbuscula*.
- Scorpiosporium** S.H. Iqbal (1974), anamorphic *Pezizomycotina*, Hso.0bP.1. 4, British Isles. See Iqbal (*Biologia Lahore* 20: 17, 1974).
- Scortechinia** Sacc. (1885), *Scortechiniaceae*. 1 (from wood etc.), widespread. See Nannfeldt (*Svensk bot. Tidskr.* 69: 49, 1975), Nannfeldt (*Svensk bot. Tidskr.* 69: 289, 1975), Subramanian & Sekar (*Kavaka* 18: 19, 1993), Huhndorf *et al.* (*MR* 108: 1384, 2004; phylogeny), Schoch *et al.* (*MR* 111: 154, 2007; phylogeny).
- Scortechinia** Sacc. (1891) = *Scortechinia* Sacc. (1885). Typified differently from *Scortechinia* Sacc. (1885), but the two types are conspecific. fide Nannfeldt (*Svensk bot. Tidskr.* 69: 49, 289, 1975).
- Scortechiniaceae** Huhndorf, A.N. Mill. & F.A. Fernández (2004), *Coronophorales*. 3 gen., 3 spp. See Huhndorf *et al.* (*MR* 108: 1384, 2004; phylogeny), Schoch *et al.* (*MR* 111: 154, 2007; phylogeny).

- Scortechiniella** Arx & E. Müll. (1954) = *Nitschkia* fide Nannfeldt (*Svensk bot. Tidskr.* 66: 49, 1975).
- Scortechiniellopsis** Sivan. (1974) = *Nitschkia* fide Nannfeldt (*Svensk bot. Tidskr.* 66: 49, 1975).
- Scorteus** Earle (1909) = *Marasmius* fide Pennington (*North Amer. Flora* 9: 250, 1915).
- Scothelius** Bat., J.L. Bezerra & Cavalc. (1965), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, Brazil. See Batista *et al.* (*Atas Inst. Micol. Univ. Pernambuco* 2: 302, 1965).
- Scotiosphaeria** Sivan. (1977), *Pezizomycotina*. 1, British Isles. See Sivanesan (*TBMS* 69: 119, 1977).
- Scotoderma** Jülich (1974), *Stereaceae*. 1, British Isles. See Jülich (*Proc. K. Ned. Akad. Wet. Ser. C, Biol. Med. Sci.* 77: 149, 1974).
- Scotomyces** Jülich (1978), *Ceratobasidiaceae*. 1, widespread. See Roberts (*Rhizoctonia-forming fungi*, 1999), Wojewoda (*Acta Mycologica Warszawa* 38: 3, 2003; Poland).
- screening**, routine testing of organisms or chemical substances for a particular property (e.g. for antibiotic production, fungicidal effect, etc.). See Dreyfuss (*Sydowia* 39: 22, 1987; pharmaceutical prospecting), Bioprospecting.
- scrobiculate** (1) roughened; resembling sawdust; (2) (of lichens), coarsely pitted; foveolate.
- scrupose**, rough with very small hard points.
- Sculptolumina** Marbach (2000), *Caliciaceae* (L.). 2, pantropical. See Marbach (*Bibliotheca Lichenol.* 74: 296, 2000).
- scutate**, like a round plate or shield.
- Scutellaria** Baumg. (1790) nom. dub., *Lecanorales*.
- Scutelliformis** Salazar-Yepes, Pardo-Card. & Buriticá (2007), *Phragmidiaceae*. Anamorph *Gerwasia*. 1, S. America. See Salazar Yepes, M.; Pardo Cardona, V.M.; Buriticá Céspedes, P. (*Caldasia* 29: 105, 2007).
- Scutellinia** (Cooke) Lambotte (1887) nom. cons., *Pyronemataceae*. 66, widespread (esp. north temperate). See Kaushal *et al.* (*Bibliotheca Mycol.* 91: 583, 1983; key 14 spp. India), Schumacher (*Mycotaxon* 33: 149, 1988; 144 excl. names), Schumacher (*Op. Bot.* 101: 101, 1990; monogr.), Wu & Kimbrough (*Bot. Gaz.* 152: 421, 1992; ascospores), van Brummelen (*Persoonia* 15: 129, 1993; ultrastr.), Landvik *et al.* (*Nordic J. Bot.* 17: 403, 1997; DNA), Paal *et al.* (*Persoonia* 16: 491, 1998; Netherlands), Wang (*Bull. natn. Mus. Nat. Sci. Taiwan* 11: 119, 1998; Taiwan), Matocec (*Mycotaxon* 76: 481, 2000; Croatia), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Scutelloidea** Tim (1971) = *Rosenscheldiella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Scutellospora** C. Walker & F.E. Sanders (1986), *Gigasporaceae*. 32, widespread. See Koske & Walker (*Mycol.* 77: 702, 1985), Koske & Walker (*Mycotaxon* 27: 219, 1986), Walker & Saunders (*Mycotaxon* 27: 169, 1986), Morton & Koske (*Mycol.* 80: 520, 1988), Koske & Halvorson (*Mycol.* 81: 927, 1989), Spain *et al.* (*Mycotaxon* 35: 219, 1989), Błaszowski (*Mycol.* 83: 537, 1991), Walker *et al.* (*Cryptog. Mycol.* 14: 279, 1993), Franke & Morton (*CJB* 72: 122, 1994; revision, phylogeny), Koske & Gemma (*Mycol.* 87: 678, 1995), Morton (*Mycol.* 87: 127, 1995; development, phylogeny), Thingstrup *et al.* (*MR* 99: 1225, 1995; detection), Yao *et al.* (*Genera of Endogonales*: 229 pp., 1996), Walker *et al.* (*Ann. Bot.* 82: 721, 1998), Bever & Morton (*Am. J. Bot.* 86: 1209, 1999; genetic variation), Redecker *et al.* (*Fungal Genetics Biol.* 28: 238, 1999; phylogeny), Stürmer & Morton (*MR* 103: 949, 1999), Souza *et al.* (*MR* 109: 697, 2005; morphological, ontogenetic and molecular characterization of *Scutellospora reticulata*), Dotzler *et al.* (*Mycol. Progr.* 5: 178, 2006; germination shields in *Scutellospora* from the 400 million-year-old Rhynie chert), Redecker & Raab (*Mycol.* 98: 885, 2006; phylogeny), Silva *et al.* (*Mycotaxon* 94: 293, 2005; key).
- Scutellosporites** Dotzler, M. Krings, T.N. Taylor & Agerer (2006), *Fossil Fungi*. 1.
- Scutellum** Speg. (1881) nom. dub., *Fungi*. See Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- scutellum**, see *thyriotheceum*.
- Scutiger** Paulet (1793) nom. inval., *Albatrellaceae*. 1. See Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974).
- Scutigeraceae** Bondartsev & Singer (1941) = *Albatrellaceae*.
- Scutisporium** Preuss (1851) = *Stemphylium* fide Saccardo (*Syll. fung.* 4: 519, 1886).
- Scutisporus** K. Ando & Tubaki (1985), anamorphic *Pezizomycotina*, Hso.#eH.1/10. 1, Japan. See Ando & Tubaki (*TMSJ* 26: 153, 1985).
- Scutobelonium** Graddon (1984), *Helotiales*. 1, British Isles. See Graddon (*TBMS* 83: 377, 1984), Nauta & Spooner (*Mycologist* 14: 65, 2000).
- Scutomollisia** Nannf. (1976), *Helotiales*. c. 14, widespread (northern & central Europe). See Graddon (*TBMS* 74: 265, 1980), Hein & Scheuer (*Sydowia* 38: 125, 1986), Nauta & Spooner (*Mycologist* 14: 65, 2000).
- Scotomyces** J.L. Bezerra & Cavalc. (1972) = *Microtheliopsis* fide Lücking *et al.* (*Lichenologist* 30: 121, 1998).
- Scutopeltis** Bat. & H. Maia (1957), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, Ghana. See Batista & Maia (*Revta Biol. Lisb.* 1: 123, 1957).
- Scutopycnis** Bat. (1957), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, USA. See Batista (*An. Soc. Biol. Pernambuco* 15: 422, 1957).
- Scutoscypha** Graddon (1980) = *Calycellina* fide Baral & Krieglsteiner (*Beih. Sydowia* 6, 1985), Raitviir (*Scripta Mycol.* 20, 2004).
- Scutula** Tul. (1852) nom. cons., *Ramalinaceae* (±L). 13 (in lichens), widespread. See Hawksworth (*TBMS* 74: 363, 1980), Rambold & Triebel (*Bibliotheca Lichenol.* 48, 1992), Jørgensen & Santesson (*Taxon* 42: 881, 1993; nomencl.), Triebel *et al.* (*Symb. bot. upsal.* 32: 323, 1997), Andersen & Ekman (*MR* 109: 21, 2005; phylogeny), Wedin *et al.* (*Lichenologist* 39: 329, 2007; N Hemisphere, key).
- Scutularia** P. Karst. (1885) = *Xylogramma* fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).
- Scutulopsis** Velen. (1934), ? *Helotiales*. 1, former Czechoslovakia.
- scutulum** (pl. -a), cup-like crust or mat of hyphae produced in the follicles of the scalp or the body in infections by *Trichophyton schoenleinii*.
- Scypharia** (Quél.) Quél. (1886) [non *Scypharia* Miers 1860, *Rhamnaceae*] = *Sarcoscypha* fide Denison (*Mycol.* 64: 616, 1972).
- Scyphiphorus** Vent. (1799) ≡ *Pyxidium* Hill.
- scyphoid**, cup-like.
- Scyphophora** Gray (1821) ≡ *Pyxidium* Hill.
- Scyphophorus** Ach. ex Michx. (1803) ≡ *Pyxidium* Hill.

Scyphopilus P. Karst. (1881) = *Thelephora* fide Killermann in Engler & Prantl (*Naturl. Pflanzenfam.* 2, 1928).

Scyphorus Raf. (1814) = *Pyxidium* Hill.

Scyphorus Raf. (1815) = *Scyphophora*.

Scyphospora L.A. Kantsch. (1928), anamorphic *Apiospora*, Cac.0eP.1. 1, widespread. See Sivanesan (*TBMS* 81: 313, 1983; teleomorph).

Scyphostroma Starbäck (1899) = *Subicularium* fide Eriksson (*SA* 8: 77, 1989).

scyphus, a cup-like apex of a lichenized podetium, as in *Cladonia fimbriata*.

Scytalidium Pesante (1957), anamorphic *Helotiales*, Hso.0-1eP.38. 18, widespread. A polyphyletic genus; see also *Neofusicoccum*. See Sigler & Carmichael (*Mycotaxon* 4: 395, 1976; key 6 spp.), Sigler & Wang (*Mycol.* 82: 399, 1990), Straatsma & Samson (*MR* 97: 321, 1993; taxonomy of *S. thermophilum*), Marriott *et al.* (*J. Clin. Microbiol.* 35: 2949, 1997; from human), Roeijmans *et al.* (*J. Med. Vet. Mycol.* 35: 181, 1997; DNA), Currah *et al.* (*Karstenia* 39: 65, 1999; from roots), Lacaz *et al.* (*Revista do Instituto de Medicina Tropical de São Paulo* 41: 319, 1999; synanamorphs, onychomycosis), Lyons *et al.* (*MR* 104: 1431, 2000; molecular variation), Machouart-Dubach *et al.* (*FEMS Microbiol. Lett.* 208: 187, 2001; phylogeny), Dunn *et al.* (*J. Clin. Microbiol.* 41: 5817, 2003; from human), Machouart *et al.* (*FEMS Microbiol. Lett.* 238: 455, 2004; phylogeny), Hambleton & Sigler (*Stud. Mycol.* 53: 1, 2005; phylogeny), Crous *et al.* (*Stud. Mycol.* 55: 99, 2006; phylogeny).

Scytenium Gray (1821) = *Leptogium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Scytinopogon Singer (1945), *Clavariaceae*. 4, Europe. See Zhang & Yang (*Mycosystema* 22: 663, 2003), García-Sandoval *et al.* (*Mycotaxon* 89: 185, 2004; systematics), García-Sandoval *et al.* (*Mycotaxon* 94: 265, 2005).

Scytinopogonaceae Jülich (1982) = *Clavariaceae*.

Scytinostroma Donk (1956), *Lachnocladiaceae*. 32, widespread. See Boidin & Lanquetin (*Bibliotheca Mycol.* 114, 1987; key), Stalpers (*Stud. Mycol.* 40: 103, 1996; key), Larsson & Larsson (*Mycol.* 95: 1037, 2003; phylogeny).

Scytinostromella Parmasto (1968), *Russulales*. 5, widespread. See Freeman & Petersen (*Mycol.* 71: 85, 1979; key), Ginns & Freeman (*Bibliotheca Mycol.* 157, 1994; N. Am. spp.), Spirin (*Novosti Sistematiki Nizshikh Nov. sist. Niz. Rast.* 36: 66, 2002; Russia).

Scytinopsis Singer (1936) nom. nud. = *Resupinatus* fide Singer (*Agaric. mod. Tax.*, 1951).

Scytinotus P. Karst. (1879) = *Panellus* fide Singer (*Agaric. mod. Tax.*, 1951).

Scytonema C. Agardh ex Bornet & Flahault (1887), *Algae. Algae*.

Scytopezis Clem. (1903) nom. dub., *Fungi*. See Eckblad (*Nytt Mag. Bot.* 15: 1, 1968).

SEA, see *Media*.

Searchomyces B.S. Mehrotra & M.D. Mehrotra (1963) = *Amblyosporium* fide Pirozynski (*CJB* 47: 325, 1969).

Seaver (Fred Jay; 1877-1970; USA). Student, Morningside College, Sioux City, Iowa (1902); PhD, Iowa State University (1912); Director of Laboratories (1908-1911) then Curator (1911-1943) then Head Curator (1943-1948), New York Botanic Garden. Associate Editor (1909-1924) then Editor (1925-1932)

then Editor-in-Chief (1935-1947) of *Mycol.*; author of 125 papers, mainly on discomycete systematics; surveyed mycotas of the West Indies with Chardón (q.v.) and Whetzel (q.v.). *Publs. Hypocreales. North American Flora* (1910); *North American Cup Fungi (Operculates)* (1928) [suppl. edn, 1942]; *North American Cup Fungi (Inoperculates)* (1951). *Biogs, obits etc.* Rogerson (*Mycol.* 65: 721, 1973) [portrait]; Stafleu & Cowan (*TL-2* 5: 463, 1985).

Seaverinia Whetzel (1945), *Sclerotiniaceae*. Anamorph *Verrucobotrys*. 1, N. America.

Sebacina Tul. & C. Tul. (1871), *Sebacinaceae*. Anamorph *Opadorhiza*. 9, widespread. See Glen *et al.* (*Mycorrhiza* 12: 243, 2002; mycorrhizal with *Eucalyptus*), Selosse *et al.* (*Mol. Ecol.* 11: 1831, 2002; ectomycorrhizae), Roberts (*Sydowia* 55: 348, 2003; N. America), Weiss *et al.* (*MR* 108: 1003, 2004; mycorrhizae).

Sebacinaceae K. Wells & Oberw. (1982), *Sebacinales*. 8 gen. (+ 5 syn.), 29 spp.

Lit.: Stalpers & Andersen in Sneh *et al.* (Eds) (*Rhizoctonia Species Taxonomy, Molecular Biology, Ecology, Pathology and Disease Control*: 58, 1996), Weiss & Oberwinkler (*MR* 105: 403, 2001), Selosse *et al.* (*New Phytol.* 155: 183, 2002), Roberts (*Sydowia* 55: 348, 2003), McCormick *et al.* (*New Phytol.* 163: 425, 2004), Walker & Parrent (*Mem. N. Y. bot. Gdn* 89: 291, 2004), Weiss *et al.* (*MR* 108: 1003, 2004).

Sebacinales M. Weiss, Selosse, Rexer, A. Urb. & Oberw. (2004). *Agaricomycetes*. 1 fam., 9 gen., 30 spp. Fam.:

Sebacinaceae

For *Lit.* see under fam.

Sebacinella Hauerslev (1977) = *Oliveonia* fide Roberts (*Rhizoctonia-forming fungi*, 1999).

seceding (1) (of lamellae), at first joined to the stipe (adnate), then free; separating from the stipe; (2) (of conidia), at first attached to the conidiogenous cell, then separating by schizolysis or rhexolysis; secession.

Secoliga Norman (1853) = *Gyalecta* Ach. fide Hafellner (*Beih. Nova Hedwigia* 79: 241, 1984).

Secoligella (Müll. Arg.) Vain. (1896) = *Aspidothelium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

secondary metabolite, a compound, generally produced in a phase subsequent to growth, which is not an essential intermediary of the central metabolism, often with an unusual chemical structure and found as a mixture of closely related chemicals (see *Secondary metabolites: their structure and function* [CIBA Foundation Symp. 171], 1992); e.g. antibiotics, Metabolic products, mycotoxins. See Stadler & Keller (Eds) (*Fungal secondary metabolite research. MR* 112, 2008). See also extrolite, metabolic products.

secondary mycelium (of *Agaricomycotina*), the dikaryotic mycelium resulting from plasmogamy in the primary mycelium (q.v.); mycelium developed from the base of a basidioma (Corner).

secondary spores (of basidiomycetes), spores other than basidiospores.

Secotiaceae Tul. (1845) = *Agaricaceae*.

secotioid (of *Agaricomycotina*), the margin of the pileus does not break free from the stipe (or if it does the pileus never fully expands), lamellae convoluted and anastomosed, basidiospores not ballistosporic; phylogeny of a - **syndrome**, see Thiers (*Mycol.* 76: 1,

- 1984).
- Secotium** Kunze (1840), Agaricaceae. c. 10, widespread (esp. warm and arid areas). See Singer & Smith (*Madroño* 15: 152, 1960).
- sectoring**, 'mutation' or selection in plate cultures resulting in one or more sectors of the culture having a changed form of growth.
- second**, having parts directed to one side only; cf. scorioid.
- Sedecula** Zeller (1941), ? Agaricales. 1, USA. See Jülich (*Bibliotheca Mycol.* 85, 1992).
- Seed-borne fungi**. Are frequently important in connexion with the transmission of plant diseases, esp. into new areas. Examples include are: *Ascochyta pisi*, *Colletotrichum lindemuthianum*, *Microdochium panattonianum*, *Gloeotinea temulenta*, *Phoma betae*, *P. lingam*, *Septoria apiicola*, *Sphaerella linorum*, *Uromyces betae* and *Ustilago nuda* in the seed (controlled by the use of hot water sterilization or sometimes by seed disinfectants); *Polyspora lini*, *Puccinia antirrhini*, *Tilletia tritici*, *Urocystis agropyri*, *Ustilago avenae*, *U. hordei*, and other smuts as spores on the surface of the seed (controlled by the use of seed disinfectants); *Claviceps purpurea*, *Sclerotinia trifoliorum* and *Sclerotium rolfsii* as sclerotia with the seed.
- Lit.*: Agarwal & Sinclair (Eds) (*Principles of seed pathology*, 2 vols, 1987-9), Agarwal *et al.* (*Phytopath. Pap.* 30, 1989; testing of rice), Doyer (*Manual of seed-borne diseases*, 1938), Dykstra (*Bot. Rev.* 27: 445, 1961; production resistant seed), 1991), Jeffs (Ed.) (*Seed treatment*, 1986), Malone & Muskett (*Proc. Internat. Seed Testing Assn* 29 (2), 1964; descr. 77 spp.), Martin (Ed.) (*Seed treatment: progress and prospects. British Crop Protection Council Monograph* 57, 1994), McGee (*Maize diseases: a reference source for seed technologists*, 2nd edn, 1990), McGee (*Soybean diseases: a reference source for seed technologists*, 1992), McGee (*Plant pathogens and the worldwide movement of seeds*, 1997), IRRI (*Rice seed health*, 1988), Neergaard (*Seed pathology*, 2 vols, 1977; monogr.), Orton (*Bull. Virg. agric. Exp. Stn* 245, 1931; bibliogr.), Singh & Mathur (*Histopathology of seed-borne infections*, 2004), Singh *et al.* (*An illustrated manual on identification of some seed-borne aspergilli, fusaria, penicillia and their mycotoxins*, Watanabe (*Pictorial atlas of soil and seed fungi: morphologies of cultured fungi*, 2002).
- Segestrella** Fr. (1831) = *Segestria*.
- Segestria** Fr. (1825) = *Porina* Müll. Arg. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), McCarthy & Malcolm (*Lichenologist* 29: 1, 1997).
- segment** (of a dictyospore), a part of the spore cut off by an A-trans-septum (Eriksson, *Opera bot.* 60, 1981); see septum.
- segregate** (in taxonomy), a taxon based on part of an earlier taxon.
- Seifertia** Partr. & Morgan-Jones (2002), anamorphic *Pezizomycotina*, H??.?. 1, widespread. *S. azaleae* (*Rhododendron* leaf and bud scorch). See Kaneko *et al.* (*Ann. phytopath. Soc. Japan* 54: 323, 1988; as *Pycnostysanus*), Partridge & Morgan-Jones (*Mycotaxon*, 2002).
- Seimatoantlerium** Strobel, E. Ford, J. Yi Li, J. Sears, Sidhu & W.M. Hess (1999) = *Pestalotiopsis* fide Bashyal *et al.* (*Mycotaxon* 72: 33, 1999), Strobel *et al.* (*Syst. Appl. Microbiol.* 22: 432, 1999).
- Seimatosporiella** Abbas, B. Sutton & Ghaffar (1998) nom. inval., anamorphic *Pezizomycotina*, Hso.?.?. 1, Pakistan. See Abbas *et al.* (*Pakist. J. Bot.* 30: 271, 1998).
- Seimatosporiopsis** B. Sutton, Ghaffar & Abbas (1972), anamorphic *Pezizomycotina*, Cpd. = eP.19. 1, Pakistan. See Sutton *et al.* (*TBMS* 59: 295, 1972), Abbas *et al.* (*Pakist. J. Bot.* 34: 449, 2002).
- Seimatosporium** Corda (1833), anamorphic *Discospora*, Cac/Ccu. = eP.19. 47, widespread. See Sutton (*The Coelomycetes*, 1980), Kang *et al.* (*MR* 103: 53, 1999), Jeewon *et al.* (*Mol. Phylogen. Evol.* 25: 378, 2002; phylogeny), Jeewon *et al.* (*MR* 107: 1392, 2003; phylogeny), Hatakeyama & Harada (*Mycoscience* 45: 106, 2004), Zimowska (*Phytopathologia Polonica* 34: 41, 2004).
- seiospore**, a dry dispersal spore.
- Seiridiella** P. Karst. (1890) ? = *Phragmotrichum* fide Sutton & Pirozynski (*TBMS* 48: 363, 1965).
- Seiridina** Höhn. (1930) = *Seimatosporium* fide Sutton (*Mycol. Pap.* 97, 1964).
- Seiridium** Nees (1816), anamorphic *Lepteutypa*, *Blogiascospora*, Cac. = eP.19. 30, widespread. See Nag Raj & Kendrick (*Sydowia* 38: 179, 1986), Chou (*Eur. J. For. Path.* 19: 435, 1989; spp. on *Cupressus*), Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993), Viljoen *et al.* (*Exp. Mycol.* 17: 323, 1993; spp. on cypress compared by sequence data), Nag Raj & Mel'nik (*Mycotaxon* 50: 435, 1994), Barnes *et al.* (*Pl. Dis.* 85: 317, 2001; on *Cupressus*), Jeewon *et al.* (*Mol. Phylogen. Evol.* 25: 378, 2002; phylogeny), Jeewon *et al.* (*MR* 107: 1392, 2003; phylogeny).
- Seiophora** Poelt (1983), Teloschistaceae (L). 11, north temperate. See Poelt (*Flora Jena* 174: 440, 1983), Frödén & Lassen (*Lichenologist* 36: 289, 2004; generic limits), Frödén & Litterski (*Graphis Scripta* 17: 22, 2005).
- Seismosarca** Cooke (1889) = *Auricularia* fide Donk (*Persoonia* 4: 158, 1966).
- Selenaspora** R. Heim & Le Gal (1936), Sarcosomataceae. 1, Europe; N. America. See Weber (*Mycol.* 87: 90, 1, 1995; posn).
- Selenodriella** R.F. Castañeda & W.B. Kendr. (1990), anamorphic *Pezizomycotina*, Hso.0eH.?12. 5, Cuba; N. America. See Crous *et al.* (*S. Afr. J. Bot.* 62: 89, 1996), Castañeda Ruiz *et al.* (*Mycotaxon* 85: 211, 2003).
- Selenophoma** Maire (1907), anamorphic *Discosphaerina*, Cpd.0eH/1eP.16. 12, widespread (temperate). See Sutton (*The Coelomycetes*, 1980), Yurlova *et al.* (*Stud. Mycol.* 43: 63, 1999).
- Selenophomites** Babajan & Tasl. (1973), Fossil Fungi. 1 (Tertiary), former USSR.
- Selenophomopsis** Petr. (1924) = *Selenophoma* fide von Arx (*Verh. K. ned. Akad. Wet. Amst.* C 51: 1, 1957).
- Selenosira** Petr. (1957), anamorphic *Pezizomycotina*, Cpd.0eH.?. 1, Pakistan. See Petrak (*Sydowia* 10: 278, 1957).
- Selenosporella** G. Arnaud ex MacGarvie (1969), anamorphic *Sordariomycetes*, Hso.0eH.?16. 5, widespread. Often synanamorphs of dematiaceous anamorphic fungi. See Sutton & Hodges (*Nova Hedwigia* 28: 487, 1977), Sutton & Hodges (*Nova Hedwigia* 29: 602, 1978), Hughes (*N.Z. J. Bot.* 17: 139, 1979), Castañeda-Ruiz & Guarro (*CJB* 76: 1584, 1998), Wang & Sutton (*CJB* 76: 1608, 1998), Miller & Huhndorf (*MR* 108: 26, 2004).

- Selenosporium** Corda (1837) = *Fusarium* fide Holubová-Jechová *et al.* (*Sydowia* 46: 247, 1994; revision).
- Selenosporopsis** R.F. Castañeda & W.B. Kendr. (1991), anamorphic *Pezizomycotina*, Hso.0fH.16. 1, Cuba. See Castañeda Ruiz & Kendrick (*Univ. Waterloo Biol. Ser.* 35: 100, 1991).
- Selenotila** Lagerh. (1892), anamorphic *Saccharomycetes*, Hso.0eH.?. 2, America; Europe. See Yarrow (*Antonie van Leeuwenhoek* 35: 418, 1969; *S. nivalis* in snow), Yarrow (*Stud. Mycol.* 14: 29, 1977; nom. dub.).
- Selenozyma** Yarrow (1977), anamorphic *Saccharomycetes*, Hso.0eH.4. 2 (from humans and bovines), Netherlands. See Yarrow (*Stud. Mycol.* 14: 29, 1977).
- Selinia** P. Karst. (1876), Bionectriaceae. Anamorph *Tubercularia*-like. 2 (coprophilous), widespread. See Udagawa (*TMSJ* 21: 283, 1980), Khan & Krug (*Mycol.* 81: 653, 1989), Ranalli & Mercuri (*Mycotaxon* 53: 109, 1995; anamorph), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Rossman *et al.* (*Mycol.* 93: 100, 2001; phylogeny).
- Seliniana** Kuntze (1891) = *Selinia* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Seliniella** Arx & E. Müll. (1955) = *Ascobolus* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- SEM**, scanning electron microscopy (q.v.).
- Semenovaia** Voronin & I.V. Issi (1986), Microsporidia. 1.
- semi-** (prefix), half. Cf. hemi-.
- Semidelitschia** Cain & Luck-Allen (1969), Delitschiaceae. 2 (coprophilous), widespread. See Cain & Luck-Allen (*Mycol.* 61: 580, 1969), Bell & Mahoney (*Muelleria* 15: 3, 2001; Australia).
- Semifissispora** H.J. Swart (1982), Dothideomycetes. 3 (on *Eucalyptus*), Australia. See Swart (*TBMS* 78: 259, 1982).
- semifissitunicate**, see ascus.
- Semigyalecta** Vain. (1921), Gyalectaceae (L). 1, S.E. Asia. See Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952), Aptroot *et al.* (*Mycotaxon* 88: 41, 2003).
- semigymnoplast**, see protoplast.
- Semilecanora** Motyka (1996) nom. inval. = *Lecanora* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- semimacronematous**, only slightly different from vegetative hyphae; frequently ascending, rarely erect. See macronematous.
- Semiomphalina** Redhead (1984), ? Hygrophoraceae (L). 1, Papua New Guinea. See Redhead (*CJB* 62: 886, 1984), Redhead *et al.* (*Mycotaxon* 83: 19, 2002; likely sister taxon to *Lichenomphalia*).
- Semipseudocercospora** J.M. Yen (1983), anamorphic *Mycosphaerellaceae*. 2. See Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003).
- Semisphaeria** K. Holm & L. Holm (1991), Dothideomycetes. 1, Norway; Sweden. See Holm & Holm (*Nordic J Bot.* 11: 686, 1991).
- Senegalosporites** S. Jardiné & Magloire (1965), Fossil Fungi. 2 (Cretaceous, Miocene), Senegal; Taiwan.
- senescence** (of fungi), the degeneration which makes indefinite propagation of certain fungi in culture impossible. See Holliday (*Nature* 221: 1224, 1969; *Neurospora*, *Podosporea*).
- Senoma** A.V. Simakova, T.F. Pankova, Y.S. Tokarev & I.V. Issi (2005), Microsporidia. 1. See Simakova *et al.* (*Protistology* 4: 143, 2005).
- sensitive**, reacting with severe symptoms to the attack of a given pathogen (*TBMS* 33: 155, 1950); **sensitivity**, the tendency of an organism attacked by a disease to give more or less strong symptoms; **sensibility** (Wilbrink).
- sensu lato** (s.l.), in a broad sense; - **stricto** (s.str.), in a narrow sense.
- separating**, see seceding; - **cell**, a cell between a conidium and a conidiogenous cell, involved in rhexolytic secession, q.v.
- Sepedoniaceae** Fr. (1832) = Hypocreaceae.
- Sepedonium** Link (1809), anamorphic *Hypomyces*, Hso.0eH.1. 14, widespread (temperate). See Rudakov (*Mik. Grib. Biol. Prakt. Znach.*, 1981; key), Sahr *et al.* (*Mycol.* 91: 935, 1999), Ng *et al.* (*Clinical Microbiology Newsletter* 25: 20, 2003; from human; 108889; host-parasite reln).
- septal pore apparatus**, see dolipore septum (Fig. 13) (- **swelling**), parenthesome (- **cap**); - **plug**, an occlusion of a septal pore.
- Septaria** Fr. (1819) nom. rej. = *Septoria* Sacc.
- Septata** A. Cali, D.P. Kotler & J.M. Orenstein (1993), Microsporidia. 1. See Cali *et al.* (*J. Eukary. Microbiol.* 40: 111, 1993).
- septate**, having septa.
- Septatium** Velen. (1934) = *Hymenoscyphus* fide Dennis (*British Ascomycetes*, 1978).
- Septobasidiaceae** Racib. (1909), Septobasidiales. 7 gen. (+ 6 syn.), 179 spp.
Lit.: Bandoni (*Stud. Mycol.* 38: 13, 1995), Begerow *et al.* (*CJB* 75: 2045, 1998), Gómez & Kisimova-Horovitz (*Mycotaxon* 80: 255, 2001), Gómez & Henk (*Lankesteriana* 4: 75, 2004), Wingfield *et al.* (*Australas. Pl. Path.* 33: 327, 2004), Henk (*Mycol.* 97: 908, 2005).
- Septobasidiales** Couch ex Donk (1964). Pucciniomycetes. 1 fam., 7 gen., 179 spp. Basidioma not gelatinous; complex relationship with insect hosts. Fam.: **Septobasidiaceae**
Lit.: Donk (1951-63, VIII, *Taxon* 7: 164, 193, 236, 1958, 12: 165, 1963).
- Septobasidium** Pat. (1892) nom. cons., Septobasidiaceae. Anamorph *Johncouchia*. 170 (symbiotic with scale insects), widespread (esp. warmer areas). See Couch (*The genus Septobasidium*, 1938), Dykstra (*CJB* 52: 971, 1974; ultrastr.), Gómez & Henk (*Lankesteriana* 4: 75, 2004; nomencl.).
- Septocarpus** Zopf (1888) = *Podochytrium* fide Fitzpatrick (*The lower fungi. Phycomycetes*, 1930).
- Septochora** Höhn. (1917) = *Helhonia* fide Sutton (*SA* 6: 151, 1987).
- Septochytrium** Berdan (1939), Cladochytriaceae. 4, N. America.
- Septocladia** Coker & F.A. Grant (1922) = *Allomyces* fide Coker (*The Saprolegniaceae with Notes on Other Water Molds*, 1923).
- Septocolla** Bonord. (1851) = *Dacrymyces* fide Saccardo (*Syll. fung.* 6: 798, 1888).
- Septocylindriaceae** Nann. (1934) = *Mycosphaerellaceae*.
- Septocylindrium** Bonord. ex Sacc. (1880) = *Ramularia* Unger fide Braun (*Monogr. Cercosporaella, Ramularia Allied Genera (Phytopath. Hyphom.)* 2: 11, 1998).
- Septocyta** Petr. (1927), anamorphic *Pezizomycotina*, St.0fH.10. 3, widespread. See Priest (*Fungi of Australia: Septoria* 0, 2006).
- Septocytella** Syd. (1929), anamorphic *Pezizomycotina*,

- St.0fH.?. 1, China.
- Septodochium** Matsush. (1971), anamorphic *Pezizomycotina*, Hsp.≡ eH.15. 1, Solomon Islands. See Matsushima (*Microfungi of the Solomon Islands and Papua-New Guinea*: 54, 1971).
- Septodothideopsis** Henn. (1904) nom. dub., anamorphic *Pezizomycotina*. See Höhnelt (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt. 1* 119: 877, 1910).
- Septofusidium** W. Gams (1971), anamorphic *Nectriaceae*, Hso.1eH.?.33. 5, widespread. See Gams (*Cephalosporium-artige Schimmelpilze*: 147, 1971), Luangsa-ard *et al.* (*Mycol.* 96: 773, 2004; phylogeny).
- Septogloeum** Sacc. (1880), anamorphic *Pezizomycotina*, Cac.≡ eH.15. 2, widespread. See Sutton & Pollack (*Mycopathologia* 52: 331, 1974), Sutton & Webster (*TBMS* 83: 59, 1984).
- Septoidium** G. Arnaud (1921), anamorphic *Alina*, Hso.≡ eP.19. 7, widespread (tropical).
- Septolpidium** Sparrow (1933), Chytridiales. 1 (in diatoms), British Isles.
- Septomazzantia** Theiss. & Syd. (1915) = *Diaporthe* fide Petrak (*Sydowia* 8: 294, 1954).
- Septomycetes**. Class within the *Orthomycotina* (q.v.) including *Brachybasidiales*, *Exobasidiales*, *Septobasidiales* and *Tilletiales* (Cavalier-Smith, in Rayner *et al.* (Eds), *Evolutionary biology of the fungi*, 1987).
- Septomycotera**. Class within the *Orthomycotina* (q.v.) including *Brachybasidiales*, *Exobasidiales*, *Septobasidiales* and *Tilletiales* (Cavalier-Smith, in Rayner *et al.* (Eds), *Evolutionary biology of the fungi*, 1987).
- Septomyrothecium** Matsush. (1971), anamorphic *Hypocreales*, Hsp.0eP.15. 1, Papua New Guinea. See Matsushima (*Bull. natn. Sci. Mus. Tokyo*, B 14: 469, 1971).
- Septomyxa** Sacc. (1884) = *Diplodina* fide Sutton (*Mycol. Pap.* 141, 1977).
- Septomyxella** (Höhn.) Höhn. (1923), anamorphic *Pezizomycotina*, Cac.1eH.?. 1, Italy.
- Septonema** Corda (1837), anamorphic *Dothideomycetes*, Hso.≡ eP.3 (±L). 13, widespread. See Hughes (*Naturalist Hull*: 173, 1951), Hughes (*Naturalist Hull*: 7, 1952), Holubová-Jechová (*Folia geobot. phytotax.* 13: 422, 1978), Grondona *et al.* (*MR* 101: 1489, 1997; ecology).
- Septopatella** Petr. (1925), anamorphic *Pezizomycotina*, Ccu.0fH.10. 1, N. America; Europe. See Dyko & Sutton (*CJB* 57: 370, 1979).
- Septopezizella** Svrček (1987), *Helotiaceae*. 1, Europe. See Svrček (*Česká Mykol.* 41: 88, 1987).
- Septoplaca** Petr. (1964) = *Piptarthron* fide Sutton (*The Coelomycetes*, 1980).
- Septorella** Allesch. (1897) = *Fusarium* fide Höhnelt (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt. 1* 121: 339, 1912).
- Septorella** Berk. [not traced] ? nom. nud., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Septoria** Fr. (1819) nom. rej. prop., anamorphic *Pezizomycotina*.
- Septoria** Sacc. (1884) nom. cons., anamorphic *Mycosphaerella*, Cpd.0fH.10. c. 1072, widespread. *S. apiicola* (celery (*Apium*) leaf spot), *S. azaleae* (azalea (*Rhododendron*) leaf scorch), *S. gladioli* (hard rot and leaf spot of *Gladiolus*), *S. lycopersici* (tomato leaf spot), *S. nodorum* (wheat glume blotch), *S. tritici* (wheat leaf spot). See MacMillan & Plunkett (*J. agric. Res.* 64: 547, 1942; spore structure and germination), Jörstad (*Skr. Utg. Norske Vidensk.-Akad. Oslo N.S.* 22: 1, 1965), Jörstad (*Skr. Utg. Norske Vidensk.-Akad. Oslo N.S.* 24: 1, 1967; Norwegian spp. on dicots and *Gramineae*), Sutton (*The Coelomycetes*, 1980; refs), Constantinescu (*TBMS* 83: 383, 1984; spp. on *Betulaceae*), Scharen & Sanderson (*Septoria of Cereals*: 37, 1985), Andrianova (*Mikol. Fitopatol.* 20: 259, 1986; taxonomic criteria), Andrianova (*Mikol. Fitopatol.* 21: 393, 1987; subgen. clas-sif.), Sutton & Pascoe (*TBMS* 89: 521, 1987; spp. on *Acacia*), Teterovnikova-Babayan (*Griby roda Septoria*, 1987; spp. former USSR), McDonald & Martinez (*Phytopathology* 79: 1186, 1989), Sutton & Pascoe (*Stud. Mycol.* 31: 177, 1989; spp. from Australia), Cooley *et al.* (*MR* 94: 145, 1990; cotransformation in *S. nodorum*), McDonald & Martinez (*Phytopathology* 80: 1368, 1990; RLFP's and *S. tritici*), Farr (*Mycol.* 83: 611, 1991; spp. on *Cornus*), Newton & Caten (*Pl. Path.* 40: 546, 1991; strains of *S. nodorum* adapted to wheat or barley), Andrianova (*Mikol. Fitopatol.* 26: 425, 1992; spp. described by Hollós), Farr (*Sydowia* 44: 13, 1992; spp. on *Fabaceae* tribe *Genisteeae*), Verkley (*Mycol.* 90: 189, 1998; ultrastr.), Caten in Lucas *et al.* (Eds) (*Septoria on Cereals A Study of Pathosystems*: 26, 1999; genetics), Carlier *et al.* (*Phytopathology* 90: 884, 2000; on *Musa*), Cunfer (*Can. J. Pl. Path.* 22: 332, 2000; on *Gramineae*), Verkley & Priest (*Stud. Mycol.* 45: 123, 2000; re-view), Goodwin *et al.* (*Phytopathology* 91: 648, 2001; phylogeny), Schnieder *et al.* (*Eur. J. Pl. Path.* 107: 285, 2001; genetic diversity), Linde *et al.* (*Petria* 12: 95, 2002; population structure), Goodwin *et al.* (*Molecular and General Genetics* 269: 1, 2003; mating types), Banke *et al.* (*Fungal Genetics Biol.* 41: 226, 2004; molecular variation), Verkley & Starink-Willemsse (*Mycol. Progr.* 3: 315, 2004; phylogeny, on *Asteraceae*), Verkley *et al.* (*Mycol.* 96: 558, 2004; phylogeny), Feau *et al.* (*J. Mol. Evol.* 64: 489, 2007; phylogeny).
- Septoriaceae** W.B. Cooke (1983) = *Mycosphaerella-ceae*.
- Septoriella** Oudem. (1889), anamorphic *Dothideomycetes*, St.≡ eP.1. 16, widespread. See Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993).
- Septoriomyces** Cavalc. & A.A. Silva (1972) = *Phyllo-bathelium* fide Lücking *et al.* (*Lichenologist* 30: 121, 1998).
- Septoriopsis** F. Stevens & Dalbey (1918) = *Cercosep-toria*.
- Septoriopsis** Gonz. Frag. & M.J. Paúl (1915) ? = *Septoria* Sacc. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Septoriopsis** Höhn. (1920) = *Groveolopsis*.
- Septorisphaerella** Kleb. (1918) = *Mycosphaerella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Septosperma** Whiffen ex R.L. Seym. (1971), Chytridi-aceae. 5 (on chytrids), widespread (temperate). See Blackwell & Powell (*Mycotaxon* 42: 43, 1991).
- Septosphaerella** Laib. (1922) = *Mycosphaerella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Septosporium** Corda (1831), anamorphic *Pezizomy-cotina*, Hso.#eP.1. 5, Europe; N. America.
- Septothyrella** Höhn. (1911), anamorphic *Pezizomy-cotina*, Cpt.≡ eH.?. 5, Africa.
- Septotinia** Whetzel ex J.W. Groves & M.E. Elliott (1961), *Sclerotiniaceae*. Anamorph *Septotis*. 2, wide-spread (temperate). See Groves & Elliott (*Mycol.* 29:

- 134, 1961).
- Septotia** N.F. Buchw. ex Arx (1970), anamorphic *Septotia*, Cac.≡ eH.39. 2, N. America; Europe. See Sutton (*Mycol.* 72: 208, 1980).
- Septotrapelia** Aptroot & Chaves (2007), Pilocarpaceae (L). 1, Costa Rica. See Aptroot *et al.* (*J. Hattori bot. Lab.* 100: 617, 2006).
- Septotrichum** Corda (1840) nom. dub., Plantae. Based on a leaf outgrowth fide Bonorden (1851).
- Septotrullula** Höhn. (1902), anamorphic *Pezizomycotina*, Hsp.≡ eH.38. 1, widespread. See Sutton & Pirozynski (*TBMS* 48: 355, 1965).
- septum** (pl. **septa**), a cell wall or partition; Talbot (*Taxon* 17: 622, 1968) distinguishes **primary** -, a septum formed in direct association with nuclear division (by constriction, mitosis, or meiosis) separating the daughter cells and having a pore (see Markham, *MR* 98: 1089, 1994; review) which may be modified as a dolipore (Fig. 13) (q.v.; in basidiomycetes) or be associated with Woronin bodies (in ascomycetes; see Kimbrough, in Hawksworth, 1994: 127, ultrastr.), and **adventitious** - (retraction or retaining septum, 'cloison de retrait'), a septum formed in the absence of, or independently of, nuclear division, esp. in association with the movement of cytoplasm from one part of the fungus to another; primary septa are characteristic of higher fungi, adventitious septa of lower fungi where nuclear division is by constriction; **angular** - (Eriksson, *Ark. Bot.* II 6: 339, 1967), oblique septum; **longiseptum**, a longitudinal septum within a spore (Reynolds, *Mycol.* 63: 1173, 1971); **oblique** -, a septum within a segment of a spore arising at an oblique angle to that delimiting the segment (Eriksson, *Opera bot.* 60, 1981); **trans**-, a transverse septum within a spore (Reynolds, 1971), which may be an **A trans-septum** (forming a segment) or a **B trans-septum** (laid down in a segment after division by a longiseptum; never in macrocephalic spores) (Eriksson, 1981). Ascospores in which the septation proceeds from the primary septum towards the poles, so that immature spores have longer end cells are termed **macrocephalic** (Fig. 22A); those in which it proceeds by each trans-septum dividing a segment into two of ± equal lengths are **microcephalic** (Fig. 22B) (Eriksson, 1967, 1981), Curry & Kimbrough (*Mycol.* 75: 781, 1983; *Pezizaceae*). See also Anamorphic fungi, euseptum, distoseptum, multiperforate septum, and Fig. 22.
- Sepultaria** (Cooke) Boud. (1885) = *Geopora* fide Burdsall (*Mycol.* 60: 504, 1968), Yao & Spooner (*MR* 100: 72, 1996), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Sepultariella** Kutorga (2000), Pyronemataceae. 1, widespread. See Kutorga (*Lietuvos Grybai* 3: 188, 2000).
- sequestrate**, fungal fruit-bodies which have evolved from having exposed hymenia and forcibly discharged spores to a closed or even hypogeous habit in which spores are retained in the fruit-body until it decays or is eaten by an animal vector. Many sequestrate taxa can be clearly recognized as being derived from specific spore-discharging ancestors, e.g. *Rhizopogon* from *Suillus*.
- Serda** Adans. (1763) nom. rej. = *Gloeophyllum* fide Donk (*Verh. K. ned. Akad. Wet.* tweede sect. 62: 1, 1974).
- Serendipita** P. Roberts (1993), Auriculariales. 8, widespread. See Roberts (*MR* 97: 474, 1993), Trichies (*BSMF* 118: 351, 2002; France n.sp.).
- Serenomyces** Petr. (1952), Phaeocharaceae. 5 (on *Palmae*), widespread (tropical). See Barr *et al.* (*Mycol.* 81: 47, 1989; key), Hyde *et al.* (*SA* 15: 117, 1997), Hyde & Cannon (*Mycol. Pap.* 175: 114, 1999).
- Sericeocybe** Rob Henry (1993) nom. inval. = *Cortinarius* fide Kuyper (*in litt.*).
- Sericeomyces** Heinem. (1978) = *Leucoagaricus* fide Kuyper (*in litt.*).
- sericeous**, like silk.
- Seriella** Fr. (1849) nom. dub., *Pezizomycotina*.
- seriopectenchyma**, see plectenchyma.
- Serology**. Serological methods, which depend on the ability of a fungus to act as an antigen (q.v.), have two main mycological applications: (1) for the identification of fungi or investigations into the relationships between different fungi; (2) for the diagnosis of infections of humans and other vertebrates by fungal pathogens.
- For identification, a preparation of the unknown fungus is tested with antiserum prepared against a named fungus when a reaction indicates that the two fungi have antigens in common and are therefore conspecific or closely related. An antiserum prepared from one fungus may, however, not infrequently also give a reaction ('cross-reaction') with other fungi indicating the possession of some antigens in common. This may be taken to be evidence of phylogenetic relatedness. *Phymatotrichum omnivorum* antiserum, for example, gives a reaction with certain gasteromycetes. Because of such cross-reactions and the difficulty of obtaining purified fungal antigens serological identification of fungi is in a less developed state than that for bacteria and viruses.
- Serological diagnosis of infection (or past infection) of humans or animals by fungal pathogens is a medical mycological technique of proven utility for a number of important mycoses. In N. Am., for example, millions of humans and domestic and farm animals are marked for life by antibodies induced by subclinical or mild attacks of coccidioidomycosis and histoplasmosis as revealed by testing the reaction of the skin or blood serum to coccidioidin and histoplasmin (q.v.), antigens prepared from the pathogens (See also blastomycin, oidiomycin, spherulin, sporotrichin.).
- The antigen-antibody (antiserum) reaction may be tested in several ways. The most useful techniques are based on agglutination or precipitation (see antigen). In the first the antigenic particles are usually whole fungal cells but an alternative is to adsorb the antigen onto particles of latex or charcoal. In the second, the reaction is demonstrated by the formation of a precipitate when the antiserum (antibody) is added to a tube containing the corresponding antigen in solution or when antibody and antigen are allowed to diffuse towards one another in a clear agar gel. See also anaphylaxis, complement-fixation, ELISA.
- Lit.*: Chester (*Quart. Rev. Biol.* 12: 19, 165, 294, 1937; plants), Seeliger (*Mykologische Serodiagnostik*, 1958), Mathews (*Plant virus serology*, 1956; methods), Proctor (*Progress in microbiological techniques*: 213, 1967), Kaufman (*Manual of clinical mycology*, 1975), Evans (Ed.) (*Serology of fungal infections and farmer's lung*, 1976).
- serous** (of latex), like serum; watery; opalescent.

Serpentisclerotes Beneš (1959), Fossil Fungi. 1 (Carboniferous), former Czechoslovakia.

Serpula (Pers.) Gray (1821), Serpulaceae. 2, widespread. *S. lacrymans* (syn. *Merulius lacrymans*), the dry rot or 'house' fungus. See Cooke (*Mycol.* 49: 197, 1957; key), Harmsen (*Friesia* 6: 233, 1960; taxonomy, culture) Wood-attacking fungi, Anon. (*Leaf. For. Prod. Res. Lab.*: 6, 1964), White *et al.* (*MR* 105:

447, 2001; intraspecific variation), Zmitrovich (*Novosti Sistematiki Nizshikh Nov. sist. Niz. Rast.* 35: 70, 2001), Zmitrovich & Spirin (*Mikol. Fitopatol.* 36: 11, 2002), Legon (*Mycologist* 17: 156, 2003; *Serpula himantoides*), Huckfeldt & Schmidt (*Mycologist* 20: 42, 2006; key european strand-forming house-rot fungi).

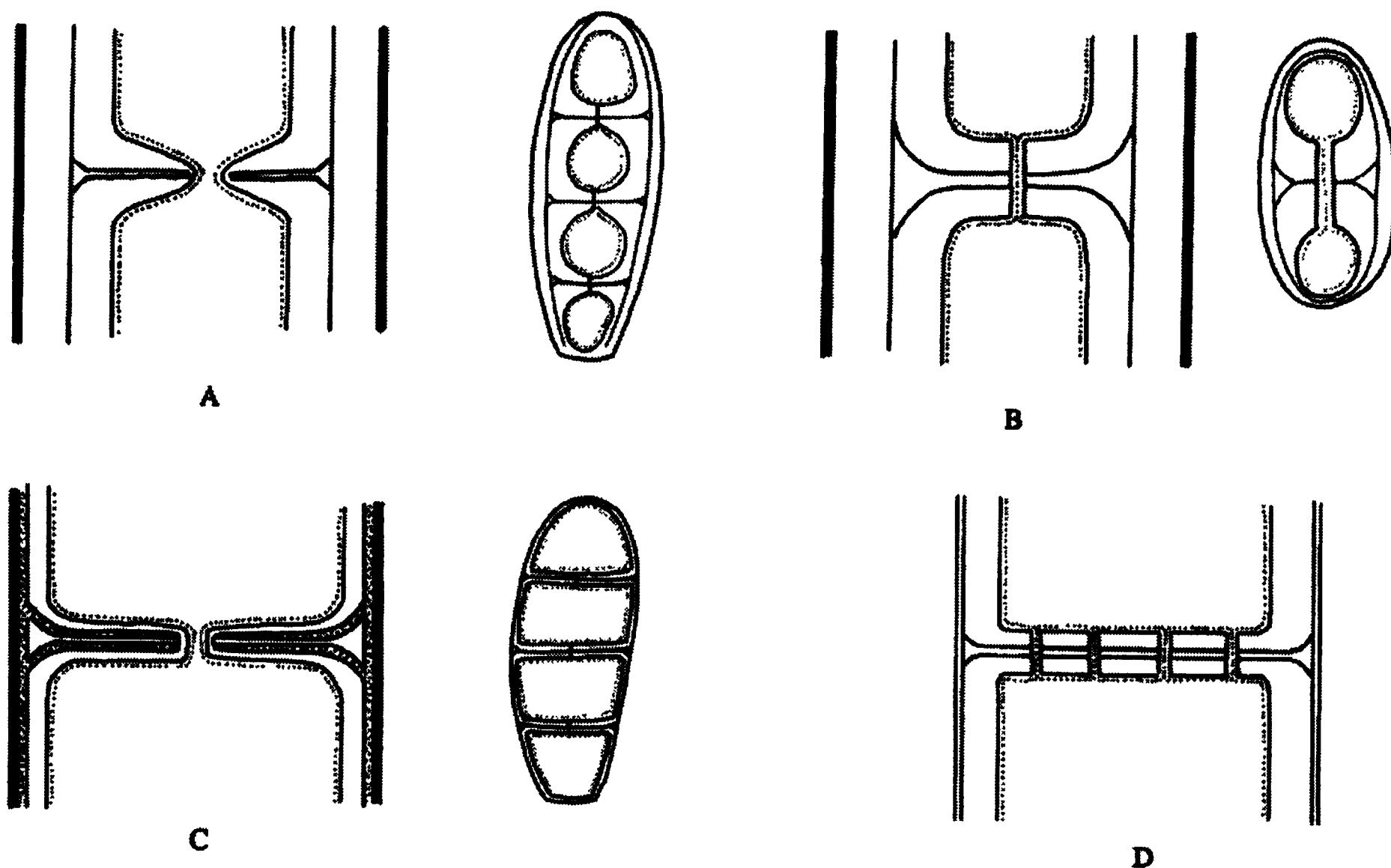


Fig. 34. Types of septum. A, distoseptum (pseudoseptum); B, distoseptum (polarilocular); C, euseptum; D, multiperforate septum. See also dolipore septum.

Serpulaceae Jarosch & Bresinsky (2001), Boletales. 4 gen. (+ 4 syn.), 20 spp.

Serpulomyces (Zmitr.) Zmitr. (2002), Amylocorticiaceae. 1, Europe. See Zmitrovich & Spirin (*Mikol. Fitopatol.* 36: 20, 2002).

serrate, edged with teeth, like a saw (Fig. 23.46).

serrulate, delicately toothed.

Servazziella J. Reid & C. Booth (1987), Xylariales. 1 (on *Araucaria*), Australasia. See Eriksson & Hawksworth (*SA* 6: 250, 1987; posn).

Servitia M.S. Christ. & Alstrup (2001), Verrucariaceae (L). 1, Greenland. See Alstrup & Hansen (*Graphis Scripta* 12: 41, 2001).

Sesia Adans. (1763) nom. rej. $\equiv$ *Gloeophyllum* fide Murrill (*Bull. Torrey bot. Club* 31: 415, 1904).

Sesquicillium W. Gams (1968) = *Clonostachys* fide Veenbas-Rijks (*Acta Bot. Neerl.* 19: 323, 1970), Samuels (*Mem. N. Y. bot. Gdn* 49: 266, 1989; teleomorph), Rossman *et al.* (*Mycol.* 93: 100, 2001; phylogeny), Schroers (*Stud. Mycol.* 46: 1, 2001; synonymy).

sessile, having no stem.

Sessiliospora D. Hawksw. (1979), anamorphic *Pezizomycotina*, Hso. $\equiv$ eP.24. 1 (on lichens), Malaysia. See Hawksworth (*Bull. Br. Mus. nat. Hist. Bot.* 6: 250, 1979).

seta (pl. -ae) (Lat., a bristle), (1) a stiff hair, generally

thick-walled and dark in colour; in hyphomycetes, see Dev Rao (*in* Subramanian (Ed.), *Taxonomy of fungi*: 397, 1984); (2) (in hymenomycetes), a sterile hyphal end, thick-walled, darkening in KOH sol., found frequently projecting from the hymenium in xanthochroic basidiomata (Fig. 18A). Lentz (1954) distinguished 'seta', 'embedded seta', and 'stellate seta' (asteroseta) (Fig. 18C). Smith (1966) treated the last as a cystidium; see cystidium (3).

setaceous (Lat., setaceus), bristle-like; cf. setose.

Setaria Ach. ex Michx. (1803) nom. rej. prop. $\equiv$ *Bryoria*.

Setchellia Magnus (1896) = *Doassansia* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).

Setchelliogaster Pouzar (1958), Agaricales. 5, widespread (warm dry areas). Belongs to the *Bolbitiaceae* or *Cortinariaceae*. See Singer & Smith (*Madroño* 15: 73, 1959), Lago *et al.* (*Mycotaxon* 78: 37, 2001), Martín & Moreno (*Mycotaxon* 78: 257, 2001), Francis & Bougher (*Australasian Mycologist* 23: 1, 2004; Australia).

Setella Syd. & P. Syd. (1916) = *Dysrhynchis* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).

Seticyphella Agerer (1983), Cyphellaceae. 3, Europe. See Agerer (*Mitt. bot. StSamml. Münch.* 19: 282, 1983).

Setiferotheca Matsush. (1995), Chaetomiaceae. 1

- (from soil), Japan; Venezuela. See Matsushima (*Mycol. Mem.* 8, 1995), Silva & Hanlin (*Mycoscience* 37: 261, 1997; as *Chaetomidium*).
- setiform**, see setaceous.
- Setigeroclavula** R.H. Petersen (1988), Clavariaceae. 1, New Zealand. See Petersen (*Bull. N.Z. Dept. Sci. Industr. Res., Pl. Dis. Div.* 263: 143, 1988).
- Setocampanula** Sivan. & W.H. Hsieh (1989), Trichosphaeriaceae. 1 (from bark), Taiwan. See Sivanesan & Hsieh (*MR* 93: 83, 1989).
- Setodochium** Bat. & Cif. (1957) ? = Wiesneriomyces fide Maniotis & Strain (*Mycol.* 60: 203, 1968).
- Setoerysiphe** Y. Nomura (1984) = Erysiphe fide Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 1, 1995), Braun *et al.* (*The Powdery Mildews A Comprehensive Treatise*: 13, 2001).
- Setogyroporus** Heinem. & Rammeloo (1982), Boletaceae. 1, tropical Africa. See Heinemann & Rammeloo (*Bulletin du Jardin Botanique National de Belgique* 52: 481, 1982).
- Setolibertella** Punith. & Spooner (1999), anamorphic *Pezizomycotina*. 1, Azores. See Punithalingam & Spooner (*Kew Bull.* 54: 562, 1999).
- Setomelanoma**, see *Setomelanomma*.
- Setomelanomma** M. Morelet (1980), Pleosporales. 1, France; USA. See Morelet (*Bulletin de la Société des Sciences naturelles et d'Archéologie de Toulon et du Var* 227: 15, 1980), Rossman *et al.* (*CJB* 80: 1209, 2002; phylogeny), Kruys *et al.* (*MR* 110: 527, 2006; phylogeny).
- Setomyces** Bat. & Peres (1961) nom. inval. = Tricharia Fée fide Lücking *et al.* (*Lichenologist* 30: 121, 1998).
- Setopeltis** Bat. & A.F. Vital (1959), Micropeltidaceae. 1, pantropical. See von Arx & Müller (*Stud. Mycol.* 9, 1975), Reynolds & Gilbert (*Aust. Syst. Bot.* 18: 265, 2005), Reynolds & Gilbert (*Cryptog. Mycol.* 27: 249, 2006).
- Setophiale** Matsush. (1995), anamorphic *Pezizomycotina*, Hso.0eH.15. 1, Peru. See Matsushima (*Matsush. Mycol. Mem.* 8: 35, 1995).
- Setoscypha** Velen. (1934) = Phialina fide Huhtinen (*Karstenia* 29: 545, 1990).
- setose** (Lat. setosus; bristly), covered with bristles; cf. setaceous, setulose.
- Setosphaeria** K.J. Leonard & Suggs (1974), Pleosporaceae. Anamorph *Exserohilum*. 8 (on *Poaceae*), widespread. See Borchardt *et al.* (*Eur. J. Pl. Path.* 104: 611, 1998), Borchardt *et al.* (*J. Phytopath.* 146: 451, 1998; population biology), Silva-Hanlin & Hanlin (*MR* 103: 153, 1999; DNA), Olivier *et al.* (*Mycol.* 92: 736, 2000; phylogeny), Zhang & Berbee (*Mycol.* 93: 1048, 2001; phylogeny), Kodsueb *et al.* (*Mycol.* 98: 571, 2006; phylogeny).
- Setosporella** Mustafa & Abdul-Wahid (1989), anamorphic *Pezizomycotina*, Hso.0eP.?36. 1 (from soil), Egypt. See Mustafa & Abdul-Wahid (*MR* 93: 227, 1989).
- Setosynnema** D.E. Shaw & B. Sutton (1985), anamorphic *Pezizomycotina*, Hsy.0fH.10. 1 (aero-aquatic), Australia; Papua New Guinea. See Shaw & Sutton (*J. Linn. Soc. Bot.* 91: 33, 1985).
- setula** (Lat., a little bristle), (1) a delicate hair-like appendage arising from a conidium, as in *Dinema sporium*; (2) (in hymenomycetes), a thick-walled, pigmented, terminal element of a tramal cystidium.
- setule** (in hymenomycetes), a thin-walled, rarely pigmented, usually lageniform cystidium on the pileus or stipe.
- Setulipes** Antonín (1987), Marasmiaceae. c. 25, widespread (north temperate). See Antonín *et al.* (*Mycotaxon* 63: 359, 1997; taxonomy), Antonín (*Mycotaxon* 88: 53, 2003; tropical African spp.), Wilson & Desjardin (*Mycol.* 97: 667, 2005; phylogeny; in *Gymnopus* clade), Antonín (*Monograph of Marasmius, Gloiocephala, Plalaeocephala and Setulipes in Tropical Africa*, 2007), Antonín & Buyck (*MR* 111: 919, 2007; tropical African spp.; key).
- setulose** (Lat., setulosus), covered with fine bristles or hairs; cf. setaceous.
- Seuratia** Pat. (1904), Seuratiaceae (?L). Anamorph *Atichia*. 5, widespread. See Meeker (*CJB* 53: 2462, 1975), Meeker (*CJB* 53: 2485, 1975; key, morphology), Reynolds & Gilbert (*Aust. Syst. Bot.* 18: 265, 2005; Australia).
- Seuratiaceae** Vuill. ex M.E. Barr (1987), *Pezizomycotina* (inc. sed.). 3 gen. (+ 10 syn.), 12 spp.
Lit.: Meeker (*CJB* 53: 2464, 1975), Eriksson (*Mycotaxon* 15: 249, 1982), Rodríguez Hernández & Camino Vilaró (*Revta Jardín bot. Nac. Univ. Habana* 6: 61, 1985), Sutton (*Sydowia* 38: 324, 1985), Barr (*Mycotaxon* 29: 501, 1987), Sivanesan & Hsieh (*MR* 99: 1295, 1995).
- Seuratiopsis** Woron. (1934), ? Seuratiaceae. 1, Crimea.
- sewage fungus**, *Leptomitius lacteus*, found in polluted water, sometimes blocking sewage filters.
- Sex**. In some fungi reproduction is by asexual methods only, in others it is parthenogenic, but in most there is a sexual process. Probably one third of all fungi have more than one type of reproduction, frequently in two well-marked phases (the 'teleomorph' and 'anamorph') which may have separate names (see Nomenclature).
- As in the *Algae* and *Bryophyta*, the sexual or assimilative phase is generally haploid (i.e. a gametophytic generation), though in basidiomycetes (see under) the cells are commonly dikaryotic. In most Fungi (but not Mycetozoa) nuclear fusion is not till shortly before meiosis and the development of 'sexual' spores. For a life-cycle summary of an hypothetical typical filamentous fungus see Fig. 36, and for *Pucciniales* see Fig. 25.
- Fungi having sex organs are commonly monoecious, infrequently dioecious. If sex organs are not present or (as in basidiomycetes and *Mucorales*) are of like morphology the fungus is (1) homothallic (q.v.), when one haploid mycelium is able to give a sporocarp or (2) heterothallic (q.v.), when there are two or more haploid mycelial types and diploidization must be effected for sporocarp development to take place. Heterothallic mycelia may be different (sexually dimorphic) or, more commonly, alike in form so that, as the 'sexes' may be determined only by chemical methods, they are generally named + and -.
- In bipolar species sporocarp development is dependent on two factors, and in tetrapolar species on four. When segregation in a tetrapolar species takes place at the second division of meiosis one basidium may give all four types of spore, but when segregation is at the first division only two types (A_1B_1 and A_2B_2 or A_1B_2 and A_2B_1) are produced by one basidium. Normal basidiocarps are generally produced only when the secondary mycelium resulting from the fusion of primary mycelia is of the genotype $A_1B_1A_2B_2$ (Buller, 1941). These various genetical

devices favour or ensure outbreeding or inbreeding. As Esser has pointed out incompatibility is of 2 main types: (1) **homogenic incompatibility** (e.g. bipolar and tetrapolar systems) in which mating is prevented between strains having the same factor(s) so that inbreeding is prevented and outbreeding encouraged, and (2) **heterogenic incompatibility** in which mating is prevented between strains having different factors so that outbreeding is prevented and inbreeding encouraged.

Two genes determine mating type and, in *Coprinus cinereus*, these have been extensively studied, with more than 12,000 mating types already identified.

Lit.: Burnett (*Fungal populations and species*, 2003: 130), Casselton & Olesnický (*Microbiol. mol. biol. rev.* 62: 55, 1998; molecular genetics of mating recognition in basidiomycetes), Esser & Raper (Eds) (*Incompatibility in fungi*, 1965), Heitman *et al.* (*Sex in fungi: molecular determination and evolutionary implications*, 2007), Raper (*in* Wenrich (Ed.), *Sex in micro-organisms*, 1954, *Mycol.* 51: 107, 1959, 55: 79, 1963, *Genetics of sexuality in higher fungi*, 1966), Stabens (*in* Gow & Gadd (Eds), *The growing fungus*: 383, 1995). See also Genetics, hormones, parasexual cycle.

Seychellomyces Matsush. (1981), anamorphic *Pezizomycotina*, Hso.≡ eP.23. 1, Seychelles. See Matsushima (*Matsush. Mycol. Mem.* 2: 14, 1981).

Seynesia Sacc. (1883), Xylariales. 2, widespread (tropical). See Barr (*Mycotaxon* 39: 43, 1990; posn), Læssøe (*SA* 13: 43, 1994), Hyde (*Sydowia* 47: 199, 1995), Kang *et al.* (*Fungal Diversity* 2: 135, 1999), Guo & Hyde (*Nova Hedwigia* 72: 461, 2001; Hong Kong), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).

Seynesiella G. Arnaud (1918), Microthyriaceae. 4, widespread. See Sivanesan & Shivas (*Fungal Diversity* 11: 151, 2002), Belomesyatseva (*Mycena* 4, 2004).

Seynesiola Speg. (1919) = *Arnaudiella* fide Stevens & Ryan (*Ill. biol. monogr.* 17 no. 2, 1939), Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).

Seynesiopeltis F. Stevens & R.W. Ryan (1925), Microthyriaceae. 1, Hawaii.

Seynesiopsis Henn. (1904), anamorphic *Pezizomycotina*, Cpt.1eP.?. 1, S. America.

Seynesiospora Bat. (1960) = *Cyclothea* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).

shaggy ink cap (or **mane**), basidioma of the edible *Coprinus comatus*.

Shanorella R.K. Benj. (1956), Onygenaceae. Anamorph *Chrysosporium*. 1, USA; Europe. See Benjamin (*Aliso* 3: 319, 1956), Sugiyama & Mikawa (*Mycoscience* 42: 413, 2001; phylogeny), Solé *et al.* (*MR* 106: 388, 2002; phylogeny), Untereiner *et al.* (*Stud. Mycol.* 47: 25, 2002; phylogeny).

Shanoria Subram. & K. Ramakr. (1956) = *Strigula* fide Sutton (*Kew Bull.* 31: 461, 1977), Eriksson & Hawksworth (*SA* 11: 56, 1992).

Shanoriella Bat. & Cif. (1962) = *Limacinula* Höhn. fide Reynolds (*Bull. Torrey bot. Club* 98: 157, 1971).

shape, configuration or form, total effect produced by the outline of the structure (Fig. 23).

Shawiella Hansf. (1957), anamorphic *Pezizomycotina*, Ccu.≡ eP.1. 1, Papua New Guinea. See Hansford (*Proc. Linn. Soc. N. S. W. Ser.* 2 82: 226, 1957).

shaybah, Saudi Arabian name for *Parmelia austrosinensis* used in cooking.

Shear (Cornelius Lott; 1865-1956; USA). Plant pathologist and mycologist (1901-1923) then Head of the Division of Mycology and Disease Survey (1923-1935), USDA Bureau of Plant Industry, Beltsville, Maryland. Second President of the Mycological Society of America. Noted for his studies in diseases of cranberry and other fruits, pyrenomycetes and many publications on general mycology and nomenclature. *Publs.* (with Clements) *Genera of Fungi* (1931). *Biogs, obits etc.* Petrak (*Sydowia* 11: 1, 1957) [bibliography, portrait]; Stafleu & Cowan (*TL-2* 5: 585, 1985); Stevenson (*Mycol.* 49: 283, 1957) [bibliography, portrait]; Stevenson (*Taxon* 6: 7, 1957) [portrait]; Stevenson *Phytopathology* 47: 321, 1957).

Shearia Petr. (1924), anamorphic *Pleomassaria*, St.#eP.19. 2, widespread. See Barr (*Mycotaxon* 15: 349, 1982; teleomorph), Tubaki *et al.* (*TMSJ* 24: 121, 1983; cultural characters), Tanaka *et al.* (*Mycoscience* 46: 248, 2005; Japan).

Sheariella Petr. (1952), anamorphic *Pezizomycotina*, St.0eP.1. 1, Hawaii. See Petrak (*Sydowia* 6: 302, 1952).

Shecutia Nieuwl. (1916) = *Libertiella*.

shield-lichens, formerly applied to lichens having large apothecia (obsol.).

shii-take, *Lentinula edodes*. For cultivation the wood is inoculated with spawn. Basidiomata are produced after 2 years, then there are two crops a year for a number of years. Alternatively, basidiomata are obtained 12 weeks after inoculation of a mixture of hardwood sawdust, nutrients and water (Jones & Liu, *Mycologist* 4: 121, 1990). See Singer & Harris (*Mushrooms and truffles*, 1987), Maher (Ed.) (*Mushroom Science* 13, *Science and cultivation of edible fungi*, 1991), Stamets (*Growing gourmet and medicinal mushrooms*, 1993), Chang & Hayes (*Biology and cultivation of edible mushrooms*, 1978), Przybylowicz & Donoghue (*Shiitake growers handbook*, 1988), Tan & Moore (*MR* 96: 1077, 1992; *in vitro* cultivation).

Shimizuomyces Kobayasi (1981), Clavicipitaceae. 2, Japan. See Kobayasi (*Bull. natn. Sci. Mus. Tokyo*, B 7: 1, 1981), Fukatsu & Nikoh (*Mycology Series* 19: 311, 2003), Sung *et al.* (*Stud. Mycol.* 57, 2007).

Shiraia Henn. (1900), Pleosporales. 1, China; Japan. See Amano (*Bull. natn. Sci. Mus. Tokyo*, B 6: 55, 1980), Amano (*TMSJ* 24: 35, 1983), Tsuda *et al.* (*TMSJ* 30: 493, 1989; synanamorph), Cheng *et al.* (*Journal of Basic Microbiology* 44: 339, 2004; phylogeny), Kruys *et al.* (*MR* 110: 527, 2006; phylogeny).

Shiraiella Hara (1914) = *Mycocitrus* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).

Shitaker Lloyd (1924) nom. nud. = *Lentinula*.

Shivomyces Hosag. (2004), anamorphic *Asterinaceae*. 1, India. See Hosagoudar (*J. Econ. Taxon. Bot.* 28, 2004).

shoe-string fungus, the honey agaric, *Armillaria mellea*.

Shomea Bat. & J.L. Bezerra (1964) ? = *Geastrum* fide Sutton (*in litt.*).

Shortensis Dilcher (1965), Fossil Fungi, Micropeltidaceae. 1 (Eocene), USA. = *Manginula* fide Lange (*Austr. J. Bot.* 17: 565, 1969), = *Vizella* (Dothid.) fide Selkirk (1972).

shot-hole, a leaf spot disease characterized by holes made by the dead parts dropping out; of *Antirrhinum* (*Heteropatella antirrhini*); of peach (*Stigmia carpo-*

- phila*); of cherry (*Blumeriella jaapii*).
- shoyu** (soy sauce), an oriental sauce of soybeans and wheat fermented by *Aspergillus*, yeasts, and bacteria (Hesseltine, *Mycol.* 57: 174, 1965). See also ketjap.
- Shropshiria** F. Stevens (1927) = *Munkia* fide Marchionatto (*Rev. Argent.-agron.* 7: 172, 1940).
- Shrungabeeja** V.G. Rao & K.A. Reddy (1981), anamorphic *Pezizomycotina*, Hso.#eP.19. 1, India. See Rao & Reddy (*Indian J. Bot.* 4: 109, 1981).
- Shuklania** J.N. Dwivedi (1959), Fossil Fungi, Pucciniales. 1 (Tertiary), India.
- Siamia** V. Robert, C. Decock & R.F. Castañeda (2000), anamorphic *Pezizomycotina*. 1, Thailand. See Robert *et al.* (*MR* 104: 893, 2000).
- Sibirina** G.R.W. Arnold (1970), anamorphic *Hypomyces*, Hso.1eH.15. 7 (mycoparasitic), widespread. See Gams *et al.* (*CJB* 76: 1570, 1998), Pöldmaa (*Mycol.* 95: 921, 2003), Watanabe *et al.* (*Mycoscience* 44: 411, 2003; Japan).
- sibling species**, accepted synonym for cryptic species; species which are genetically distinct and not interbreeding, but are not morphologically distinct.
- sicyospore**, a thick-walled storage cell (obsol.).
- siderophore**, a metabolic product of a fungus (or other organism) which binds iron and facilitates its transport from the environment into the microbial cell. See Winkelmann (*in* Hawksworth (Ed.), *Frontiers in mycology*: 49, 1991; review roles).
- SIDS**, see cot death.
- Siegertia** Körb. (1860) = *Rhizocarpon* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Siemaszkoa** I.I. Tav. & T. Majewski (1976), Laboulbeniaceae. 7, Europe; S. America. See Majewski (*Polish Bot. Stud.* 2: 219, 1991; key).
- sigatoka**, A major disease of banana (*Musa*) caused by *Mycosphaerella musicola* (anamorph *Cercospora musae*). See *IMI Descriptions* 414, 1974; *IMI Map* 7; Meredith (*Phytopath. Pap.* 11, 1970; monogr.).
- Sigmatomyces** Sacc. & P. Syd. (1913), anamorphic *Pezizomycotina*, Hsp.0eH.?. 1, Philippines.
- Sigmogloea** Bandoni & J.C. Krug (2000), Tremellales. 1, Canada. See Bandoni & Krug (*Mycoscience* 41: 376, 2000).
- sigmoid**, curved like the letter 'S' (Fig. 23.6).
- Sigmoidea** J.L. Crane (1968), anamorphic *Corollospora*, Hso.≡ eH.15. 2, widespread. See Crane (*Am. J. Bot.* 55: 998, 1968), Ando & Nakamura (*J. gen. appl. Microbiol.* Tokyo 46: 51, 2000), Marvanová & Hywel-Jones (*Cryptog. Mycol.* 21: 13, 2000; Thailand).
- Sigmoideomyces** Thaxt. (1891), Sigmoideomycetaceae. 1, N. America; Europe. See Benny *et al.* (*Mycol.* 84: 635, 1992; key).
- Sigmoideomycetaceae** Benny, R.K. Benj. & P.M. Kirk (1992), Zoopagales. 3 gen., 6 spp.
Lit.: Benny *et al.* (*Mycol.* 84: 615, 1992; key), Tanabe *et al.* (*Mol. Phylogen. Evol.* 16: 253, 2000).
- Sigridea** Tehler (1993), Roccellaceae (L). 5, widespread. See Tehler (*Nova Hedwigia* 57: 417, 1993; key), Myllys *et al.* (*Bryologist* 101: 70, 1998; phylogeny), Follmann (*J. Hattori bot. Lab.* 90: 251, 2001; key S American spp.), Ertz *et al.* (*Biblthca Lichenol.* 91: 155 pp., 2005).
- sikyotic cell** (the 'Schröpfkopf-Zelle' of Burgeff, 1924), the terminal cell of a *Parasitella simplex* hypha by which the parasite anchors itself to its host (*Absidia glauca*). After several days this organ differentiates into a **sikospore** (sikyotic spore). See Kellner *et al.* (*Mycologist* 5: 120, 1991).
- Sillia** P. Karst. (1873), Sydowiellaceae. 1 or 3, Europe; America. See Barr (*Mycol. Mem.* 7, 1978), Rossman *et al.* (*Mycoscience* 48: 135, 2007; review).
- silver ear**, the basidioma of the edible *Tremella fuciformis*. See *Tremella*.
- silver leaf**, of plum and other fruit trees (*Chondrostereum purpureum*).
- simblosore**, Langeron's (1945) term for zoospore, q.v.
- Simblum** Klotzsch ex Hook. (1831) = *Lysurus* fide Dring (*Kew Bull.* 35: 1, 1980).
- Simocybe** P. Karst. (1879), Inocybaceae. 25, widespread. See Singer (*Sydowia* 15: 71, 1962), Singer (*Beih. Nova Hedwigia* 44: 485, 1973; key 18 neotrop. spp.), Pegler & Young (*Kew Bull.* 30: 225, 1975; 4 Brit. spp.), Horak (*Sydowia* 32: 123, 1979; key 4 Papua New Guinea spp.), Horak (*N.Z. J. Bot.* 18: 187, 1980; key 6 NZ spp.), Reid (*TBMS* 82: 221, 1984; key Brit. spp.), Aime *et al.* (*Am. J. Bot.* 92: 74, 2005; phylogeny and taxonomy).
- Simoninus** Roum. (1879) = *Chaenocarpus* Spreng.
- Simonyella** J. Steiner (1902), ? Roccellaceae (L). 1, W. Asia. See Tehler (*CJB* 68: 2458, 1990; cladistics), Feige *et al.* (*Flora* 187: 159, 1992; anatomy), Myllys *et al.* (*Lichenologist* 31: 461, 1999; phylogeny).
- simple**, unbranched; having no divisions.
- Simplicillium** W. Gams & Zare (2001), anamorphic *Torrubiella*. 4, widespread. See Zare & Gams (*Nova Hedwigia* 73: 38, 2001), Sung *et al.* (*Stud. Mycol.* 57, 2007).
- Simuliomyces** Lichtw. (1972), Legeriomycetaceae. 1 (in *Diptera*), widespread. See Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986; key), Nelder *et al.* (*Fungal Diversity* 22: 121, 2006; ecology and taxonomy).
- Simuliospora** Khodzhaeva, S.V. Krylova & I.V. Issi (1990), Microsporidia. 2.
- Singer** (Rolf; 1906-1994; Germany, later Austria, Spain, Russia, USA, Argentina, Chile). Born at Schliersee in south Germany, studying chemistry at the University of Munich; PhD student of Wettstein, Vienna (1928-1931); subsequently lived and worked in Barcelona (1933-1935), Leningrad [St Petersburg] (1935-1940) [Dr Biol. Sci.], Harvard (1941-1947), Tucumán (1948-1960), Buenos Aires (1960-1969), Santiago (1967-1968), and Chicago (1968-1994) [associate of the Field Museum and University of Illinois]. Made major contributions to the overall understanding of *Agaricales* and to neotropical agaricology, describing some 2,450 new fungi in about 400 publications in 9 languages; also made important contributions on ethnomycology, mycorrhizas, nomenclature, and truffles. His collections are distributed among at least 42 institutions. *Publs. The Agaricales in Modern Taxonomy*, 1951 [edn 4, 1986, the most recent, treats 230 genera]. *Biogs, obits etc.* Mueller (*Mycol.* 87: 144, 1995); M. Singer (*Mycologists and Other Taxa*, 1984).
- Singera** Bat. & J.L. Bezerra (1960) = *Vermiculariopsisella* fide Sutton (*Mycol. Pap.* 141, 1977).
- Singerella** Harmaja (1974) = *Singerocybe*.
- Singeriella** Petr. (1959) = *Blasdalea* fide von Arx (*in litt.*).
- Singerina** Sathe & S.D. Deshp. (1981), Agaricaceae. 1, India. See Sathe & Deshpande (*Maharashtra Assoc. Cult. Sci. Monogr.* 1: 35, 1980).
- Singerocybe** Harmaja (1988) = *Clitocybe* fide Kuyper (*in litt.*).

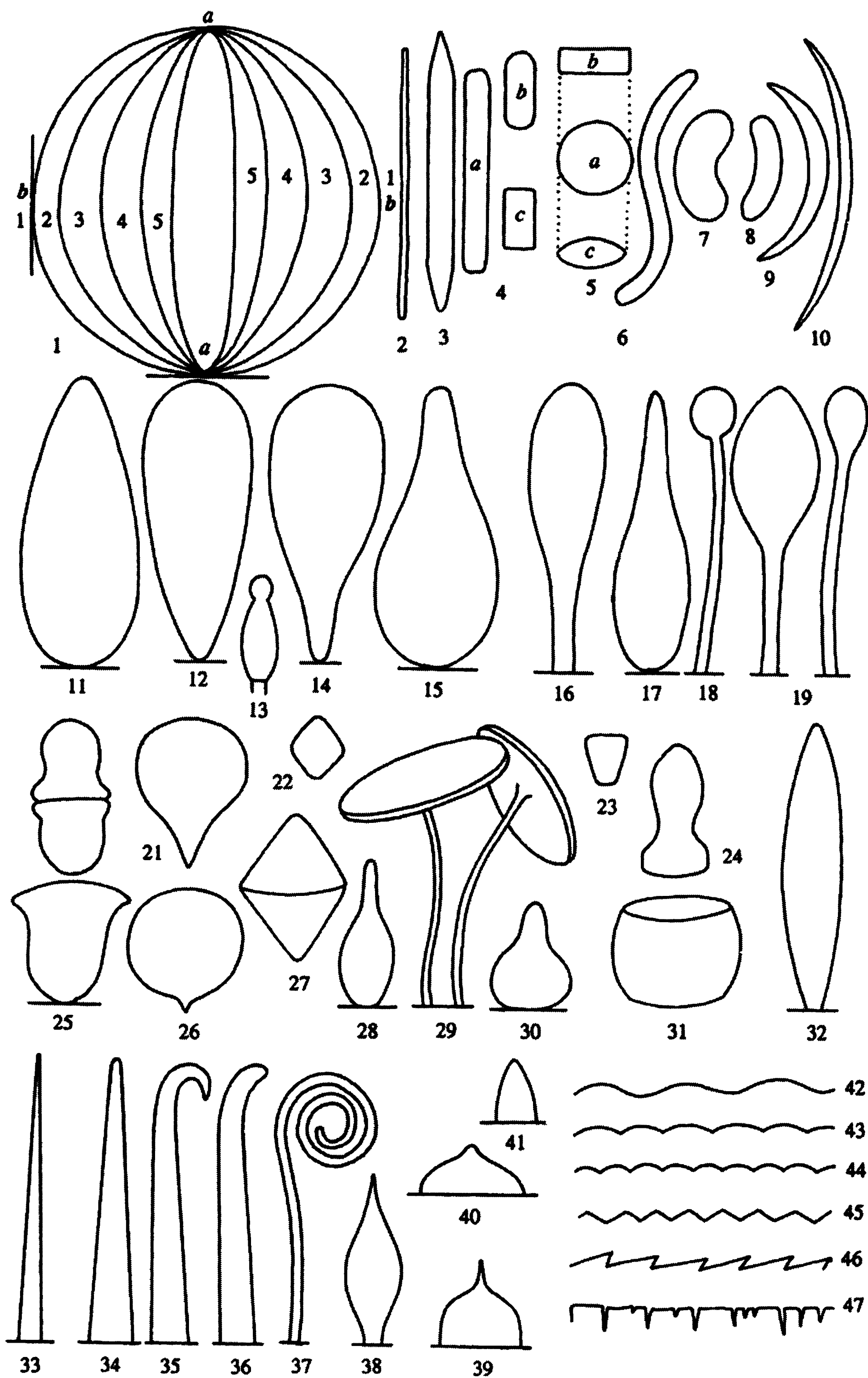


Fig. 23. Shapes. 1, shapes based on the sphere and ellipsoids, adapted from Payak (*Mycopath.* 16: 72, 1962). Terms in parentheses are used by Erdtman (*An introduction to pollen analysis*, 1954). Ratios are those of Bas (*Persoonia* 5: 321, 1969).

	axis aa	axis bb	length: breadth
1 by 1	globose (spherical)	(spherical)	1.0-1.05
1 to 2	subglobose (prolate spheroidal)	(oblate spheroidal)	1.05-1.15
2 to 3	broadly ellipsoidal (subprolate)	(suboblate)	1.15-1.3
3 to 4	ellipsoidal (prolate)	(oblate)	1.3-1.6; elongate
4 by 4	oval (perprolate)	(peroblate)	
5 by 5	fusiform		

2, filiform; 3, acerose; 4, cylindrical, restricted by Bas (1969) to cylinders with a length: breadth ratio of 2.0-3.0; a, bacilliform (1:b >3.0), b, c, oblong, b, apices rounded (obtuse), c, apices truncate; 5, a, discoid or lenticular in surface view, b, discoid in side view, c, lenticular in side view; 6, sigmoid; 7, reniform (fabiform); 8, allantoid; 9, lunate (crescentic); 10, falcate; 11, ovoid; 12, obovoid; 13, lecythiform; 14, pyriform; 15, obpyriform; 16, clavate; 17, obclavate; 18, capitate; 19, spathulate; 20, bicampanulate; 21, turbinate; 22, quadrangular (rhomboidal); 23, cuneiform; 24, dolabriform; 25, campanulate; 26, napiform; 27, biconic; 28, lageniform; 29, peltate; 30, ampulliform; 31, doliiform; 32, cymbiform (navicular); 33, acicular; 34, subulate; 35, hamate (uncinate); 36, corniform; 37, circinate; 38, ventricose. Apices. 39, mucronate; 40, papillate; 41, acute. Edges. 42, sinuate; 43, crenate; 44, crenulate; 45, dentate; 46, serrate; 47, laciniate. See also Systematics Association Committee for Descriptive Terminology (*Taxon* 9: 245, 1960; list of works, 11: 145, 1962; terminology of simple symmetrical plane shapes, chart).

Singeromyces M.M. Moser (1966), Boletaceae. 1, Argentina. Basidioma gasteroid. See Moser (*Nova Hedwigia* 10: 331, 1965).

Sinoboletus M. Zang (1992), Boletaceae. 10, China. See Zang (*Mycotaxon* 45: 223, 1992), Zang *et al.* (*Mycosystema* 25: 366, 2006).

Sinodidymella J.Z. Yue & O.E. Erikss. (1985), Dacampiaceae. 2, China; N. America. See Yue & Eriksson (*Mycotaxon* 24: 293, 1985), Barr (*Mycotaxon* 46: 387, 1993), Barr (*Mycotaxon* 82: 373, 2002).

Sinolloydia C.H. Chow (1936) = *Lysurus* fide Dring (*Kew Bull.* 35: 1, 1980).

Sinosphaeria J.Z. Yue & O.E. Erikss. (1987) = *Thyridium* Nitschke fide Eriksson & Yue (*SA* 8, 1989), Taylor *et al.* (*Sydowia* 49: 94, 1997).

Sinotermatomyces M. Zang (1981) = *Termitomyces* fide Wei *et al.* (*Fungal Diversity* 21: 225, 2006).

sinuate (1) (of lamellae), notched at the proximal end at junction with stipe (Fig. 19D) (cf. adnate); emarginate; (2) (of an edge), undulating (Fig. 23.42).

Siphomycetes. See *Phycomycetes*.

siphon (obsol.), an aseptate hypha (Vuillemin, 1912).

Siphonaria H.E. Petersen (1903), Chytridiaceae. 3, Europe; America. See Karling (*Am. J. Bot.* 32: 580, 1945), Dogma (*Nova Hedwigia* 25: 107, 1974).

Siphonia Fr. (1820) [non *Siphonia* Rich. ex Schreb. 1791, *Euphorbiaceae*] = *Dufourea*.

Siphula Fr. (1824) nom. rej. = *Dufourea*.

Siphula Fr. (1831) nom. cons., Icmadophilaceae (L.). c. 33, widespread. See Santesson (*Svensk Natur.*: 176, 1964), Bendz *et al.* (*Acta Chem. Scand.* 19: 1250, 1965), Kantvilas (*Herzogia* 12: 7, 1996), Kantvilas (*Herzogia* 13: 119, 1998), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998), Platt & Spatafora (*Lichenologist* 31: 409, 1999; DNA), Kantvilas (*Bibliotheca Lichenol.* 82: 37, 2001), Ekman & Tønsberg (*MR* 106: 1262, 2002; phylogeny), Kantvilas & Elix (*Herzogia* 15: 1, 2002; S America), Kantvilas (*Austrobaileya* 6: 949, 2004; Australia), Grube & Kantvilas (*Lichenologist* 38: 241, 2006; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylog-

eny).

Siphulaceae Rchb. (1837) = Icmadophilaceae.

Siphulastrum Müll. Arg. (1889), Pannariaceae (L.). 4, widespread (temperate). See Jørgensen (*Lichenologist* 30: 533, 1998).

Siphulella Kantvilas, Elix & P. James (1992), Icmadophilaceae (L.). 1, Tasmania. See Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998; DNA).

Siphulina (Hue) C.W. Dodge (1965) = *Pannaria* fide Dodge (*Trans. Am. microsc. Soc.* 84: 510, 1965), Jørgensen (*Cryptog. Mycol.* 26: 37, 2005).

Sipmania Egea & Torrente (1994), Roccellaceae (L.). 1, Fiji. See Egea & Torrente (*Bibliotheca Lichenol.* 54: 165, 1994), Grube (*Bryologist* 101: 377, 1998).

sirenin, a hormone secreted by the female gamete of *Allomyces* which attracts male gametes.

Sirentyloma Henn. (1895) ? = *Phyllachora* Nitschke ex Fuckel (1870) fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Sirexipula Bubák (1907), anamorphic *Pezizomycotina*, Cpd.0eH/1eP.15. 2, Europe; N. America.

Sirexipulina Petr. (1923) = *Topospora* fide Sutton (*Mycol. Pap.* 141, 1977).

Sirobasidiaceae Lindau (1897), Tremellales. 2 gen., 11 spp.

Lit.: Benkert (*Mykol. MittBl.* 34: 79, 1991), Ingold (*MR* 99: 1187, 1995), Bandoni & Boekhout in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 705, 1998), Bandoni (*CJB* 76: 1540, 1998), Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 1351, 2000), Sampaio *et al.* (*Mycol.* 94: 874, 2002).

Sirobasidium Lagerh. & Pat. (1892), Sirobasidiaceae. 8, widespread (esp. tropical). See Boedijn (*Bull. Jard. bot. Buitenz.* ser. 3 13: 266, 1934), Lowy (*Mycol.* 48: 324, 1956; key), Kobayashi (*TMSJ* 4: 29, 1962), Moore (*Antonie van Leeuwenhoek* 45: 113, 1979; septal ultrastr.), Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 1351, 2000; mol. phylogeny), Weiss *et al.* (*Frontiers in Basidiomycote Mycology*: 7, 2004).

Sirococcus Preuss (1855), anamorphic *Diaporthales*, St.1eH.15. 3, widespread (temperate). See Sutton (*The Coelomycetes*, 1980), Furnier *et al.* (*CJB* 77:

- 783, 1999), Smith *et al.* (*Forest Pathology* 33: 141, 2003; host-related variation in conifers), Kirsits *et al.* (*Forest Pathology* 37: 40, 2007; Bhutan), Konrad *et al.* (*Forest Pathology* 37: 22, 2007; genetic variation), Mejía *et al.* (*MR* 112: 23, 2008; phylogeny), Rossman *et al.* (*Forest Pathology* 38: 47, 2008; phylogeny).
- Sirocrocis** Kütz. (1843) nom. dub., ? Fungi.
- Sirocyphis** Clem. (1909), anamorphic *Pezizomycotina*, Cpd.0eH.?. 1, USA.
- Sirodesmites** Pia (1927), Fossil Fungi. 1 (Oligocene), Europe.
- Sirodesmium** De Not. (1849) = *Coniosporium* fide Hughes (*CJB* 36: 805, 1958), Hughes & Crane (*Kavaka* 32: 27, 2004).
- Sirodiplospora** Naumov (1915) = *Topospora* fide Groves (*CJB* 43: 1195, 1965).
- Sirodochiella** Höhn. (1925), anamorphic *Pezizomycotina*, Cpd.0eH.?. 1, Europe.
- Sirodomus** Petr. (1947) = *Sirexipula* fide Sutton (*Mycol. Pap.* 141, 1977).
- Sirodothis** Clem. (1909), anamorphic *Tympanis*, St.0eH.15. 4, widespread. See Sutton & Funk (*CJB* 53: 521, 1975).
- Sirogloea** Petr. (1923), anamorphic *Pezizomycotina*, St.0eH.?. 1, Europe.
- Sirologniella** Naumov (1926), anamorphic *Pezizomycotina*, St.0eH.3. 1, former USSR.
- Siropatella** Höhn. (1903) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Siropeltis** Arx & R. Garnier (1960) = *Sphaerobolus* fide Stalpers (*in litt.*).
- Sirophoma** Höhn. (1917), anamorphic *Pezizomycotina*, Cpd.0eH.?. 2 or 3, Europe.
- Siroplacodium** Petr. (1940), anamorphic *Pezizomycotina*, St.0eH.15. 5, Europe; Asia.
- Siroplaconema** Petr. (1922) ? = *Ceuthospora* Grev. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Siropleura** Petr. (1934), anamorphic *Pezizomycotina*, St.0eH.?. 1, Europe.
- Siroscyphella** Höhn. (1910) = *Pseudocenangium* P. Karst. fide Dyko & Sutton (*CJB* 57: 370, 1979).
- Siroscyphellina** Petr. (1923), anamorphic *Pezizomycotina*, St.0eH.?. 2, Austria; N. America. See Wehmeyer (*Sydowia* 6: 433, 1952).
- Sirosiphon** Kütz. (1843), Algae.
- Sirosperma** Syd. & P. Syd. (1916), anamorphic *Pezizomycotina*, Cpd.0eH.23. 2, Papua New Guinea; Florida.
- Sirosphaera** Syd. & P. Syd. (1913), anamorphic *Pezizomycotina*, Cpd/St.0eH.23. 1, Philippines.
- Sirosporium** Bubák & Serebrian. (1912), anamorphic *Mycosphaerellaceae*, Hso.≡ eP.10. 25, widespread. See Ellis (*Dematiaceous Hyphomycetes*, 1971), Ellis (*More Dematiaceous Hyphomycetes*, 1976), Braun (*Cryptog. Mycol.* 20: 155, 1999; gen. concepts), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003).
- Sirosporaemella** Naumov (1951), anamorphic *Pezizomycotina*, Cpd.0eH.15. 1, Russia. See Naumov (*Bot. Mater. Otd. Sporov. Rast. Bot. Inst. Komarova Akad. Nauk S.S.S.R.* 7: 114, 1951).
- Sirostromella** Höhn. (1916) = *Pseudodiscula* fide Sutton (*Mycol. Pap.* 141, 1977).
- Sirothecium** P. Karst. (1887), anamorphic *Pezizomycotina*, St.0bP.1. 2, Finland; Azores. See Sutton (*Proc. Indian Acad. Sci. Pl. Sci.* 94: 229, 1985).
- Sirothyriella** Höhn. (1910), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, Europe.
- Sirothyrium** Syd. & P. Syd. (1916), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, India.
- Sirotrema** Bandoni (1986), Tremellaceae. 3, widespread (north temperate). See Reid & Minter (*TBMS* 72: 345, 1979; mycoparasitic on *Lophodermium*).
- Sirozythia** Höhn. (1904), anamorphic *Pezizomycotina*, Cpd.0eH.?. 2, Europe.
- Sirozythiella** Höhn. (1909), anamorphic *Pezizomycotina*, St.1≡ eH.?. 1, Europe.
- Sisostrema**, see *Sistotrema* Fr.
- Sistotrema** Fr. (1821), Hydnaceae. Anamorphs *Burgoa*, *Ingoldiella*, *Osteomorpha*. 46, widespread. See Hallenberg (*Mycotaxon* 21: 389, 1984), Boidin & Gilles (*BSMF* 110: 185, 1994; key), Greslebin (*MR* 105: 1392, 2001; key 10 spp Argentina).
- Sistotrema** Pers. (1794) ≡ *Cerrena*.
- Sistotrema** Raf. (1820) ≡ *Sistotrema* Fr.
- Sistotremastrum** J. Erikss. (1958), Hydnodontaceae. 3, widespread. See Eriksson (*Symb. bot. upsal.* 16 no. 1: 62, 1958).
- Sistotremataceae** Jülich (1982) = Hydnaceae.
- Sistotremella** Hjortstam (1984), Hydnodontaceae. 4, widespread. See Eriksson *et al.* (*Cortic. N. Europ.* 7: 1379, 1984).
- Sitochora** H.B.P. Upadhyay (1964), anamorphic *Pezizomycotina*, Hso.1eH.?. 1 (on *Phyllachora*), Brazil. See Upadhyay (*Publções Inst. Micol. Recife* 414: 4, 1964).
- Sivanesia** W.H. Hsieh & Chi Y. Chen (1996), Botryosphaeriaceae. 1, Taiwan. See Hsieh & Chen (*MR* 98: 44, 1994), Hsieh & Chen (*MR* 100: 1106, 1996).
- Sivanesiella** Gawande & Agarwal (2004), Venturiaceae. 1, India. See Gawande & Agarwal (*Indian Phytopath.* 57: 231, 2004).
- skeletal hyphae**, see hyphal analysis.
- Skeletocutis** Kotl. & Pouzar (1958), Polyporaceae. c. 30, widespread. See David (*Naturaliste can.* 109: 235, 1982), Gilbertson & Ryvarden (*N. Amer. Polyp.* 2: 711, 1987), Pieri & Rivoire (*Bulletin Semestriel de la Fédération des Associations Mycologiques Méditerranéennes* 26: 3, 2004; Europe), Spirin (*Karstenia* 45: 103, 2005), Roberts & Ryvarden (*Kew Bull.* 61: 55, 2006; Cameroon).
- skeletocystidium**, see cystidium (1).
- Skeletohydnum** Jülich (1979), Polyporaceae. 1, New Zealand. See Jülich (*Persoonia* 10: 331, 1979).
- Skelophoromyces** Thaxt. (1931) ≡ *Scelophoromyces*.
- Skepperia** Berk. (1857), Thelephoraceae. 5, widespread (esp. tropical).
- Skepperiella** Pilát (1927), Marasmiaceae. 4, widespread. See Pegler (*Kew Bull.* 28: 257, 1973).
- Skierka** Racib. (1900), ? Pileolariaceae. 10 (on *Geraniales*, *Sapindales*, *Rhamnales*), widespread (tropical). See Mains (*Mycol.* 31: 175, 1939).
- skiophilous**, shade loving. Cf. photophobic.
- Skirgiellia** A. Batko (1978) = *Rozella* fide Longcore (*in litt.*).
- Skolekites** Norman (1852) nom. rej. = *Toninia* fide Hafellner (*Beih. Nova Hedwigia* 79: 241, 1984).
- Skoteinospora** Bat. (1962) = *Euantennaria* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Skottsbergiella** Petr. (1927), Diaporthales. 1, Juan Fernández. See Petrak (*Sydowia* 24: 264, 1971).
- Skvortzovia** Bononi & Hjortstam (1987), ? Agaricomycetes. 1, S. America. *Hymenochaetales* or *Agaricales* (*Rickenella* clade). See Bononi & Hjortstam

(*Mycotaxon* 28: 12, 1987).

Skyathea Spooner & Dennis (1986), Helotiaceae. 1 (on *Hedera*), British Isles. See Spooner & Dennis (*Sydowia* 38: 294, 1986).

skyrin, an orange-yellow wilt toxin of *Cryphonectria parasitica* (Gäumann *et al.*, *Phytopath. Z.* 36: 116, 1959). Cf. luteoskyrin.

Skyttea Sherwood, D. Hawksw. & Coppins (1981), Odontotremataceae. 31 (on lichens), widespread. See Coppins *et al.* (*SA* 10: 51, 1991; gen. concept), Diederich & Etayo (*Lichenologist* 32: 423, 2000), Iturriaga & Hawksworth (*Mycol.* 96: 925, 2004; N America).

Skyttella D. Hawksw. & R. Sant. (1988), Helotiales. 1 (on lichens, *Peltigera*), Europe; N. America. See Hawksworth & Santesson (*Graphis Scripta* 2: 33, 1988), Diederich & Etayo (*Lichenologist* 32: 423, 2000).

slaframine, a toxin of *Rhizoctonia leguminicola*; the cause of the slobber syndrome in livestock.

Slide Making. The following mounting procedures are those most frequently used for microscopic examination of fungi. For details of methods see Dring in Booth (Ed.) (*Methods in microbiology* 4: 95, 1971) Waller & Lenné (*Plant pathologist's pocketbook*, 2001), Gams *et al.* (*CBS Course of mycology*, edn 3, 1987).

Squash mount

The most widely used preparation for microscopic examination of fungi. A small portion of fungal material is removed from a culture or specimen using a mounted needle or scalpel blade and transferred to a drop of a suitable mountant on a microscope slide (see mounting fluid and stains). If necessary the material can be teased apart using a second needle and a coverslip applied. To release contents from fruit-bodies, light pressure on the coverslip is required. Air bubbles are released by gentle heating of the slide over a spirit lamp or bunsen flame. If necessary slides can be made permanent by sealing the cover slip with two layers of nail varnish. To apply this successfully, excess mounting fluid must first be removed from around the cover slip.

An improved technique involving use of a double cover-glass for preparing permanent microscope mounts was described by Kohlmeyer & Kohlmeyer (*Mycologist* 10: 107, 1996).

Agar block mount

Used to observe undisturbed structures in anamorphic fungi (e.g. *Penicillium*, *Aspergillus* and *Fusarium*) grown on low-nutrient, translucent media. See Samson *et al.* (*Introduction to Food-borne fungi*, edn 5, 1996). From a sporulating area of the colony an agar block 0.5-1cm in diameter is removed with a sterilized scalpel blade and placed fungus side up on a microscope slide. A drop of water is placed on the block and a cover slip applied. The slide can then be examined under a light microscope.

Cellophane tape mount

These are used to prepare rapid mounts of fungi from leaf surfaces and agar cultures. See Butler & Mann (*Phytopathology* 49: 231, 1959). A short length of clear adhesive single-sided tape is cut and the sticky side pressed gently on to the fungal material. The tape with fungus attached is then lowered, fungus side down, on to a drop of mounting fluid on a microscope slide and is pressed down firmly. If required a second drop of mountant can be applied to

the top surface of the tape and a cover slip applied.

Slide culture

A culture grown directly on the surface of a slide and cover slip. Mainly used to examine conidial development in anamorphic fungi but also useful for observing appressoria in the genus *Colletotrichum*. A square block of nutrient agar is placed on a sterile microscope slide supported on a bent glass rod in a Petri dish which serves as a damp chamber. The four sides of the block are inoculated with the fungus and a sterile cover slip is lowered on to the block. Sterile water is then added to the base of the dish. When sporulation has occurred, the cover slip with attached mycelium is removed and carefully lowered, fungus side down on to a drop of mountant on a slide. The agar block is removed from the slide, leaving mycelium attached to the glass. A drop of stain is applied to this and a clean cover slip added thus two mounts can be prepared from each slide culture. Air bubbles can be expelled by heating the slide gently on a hot plate overnight. Mounts are made permanent by sealing with nail varnish if required. See Riddell (*Mycol.* 42: 265, 1950).

Film culture

Using sterilized tweezers, add molten agar to one side of a coverslip so that it is covered by a thin film. When this has cooled, place it agar downwards on an inoculated block of nutrient agar as for slide cultures. After the fungus has grown into the agar film, the coverslip may be removed and mounted on a separate microscope slide with or without mounting fluid.

Hand-cut sections

For examining the structure and arrangement of fruit-bodies in plant tissues, vertical sections can be cut by hand. See Fox (*Principles of diagnostics in plant pathology*, 1993). Material to be cut is supported in elder pith, cork or polystyrene and thin sections cut with a razor blade (it is easier to cut thinner sections using a double-edge razor blades, but the additional upward-pointing blade makes this more hazardous). Sections are transferred with a mounted needle to a drop of mountant on a microscope slide and a cover slip applied.

Microtome-cut sections

Use of a freezing microtome provides the most satisfactory method for obtaining thin vertical sections of fungal fruit-bodies from plant tissues or cultures. See Waller & Lenné (*Plant pathologist's pocketbook*, 516 pp., 2001). Material is soaked for several hours in gum arabic solution. Dry specimens are best soaked overnight. The microtome stage is cooled to around -20°C with a supply of CO₂ or freon gas and a few drops of glue placed on the stage and allowed to freeze. This provides a platform on which to mount the material. The specimen is placed on the frozen glue block with the aid of a mounted needle and aligned carefully. A layer of glue is then allowed to freeze around the specimen. Required section thickness is set and sections are cut by rocking the blade across the specimen. Using a fine paint brush, sections are transferred to water contained in a watch glass. A fine mounted needle is used to transfer sections to a drop of mountant on a slide. A cover slip is then applied and the mount made permanent if required by sealing with nail varnish.

Slimacomycetes Minter (1986), anamorphic *Pezizomycotina*, Hso.0-≡ hP.1. 2, British Isles. See Minter (*Bull. Br. mycol. Soc.* 20: 23, 1986).

slime, a wet, generally sticky, substance; mucus; - **flux**, a thick liquid from the stems or branches of trees made up of, or having a connexion with, fungi and bacteria (Ogilvie, *TBMS* 9: 167, 1924; Stautz, *Phytopath. Z.* 3: 163, 1931); - **moulds**, the *Acrasiomycota*, *Dictyosteliomycota*, and *Mycetozoa*; - **spore**, a spore that becomes separated with slime from the cell producing it (Mason, 1937), cf. dry spore. See Gloiosporae.

slug (in slime moulds), the aggregated pseudoplasmodium of *Dictyosteliomycota*.

Smardaea Svrček (1969), Pyronemataceae. 7, widespread (north temperate). See Dissing (*Sydowia* 38: 35, 1986), Cao *et al.* (*Acta Mycol. Sin.* 9: 282, 1990), Hansen *et al.* (*Mycol.* 93: 958, 2001; phylogeny), Hansen *et al.* (*Mol. Phylogen. Evol.* 36: 1, 2005; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).

Smarodisia Raitv. & Vimba (2006), Pyronemataceae. 1, Latvia. See Vimba & Raitviir (*Folia cryptog. Estonica* 42: 91, 2006).

Smell. See Chiron & Michelot (*Cryptogamie Mycologie* 26: 299, 2005; detailed review). It seems likely that many fungi produce aromatic volatile chemicals, but these may be in quantities insufficient for detection by the human nose. Those which can be detected are often characteristic and sometimes of great economic value. Given that importance, investigation of fungal smell has been surprisingly limited. The odours of truffles and other underground fungi attract various animals including insects, rodents and larger mammals which are participants in a mutualistic arrangement for spore dispersal (see Animal mycophagists). In the case of truffles, the smell is particularly prized in gastronomy, and there has been extensive research into the volatile chemicals responsible (e.g. Pacioni *et al.*, *MR* 94: 201, 1990); animals can be trained to find truffles using their scent (or even using potatoes injected with the main pure chemical ingredient). Components of some perfumes are obtained from actinomycetes, lichens, and truffles. The spicy ester, methyl cinnamate, produced by *Tricholoma matsutake*, while attractive to humans, is a powerful slug repellent (Wood & Lefevre, *Biochemical systematics and ecology* 35: 634, 2007). Badcock (*TBMS* 23: 188, 1939) describes the smells of wood-attacking fungi in culture. The distinctive 'coconut' smell of some *Trichoderma* colonies in pure culture is familiar to many laboratory mycologists. The smell of 'stinking' smut (bunt) of wheat (*Tilletia laevis*) is that of trimethylamine, (CH₃)₃N (Hanna *et al.*, *J. biol. Chem.* 97: 351, 1932; *Phytopath.* 22: 978, 1932). A smell of mould is often associated with natural decaying materials, such as forest leaf litter, and with decaying building materials and other artefacts. A sweet smell has been reported in association with the spruce endophyte, *Tryblidiopsis pinastri*, although its function remains unknown (Livsey & Minter, *Can. J. Bot.* 72: 549, 1994). Some fungi, e.g. ergots and rusts, produce sweet smells which may attract insects for dispersal of the spores (Steinebrunner *et al.*, *J. Chemical Ecol.* 34: 1573, 2008); this may be associated with floral mimicry (Roy, *Nature* 362: 56, 1993). Other fungi, e.g. *Phallus impudicus*, produce strong odours usually repulsive to humans, but attractive to insects associated with spore dispersal. The odours of basidiomycete species are often of diagnostic value, although in

field mycology evaluation can be rather subjective. Gilbert (*Méthode de mycologie descriptive*, 1934; *BSMF* 48: 241, 1932; 50: 25, 1935) made a classification of the smells of natural basidiomata (see also Imler, *BSMF* 68: 400, 1952; Josserand, 1952: 63; Locquin, *Petite flore des champignons de France* 1: 97, 1956). See also Taste.

Smeringomyces Thaxt. (1908), Laboulbeniaceae. 4, widespread. See Weir & Rossi (*CJB* 75: 791, 1997; New Zealand).

Smith (Alexander Hanchett; 1904-1986; USA). University of Michigan (1934-1972). Agaricologist; monographed *Mycena* (q.v.); see also Macromycetes, USA. *Biogs, obits etc.* Rogers (*Mushroom* 5: 17, 1987); Thiers (*Mycol.* 79: 811, 1987) [bibliography, portrait]; Stafleu & Cowan (*TL-2* 5: 662, 1985).

Smith (Annie Lorrain; 1854-1937; Scotland, later England). Originally a governess; an 'unofficial worker', British Museum (Natural History), London. Her first publications were on seaweeds; she was associated with early work on seed testing; prepared exhibits on microfungi for the British Museum (Natural History) London; President of the British Mycological Society (1907); she completed J.M. Crombie's *A monograph of lichens found in Great Britain* (2 vols, 1894, 1911) and is best known for her work on lichen-forming fungi. *Publs. A Monograph of the British Lichens* (vol. 1, 1918; vol. 2, 1926); *A Handbook of British Lichens* (1921) [for a time the standard English introduction to the subject; reprint 1975]. *Biogs, obits etc.* Gepp & Rendle (*Journal of Botany* London 75: 328, 1937); Grumann (1974: 240); Stafleu & Cowan (*TL-2* 5: 663, 1985).

Smith (Erwin Frink; 1854-1927; USA). Plant pathologist and bacteriologist, USDA (1886-1927). First interested in peach yellows, later specializing in bacterial pathogens of plants. *Publs. Bacteria in Relation to Plant Disease* 3 vols (1911-1914); *Introduction to Bacterial Diseases of Plants* (1920). *Biogs, obits etc.* Rogers (*Erwin Frink Smith. A story of North American Plant Pathology*, 1952); Stafleu & Cowan (*TL-2* 5: 669, 1985); Verma (*Review of Tropical Plant Pathology* 7: 25, 1993).

Smith (Worthington George; 1835-1917; England). Architect, wood engraver and book illustrator; artist for the *Gardeners' Chronicle* (1869-1910) and *Floral Magazine* (1870-1876). An amateur mycologist and antiquarian who regularly attended meetings of the Woolhope Club (a precursor of the British Mycological Society), making humorous reports in *Gardeners' Chronicle* and a series of cartoons in other periodicals. A founder member and early President of the British Mycological Society, who also restored the models of fungi in the British Museum made by J. Sowerby (q.v.). *Biogs, obits etc.* Ainsworth (*Mycologist* 4(1): 32, 1990) [portrait]; Stafleu & Cowan (*TL-2* 5: 706, 1985).

Smithiogaster J.E. Wright (1975), Agaricaceae. 1, Argentina. Basidioma gasteroid. See Wright (*Nova Hedwigia* Beihefte 51: 360, 1975), Salusso (*Docums Mycol.* 23 no. 91: 13, 1993).

Smithiomyces Singer (1944), Agaricaceae. 2, America (tropical); Europe (introduced). See Singer (*Mycol.* 36: 366, 1944).

Smithiozyma Van der Walt, Kock & Y. Yamada (1995) = *Lipomyces* fide Gouliamova *et al.* (*Antonie van Leeuwenhoek* 74: 283, 1998), Smith in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 248,

1998), Kurtzman *et al.* (*FEMS Yeast Res.* 7: 1027, 2007; phylogeny).

Smittium R.A. Poiss. (1937), Legeriomycetaceae. 75 (in *Diptera*), widespread. See Williams (*Mycol.* 75: 242, 1983; trichospore germination and zygospores), Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986; biology, key), Williams & Lichtwardt (*Mycol.* 79: 832, 1987), Horn (*Mycol.* 81: 742, 1989; ultrastr.), Horn (*MR* 93: 303, 1989; spore extrusion), Sato *et al.* (*TMSJ* 30: 51, 1989; ultrastr.), Horn (*Exp. Mycol.* 14: 113, 1990; physiology & spore extrusion), Lichtwardt & Williams (*CJB* 68: 1057, 1990), Williams & Lichtwardt (*CJB* 68: 1045, 1990), Lichtwardt & Williams (*CJB* 70: 1193, 1992), Lichtwardt & Williams (*Mycol.* 84: 392, 1992), Lichtwardt & Williams (*Mycol.* 84: 384, 1992), Valle & Santamaría (*Mycol.* 96: 682, 2004; Iberian peninsula), White & Lichtwardt (*Mycol.* 96: 891, 2004; Norway), Strongman & Xu (*Mycol.* 98: 479, 2006; China), White (*MR* 110: 1011, 2006; phylogeny), Strongman (*CJB* 85: 949, 2007; Canada).

smut (1) a disease caused by one of the *Ustilaginales*, esp. a member of the *Ustilaginaceae* (cf. bunt); (2) a smut fungus. - **spore**, a chlamydospore of a - fungus; ustilospore; ustospore; **covered -**, a smut in which the mature spore mass keeps for a time within a covering of host (or fungal) tissue, frequently till after the sorus becomes free from the host: of barley, oats *Ustilago segetum* (syn. *U. hordei*, *U. kolleri*); sorghum, *Sporisorium sorghi*; wheat (**bunt**, **stinking -**), *Tilletia caries* and *T. laevis* (syn. *T. foetida*); (dwarf bunt), *T. controversa*. '**fig -**', *Aspergillus niger*; **flag -** of wheat, see stripe smut. **loose -**, a smut in which the spores are as an uncovered mass of powder becoming free from the host plant by wind and rain; of barley and wheat, *Ustilago segetum* var. *tritici* (syn. *U. nuda*); oats, *U. segetum* var. *avenae*; sorghum, *S. cruenta*. **stripe -**, of grasses, *U. striiformis*; rye, *Urocystis occulta*; wheat, *U. agropyri*.

sociation, society, see Phytosociology.

Societies and organizations. In very general terms, mycological societies function at three levels: international, national and local. The *International Mycological Association* (IMA) is global in scope. It constitutes the Section for General Mycology of the International Union of Biological Societies (IUBS), the primary biological component of the International Council of Scientific Unions (ICSU). The IMA also organizes the periodic International Mycological Congresses (q.v.), and has Regional Committees which are mostly organized through a series of affiliated continental-level mycological societies: the African Mycological Association, Asociación Latinoamericana de Micología, Australasian Mycological Society, European Mycological Association, International Mycological Association Committee for Asia and Mycological Society of America. Although the geographical area each covers is still in places ill-defined, these organize periodic continental-level congresses. Within each continent there are various societies functioning at a regional or national level. Some of these societies in practice are international in outlook and may themselves be affiliated to the IMA. Many countries, particularly in Africa, Asia, the Caribbean and Oceania, do not have any national mycological society, and some countries have no mycological societies at all, although in others there may be large numbers of local societies.

In many parts of the world there are parallel structures and societies for lichen-forming fungi (the International Association of Lichenologists is associated with the IUBS and participates in International Mycological Congresses), edible and medicinal fungi (the International Society for Mushroom Science arranges independent international congresses), fungi of medical and veterinary significance (the International Society for Human and Animal Mycology arranges independent international congresses), and for fungal plant pathogens (the International Society for Plant Pathology is associated with the IUBS); there are also certain mycological societies which cannot be categorized geographically because they are defined by their specialist interests, such as the International Mycorrhiza Society.

The picture is complicated by the fact that some botanical and microbiological societies also have mycological sections, and some executive functions relating purely to mycology are administered by those bodies. Issues related to the formal system of naming fungi are considered through the Permanent Committee on Fungi which reports through the General Committee on Botanical Nomenclature to International Botanical Congresses (see Nomenclature); the International Association for Plant Taxonomy also covers fungi. Within microbiology, mycological interests are represented by the Mycology Division of the International Union of Microbiological Societies. In addition there are two IUBS/IUMS inter-Union commissions: the International Commission on the Taxonomy of Fungi, and the World Federation for Culture Collections.

Since the previous edn of this *Dictionary*, the number of mycological societies has grown substantially. The *International Mycological Directory*, which has listed these societies since 1971, is now available on-line (see Internet), and should be consulted for up-to-date information.

See also BioNET-INTERNATIONAL, MIRCEN.

sociomycie, see mycosociology.

soft rot, a decomposition of plant parts (fruits, roots, stems, etc.) by fungi or bacteria resulting in the tissues becoming soft.

Soil fungi. The soil normally has large numbers of fungi (mostly anamorphic fungi, *Mucorales*, *Ascomycota*, *Chytridiomycetes* and *Oomycetes*) accompanied by even larger numbers of bacteria (and actinomycetes), although with the exception of rhizosphere soil, the fungal biomass almost everywhere exceeds that of bacteria. Soil fungi are important for keeping the soil fertile, though some may cause disease, particularly of plants. Some components of the soil mycota are cosmopolitan. These often opportunistic species grow when and where suitable nutrition can be found. They are the fungi most frequently isolated from soil using conventional techniques, and have been termed ruderals. Although cosmopolitan, environment, geographical location, climate and the soil physico-chemical properties have an effect on their proportions within the soil: for example *Penicillium* is more frequent than *Aspergillus* in temperate areas while in warmer areas the opposite is true. The mycelium of basidiomycetes is most frequent under trees and contributes to a second main category of soil fungi, the mycorrhizal species. Usually more than half of the fungal biomass is of basidiomycetes, although these are missed by most isolation techniques.

Peat bogs have large numbers of fungi (Dooley & Dickinson, *Irish J. agric. Res.* **10**: 195, 1971). See also Sand dune fungi.

The chief work of soil fungi relates to decomposition and recycling organic residues. Fungi are important in the early stages of the decomposition of plant material, immobilizing large amounts of nitrogen (N) as protein. Cellulose and lignin are the most important plant cell wall components that are mainly decomposed in litter and soil by fungi. For the latter mainly basidiomycetes but also some ascomycetes are responsible. Lichenized fungi with cyanobacterial partners take a part in the nitrogen cycle, as these fix nitrogen from the air.

There are complex biological relations between the different soil organisms themselves (see Antagonism) and between them and plants (see Mycorrhiza, rhizosphere) on which they may be parasites. Reinking and Mann (fide Garrett, 1939) grouped soil fungi as, (1) having a wide distribution (the 'soil inhabitants') and (2) the 'soil invaders', having a limited distribution, e.g. most parasitic root-infecting fungi.

A common method for the investigation of the soil biota is that of plating a series of dilutions of the soil (for problems in quantification see James and Sutherland, *Can. J. Res. C* **17**: 73, 97, **18**: 347, 435, 1939-40). Other techniques used are 'direct observation' (Conn, *Soil Sci.* **26**: 257, 1928), the Cholodny slide (Conn, *Tech. Bull. N.Y. Sta. agric. Exp. Stn* **204**, 1932), and Warcup's soil plate (*Nature* **166**: 117, 1950). Washing roots (Harley & Waid, *TBMS* **38**: 105, 1955) or soil particles (Parkinson & Williams; Gams & Domsch, *Arch. Microbiol.* **58**: 134, 1967; Bååth, *CJB* **66**: 1566, 1988), Bills & Polishook (*Mycol.* **86**: 187, 1994) shifts the balance in favour of slow-growing and poorly sporulating fungi that may be active as mycelium in the soil.

Lit.: Allsopp *et al.* (Eds) (*Microbial diversity and ecosystem function*, pp. 321-336, 2000), Arora *et al.* (*Handbook of Applied Mycology* **1**, 1991), Baker & Snyder (Eds) (*Ecology of soil-borne plant pathogens*, 1965), Barron (*The genera of hyphomycetes from soil*, 1968), Boland & Kuykendall (Eds) (*Plant-Microbe Interactions and Biological Control*, 1998), Bruehl (*Soil-borne plant pathogens*, 1987), Brussaard & Ferrera-Cerrato (*Soil ecology in sustainable agricultural systems*, 1997), Burges (*Micro-organisms in the soil*, 1958; gen. ecol. survey), Carroll & Wicklow (Eds) (*The fungal community*, edn 2, 1992), Cooke & Rayner (*Ecology of saprotrophic fungi*, 1984), Davet & Rouxel (*Detection and isolation of soil fungi*, 2000), Dehne *et al.* (Eds) (*Diagnosis and identification of plant pathogens*, pp. 503-505, 1997), Dix & Webster (*The ecology of fungi*, 1995), Domsch & Gams (*Pilze aus Agrarböden*, 1970 [Engl. transl; Hudson, *Fungi in agricultural soils*, 1972]), Domsch *et al.* (*Compendium of soil fungi*, 2 vols, 1980, [supplemented reprint, 1993]; keys, descr., monogr. 400 spp., 6593 refs), Durbin (*Bot. Rev.* **27**: 522, 1961; isolation techniques), Frankland (*Trans. mycol. Soc. Japan* **31**: 89, 1990), Gams (*in* Winterhoff (Ed.), *Fungi in Vegetation Science*, pp. 182-223, 1992), Garrett (*Soil fungi and soil fertility*, edn 2, 1981), Gilman (*A manual of soil fungi*, edn 2, 1957; systematics), Gray & Williams (*Soil micro-organisms*, 1971), Griffin (*Ecology of soil fungi*, 1972), Hall (Ed.) (*Managing soilborne plant pathogens*, pp. 250-278, 1996), Hillocks & Waller (Eds) (*Soilborne Dis-*

eases of Tropical Crops, pp. 3-16, 1997), Hornby (Ed.) (*Biological control of soil-borne plant pathogens*, 1990), Jensen *et al.* (Eds) (*Microbial communities in soil*, 1986), Johnson & Curl (*Methods for studying soil microflora-plant disease relationships*, edn 2, 1972), Litvinov (*Key to microscopic soil fungi*, 1967 [Russ.]), Lockwood (*Biol. Rev.* **52**: 1, 1977; fungistasis), Müller *et al.* (Eds) (*Measuring and monitoring biological diversity: Standard methods for Fungi*, 2000), Parkinson & Waid (Eds) (*The ecology of soil fungi*, 1960), Pfenning (*in* Hyde (Ed.), *Biodiversity of tropical microfungi*, pp. 341-365, 1997), Rayner & Boddy (*Fungal decomposition of wood, its biology and ecology*, 1988), Rossen *et al.* (Eds) (*Fungal identification techniques*, 1996), Schippers & Gams (Eds) (*Soil-borne plant pathogens*, 1979), Seifert & Gams (*in* McLaughlin *et al.* (Eds), *The Mycota*, **7A**, pp. 307-347, 2000), Singleton *et al.* (*Methods for research on soilborne phytopathogenic fungi*, 1992), Sneh *et al.* (Eds) (*Rhizoctonia species*, pp. 423-432, 1996), Tjamos *et al.* (Eds) (*Biocontrol of plant diseases*, pp. 75-78, 1992), Wainwright (*TBMS* **90**: 159, 1988), Waksman (*Principles of soil microbiology*, edn 2, 1931; *Soil microbiology*, 1952), Watanabe (*Pictorial atlas of soil and seed fungi: morphologies of cultured fungi*, 2002). See dermatophytes, Isolation methods, Medical and Veterinary Mycology, Mycorrhiza, Root rots.

soiling, the disfiguring of paint, fruit, or other materials by pigmented moulds.

Solanella Vaňha (1910), ? Helotiales. 1, Europe.

Soleella Darker (1967), Rhytismataceae. 4, N. America; China. See Darker (*CJB* **45**: 1427, 1967), Hou *et al.* (*CJB* **83**: 37, 2005), Hou *et al.* (*Nova Hedwigia* **83**: 511, 2006).

soleiform, shaped like the sole of a shoe, i.e. elongate-ellipsoid, with one cell much larger and broader than the other.

Solenarium Spreng. (1827) = *Glonium* fide Fries (*Syst. mycol.* **2**: 594, 1823).

Solenia Hill ex Kuntze (1898) ≡ Pinuzza.

Solenia Pers. (1794) [non *Solena* Lour. 1790, *Cucurbitaceae*] ≡ *Henningsomyces* Kuntze.

Solenodonta Castagne (1845) = *Puccinia* fide Saccardo (*Syll. fung.* **18**: 824, 1906).

Solenographa A. Massal. (1860) = *Diorygma* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Kalb *et al.* (*Symb. bot. upsal.* **34** no. 1: 133, 2004).

Solenopezia Sacc. (1889), Hyaloscyphaceae. 7, widespread. See Raitviir *et al.* (*Sydowia* **43**: 219, 1991), Raitviir *et al.* (*Docums Mycol.* **25**: 359, 1995), Cantrell & Hanlin (*Mycol.* **89**: 745, 1997; DNA).

Solenoplea Starbäck (1901) = *Camarops* fide Nannfeldt (*Svensk bot. Tidskr.* **66**: 335, 1972).

Solenopsora A. Massal. (1855), Lecanorales (L.). 19, widespread. See Verdon & Rambold (*Mycotaxon* **69**: 399, 1998), Kantvilas (*Lichenologist* **36**: 113, 2004; Tasmania), Guttová *et al.* (*Central European Lichens*: 85, 2006; morphology, chemistry), Naesborg *et al.* (*MR* **111**: 581, 2007; phylogeny).

Solheimia E.F. Morris (1967), anamorphic *Pezizomycotina*, Hsy.0eP.?. 1, C. America. See Morris (*Mycopathologia* **33**: 181, 1967), Bills *et al.* (*Sydowia* **46**: 1, 1994).

Solicorynespora R.F. Castañeda & W.B. Kendr. (1990), anamorphic *Pezizomycotina*, Hso.≡ eP.24. 8, widespread. See Castañeda Ruiz & Kendrick (*Univ.*

- Waterloo Biol. Ser.* 33: 38, 1990), Castañeda Ruiz (*Mycotaxon* 59: 449, 1996; Cuba).
- Soloacrospora** W.B. Kendr. & R.F. Castañeda (1991), anamorphic *Pezizomycotina*, Hso.1eH.12. 1, Cuba. See Castañeda Ruiz & Kendrick (*Univ. Waterloo Biol. Ser.* 35: 102, 1991), Castañeda Ruiz *et al.* (*Nova Hedwigia* 64: 473, 1997).
- solopathogenic** (of a smut such as *Ustilago zaeae*), a pathogenic monosporidial line (Christensen).
- Solorina** Ach. (1808), Peltigeraceae (L). 10, widespread. See Hue (*Mém. Soc. natn Sci. nat. math. Cherbourg* 38: 1, 1911), Thomson & Thomson (*Bryologist* 87: 151, 1984; SEM), Jahns *et al.* (*Biblthca Lichenol.* 57: 161, 1995; ontogeny), Galloway (*Cryptog. Bryol.-Lichénol.* 19: 137, 1998; NZ), Martínez & Burgaz (*Ann. bot. fenn.* 35: 137, 1998; Europe), Miadlikowska & Lutzoni (*Am. J. Bot.* 91: 449, 2004; phylogeny), Wang *et al.* (*Lichenology* 4: 1, 2005; photomorph), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Solorinaceae** Bayrh. (1851) = Peltigeraceae.
- Solorinaria** (Vain.) Gyeln. (1935), Lichinaceae (L). 2, Europe.
- Solorinella** Anzi (1860) nom. rej. = Gyalidea fide Thor (*Nordic JI Bot.* 4: 823, 1985), Vězda & Poelt (*Phyton Horn* 30: 47, 1990), Farkas & Lökös (*Acta Bot. Fenn.* 150: 21, 1994; distrib.), Henssen & Lücking (*Ann. bot. fenn.* 39: 273, 2002; ontogeny, morphology), Aptroot & Lücking (*Biblthca Lichenol.* 86: 53, 2003; morphology).
- Solorinellaceae** Vězda & Poelt (1990) = Asterothyriaceae. See Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Solorinellomyces** Cif. & Tomas. (1953) = Solorinella.
- Solorinina** Nyl. (1884) = Solorina fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Solorinomyces** E.A. Thomas ex Cif. & Tomas. (1953) = Solorina.
- Solosympodiella** Matsush. (1971), anamorphic *Pezizomycotina*, Hso.0-1eH.10. 7, Papua New Guinea. See de Hoog (*Stud. Mycol.* 26: 54, 1985; key).
- Solotermiopsis** Matsush. (1996), anamorphic *Pezizomycotina*, Hso.???. 1, Cape Province. See Matsushima (*Matsush. Mycol. Mem.* 9: 25, 1996).
- Solutoparies** Whiffen ex W.H. Blackw. & M.J. Powell (1998), Chytridiaceae. 1, USA. See Blackwell & Powell (*Mycotaxon* 67: 464, 1998).
- soma** (1) body, excluding reproductive parts or phase; (2) in Aryan religion, *Amanita muscaria* (Allegro, *The sacred mushroom and the cross*, 1970; Wasson, *Soma: the divine mushroom of immortality*, 1968, *The wondrous mushroom*, 1980; Whittier, *The brewing of soma*, 1872); -tic, pertaining to the soma. See also ethnomycology, hallucinogenic fungi.
- Somatexis** Toro (1934) = Aphanostigme fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- somatogamy**, fusion of somatic (vegetative) cells or hyphae involving plasmogamy but not karyogamy.
- Somion** Adans. (1763) nom. rej. = Spongipellis fide Donk (*Verh. K. ned. Akad. Wet.* tweede sect. 62: 1, 1974).
- Sommerfeltia** Flörke ex Sommerf. (1827) nom. rej. prop. = Solorina fide Zahlbruckner (*Catalogus Lichenum Universalis* 3, 1925).
- Sonderhenia** H.J. Swart & J. Walker (1988), anamorphic *Mycosphaerella*, Cpd. = eP.19. 1, widespread. See Swart & Walker (*TBMS* 90: 640, 1988), Crous (*Mycol. Mem.* 21: 170 pp., 1998), Verkley & Priest (*Stud. Mycol.* 45: 123, 2000), Crous *et al.* (*MR* 105: 425, 2001; phylogeny), Hunter *et al.* (*MR* 108: 672, 2004; S Africa), Hunter *et al.* (*Stud. Mycol.* 55: 147, 2006; phylogeny).
- sooty moulds**, used for fungi forming dense dark mats of hyphae on living leaves in the tropics, esp. *Capnodiaceae* (fams: *Asterinaceae*, *Antennulariaceae*, *Capnodiaceae*, *Chaetothyriaceae*, *Euantennariaceae*, *Meliolinaceae*, *Metacapnodiaceae*), *Chaetothyriales* (fam.: *Chaetothyriaceae*), *Meliolales* (fam.: *Meliolaceae*), and their anamorphs. See Hughes (*Mycol.* 68: 693, 1976; genera and interrelationships). Also *Lit.* under *Dothideales*.
- Sopagraha** Subram. & Sudha (1979) = *Arachnophora* fide Sutton (*in litt.*).
- Sophronia** Pers. (1827) [non *Sophronia* Licht. ex Roem. & Schult. 1817, *Iridaceae*] = *Phallus* fide Stalpers (*in litt.*).
- Soppittiella** Massee (1892) = *Cristella* fide Donk (*Persoonia* 4: 329, 1966).
- soralium** (pl. -ia), decorticate portions of a lichen thallus where **soredia** are located. Usually formed from medullary tissues thrusting upwards through the cortical layers and so sometimes with the chemistry of the medulla rather than of the cortex. Soralia may be **diffuse** (the upper surface of the lichen becoming a continuous soredial mass), or **delimited** (i.e. confined to well-defined areas), and can be classified according to where they originate. They can arise on tubercles (**tuberculate** -) or as fissures (**fissural** -) in some genera (Hawksworth, *Lichenologist* 5: 181, 1972). Soralia can arise at the tips of isidia, and in some taxa the soralia can contain a mixture of soredia and isidia-like structures.
- Lit.*: Du Rietz (*Svensk bot. Tidskr.* 18: 371, 1924; soralium types).
- See Spore discharge and dispersal, Spore germination.
- Sorataea** Syd. (1930), Uropyxidaceae. c. 6 (on *Leguminosae*), S. America; Asia; W. Africa. See Eboh & Cummins (*Mycol.* 72: 203, 1980), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983).
- Sorauer** (Paul Carl Moritz; 1839-1916; Germany). Student, Berlin (1862); Doctorate, Rostock (1867); Assistant, Agricultural Museum, Berlin (1867-1868); Assistant, Agricultural Experiment Station, Dahme, Brandenburg (1868-1872); Head, Experimental Station for Plant Physiology, Imperial Cider Institute, Proskau (1872-1893); retired to Berlin. First editor of *Zeitschrift für Pflanzenkrankheiten* (1891-1916). *Publs. Handbuch der Pflanzenkrankheiten* (1874) [2 Aufl., 1886; 3 Aufl. (with Lindau & Rehm), 1905-1908]; *Atlas der Pflanzenkrankheiten* (1887-1893). *Biogs, obits etc.* Stafleu & Cowan (*TL-2* 5: 749, 1985); Wittmack (*Bericht der Deutschen Botanischen Gesellschaft* 34: (50), 1917).
- Sordaria** Ces. & De Not. (1863) nom. cons., Sordariaceae. 12 (esp. coprophilous), widespread. See Lundqvist (*Symb. bot. upsal.* 20 no. 1, 1972), Read & Beckett (*CJB* 63: 281, 1985; ascoma ontogeny), Barrasa *et al.* (*Persoonia* 13: 83, 1986; narrow-spored spp.), Guarro & von Arx (*Persoonia* 13: 369, 1987; key 14 spp., list spp. names), Beatty *et al.* (*MR* 98: 1309, 1994; genetics), Pöggeler (*Curr. Genet.* 36: 222, 1999; mating type genes), Huhndorf *et al.* (*Mycol.* 96: 368, 2004; phylogeny), Miller & Huhndorf (*Mol. Phylogen. Evol.* 35: 60, 2005; phylogeny), Cai *et al.* (*MR* 110: 137, 2006; phylogeny), Rottenberg *et*

al. (*Mycol. Balcanica* 3: 1, 2006; genetic diversity), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).

Sordariaceae G. Winter (1885), Sordariales. 8 gen. (+ 7 syn.), 94 spp.

Lit.: Lundqvist (*Symb. bot. upsal.* 20 no. 1, 1972), Read & Beckett (*CJB* 63: 281, 1985), Perkins & Raju (*Exp. Mycol.* 10: 323, 1986), Perkins & Turner (*Exp. Mycol.* 12: 91, 1988), Glass *et al.* (*Exp. Mycol.* 14: 274, 1990), Perkins (*Genetics Bethesda* 130: 687, 1992), Beatty *et al.* (*MR* 98: 1309, 1994; genetics), Krug *et al.* (*Mycol.* 86: 250, 1994), Skupski *et al.* (*Fungal Genetics Biol.* 21: 153, 1997), Pöggeler (*Curr. Genet.* 36: 222, 1999), Dettman *et al.* (*Fungal Genetics Biol.* 34: 49, 2001), Dettman & Taylor (*Genetics Bethesda* 168: 1231, 2004), García *et al.* (*MR* 108: 1119, 2004), Huhndorf *et al.* (*Mycol.* 96: 368, 2004), Jacobson *et al.* (*Mycol.* 96: 66, 2004), Cai *et al.* (*MR* 110: 137, 2006), Dettman *et al.* (*Mycol.* 98: 436, 2006).

Sordariales Chadeff. ex D. Hawksw. & O.E. Erikss. (1986). Sordariomycetidae. 5 fam., 97 gen., 854 spp. Stromata absent or rarely present as subicular tissue. Ascomata perithecial or cleistothecial, thin- or thick-walled, often hairy, membranous to carbonaceous, olivaceous to black. Interascal tissue composed of wide thin-walled evanescent paraphyses, or lacking altogether. Asci cylindrical or clavate, persistent or evanescent, not fissitunicate, when persistent usually with a small J- apical ring. Ascospores $\pm$ always with at least one dark cell, with germ pore, often with a gelatinous sheath or appendages. Anamorphs usually absent or spermatial. Saprobes on rotting wood and soil, coprophilous, some fungicolous, many cellulolytic. Fams:

- (1) **Cephalothecaceae**
- (2) **Chaetomiaceae** (syn. *Achaetomiaceae*)
- (3) **Lasiosphaeriaceae** (syn. *Tripterosporeaceae*)
- (4) **Sordariaceae** (syn. *Neurosporeaceae*)

Lit.: von Arx & Müller (1954), von Arx (1981, *Sydowia* 34: 13, 1982; fams.), von Arx *et al.* (*Beih. Nova Hedw.* 94, 1988), Huhndorf *et al.* (*Mycol.* 96: 368, 2004; phylogeny), Lumbsch & Huhndorf (*MR* 111: 1064, 2007), Lundqvist (*Symb. bot. upsal.* 20(1), 1972), Moreau (*Les genres Sordaria et Pleurage*, 1953), Müller & von Arx (1973).

Sordariella J.N. Kapoor, S.P. Lal & Bahl (1975) = *Herpotrichia* fide von Arx & Müller (*Sydowia* 37: 6, 1984).

Sordariomycetes O.E. Erikss. & Winka (1997), Pezizomycotina. 15 ord., 64 fam., 1119 gen., 10564 spp. Contains most non-lichenized perithecial ascomycetes with non-fissitunicate asci. Subclass:

- (1) **Hypocreomycetidae**
- (2) **Sordariomycetidae**
- (3) **Xylariomycetidae**

Lit.: Tang *et al.* (*Ant. v. Leeuwenh.* 91: 327, 2007), Zhang *et al.* (*Mycol.* 98: 1076, 2006).

Sordariomycetidae O.E. Erikss. & Winka (1997), Sordariomycetes. Ords:

- (1) **Boliniales**
- (2) **Calosphaeriales**
- (3) **Chaetosphaeriales**
- (4) **Coniochaetales**
- (5) **Diaporthales**
- (6) **Ophiostomatales**
- (7) **Sordariales**

Lit.: von Arx & Müller (*Beitr. Kryptogfl. Schweiz* 11(1), 1954), Barr (*Mycotaxon* 39: 43, 1990), Müller

& von Arx (*Beitr. Kryptogfl. Schweiz* 11(2), 1962), Müller & von Arx (*in* Ainsworth *et al.* (Eds), *The Fungi* 4A, 1973), Samuels & Blackwell (*in* McLaughlin *et al.* (Eds), *The Mycota* 7A: 221, 2001).

soredium (pl. -ia), a non-corticate combination of phycobiont cells and fungal hyphae having the appearance of a powdery granule, and capable of reproducing a lichen vegetatively (Fig. 22J-L). For their liberation and dispersal see Bailey (*J. Linn. Soc., Bot.* 59: 479, 1966, *Revue bryol. lichén.* 36: 314, 1969, *in* Brown *et al.* (Eds), *Lichenology: progress & problems*: 215, 1976). Cf. sororium.

Sorediospora Corda (1837) = *Fumago* fide Hughes (*CJB* 36: 727, 1958).

Sørensen coefficient (K). A numerical estimate of the affinity between two biotas; $K = \frac{200xc}{a+b}$, where a = species in one region, b = species in second region, and c = number of species in common. See Poore (*J. Ecol.* 43: 606, 1955).

Soreymatosporium Sousa da Câmara (1930) = *Stemphylium* fide Wiltshire (*TBMS* 21: 211, 1938).

Sorica Giesenh. (1904) = *Caliciopsis* fide Fitzpatrick (*Mycol.* 42: 464, 1942).

sorocarp (of *Acrasiales*), a stalked fruiting structure.

Sorochytriaceae Dewel (1985), Blastocladales. 1 gen., 1 spp.

Lit.: Dewel *et al.* (*CJB* 63: 1525, 1985), Dewel & Dewel (*CJB* 68: 1968, 1990).

Sorochytrium Dewel (1985), Sorochytriaceae. 1 (on *Milnesium* (tardigrade)), USA. See Dewel & Dewel (*CJB* 68: 1968, 1990; ultrastr.).

Sorocybe Fr. (1849), anamorphic *Herpotrichiellaceae*, Hso.0eP.3. 1 (on resin), widespread. See Hughes (*CJB* 36: 727, 1958), Partridge & Morgan-Jones (*Mycotaxon* 83: 335, 2002), Seifert *et al.* (*Stud. Mycol.* 58: 235, 2007; phylogeny).

sorocyst (of *Acrasiales*), a sorocarp lacking a stalk.

Sorokina Sacc. (1892), Helotiales. c. 6, widespread (pantropical). See Dennis (*Kew Bull.* 13: 321, 1958), Spooner *et al.* (*Kew Bull.* 53: 237, 1998).

Sorokinella J. Fröhl. & K.D. Hyde (2000), Helotiales. 2, Australia; Hong Kong. See Fröhlich & Hyde (*Fungal Diversity Res. Ser.* 3: 122, 2000).

sorophore (of *Acrasiales*), a sorocarp stalk.

Sorosporella Sorokīn (1888), anamorphic *Hypocreales*, Hso.0eH.?. 1 (on insects), widespread (north temperate). See Speare (*J. agric. Res.* 18: 399, 1920), Pendland & Boucias (*Mycopathologia* 99: 25, 1987; SEM and TEM), Evans & Shah (*MR* 106: 737, 2002; ecology, morphology).

Sorosporium F. Rudolphi (1829) nom. rej. = *Thecaphora* fide Vánky (*in litt.*) cf. *Sporisorium*.

Sorosporonites X. Mu (1977), Fossil Fungi. 1, China.

Sorothelia Körb. (1865) ? = *Endococcus* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

sorus, a fruiting structure in certain fungi, esp. the spore mass in *Pucciniales* and *Ustilaginales*; a group of fruit-bodies, as in *Synchytriaceae*.

Sousa da Câmara (Manuel; 1871-1955; Portugal). Member of staff (from 1901), Lecturer (from 1905), then Senior Lecturer and Researcher (working on fungal phytopathology), then Professor of Parasitology & Phytopathology (1914-1941), also Head of Laboratory of Plant Pathology, Vice-Director (1912-1918) and Director (1918-1942), Instituto Superior de Agronomia e Veterinária, Lisbon. An outstanding taxonomist of fungi significant in plant pathology, particularly coelomycetes; he was the author or co-

- author of 491 taxa; through publication of his series of reports and a comprehensive catalogue of fungi (1902-1955) he made a significant contribution to the knowledge of the mycota of Portugal. *Publs. Mycetes aliquot Lusitaniae* I-XII (1936-1951); *Fungi Lusitaniae* I-XIII (1952-1955); *Catalogus Systematicus Fungorum Omnium Lusitaniae*, 2 vols. (1956-1958). *Biogs, obits etc.* Natividade (*Sep. Bol. Soc. Port. Ciências Naturais*, 2a Serie, 5: I, 1955); Oliveira (*Agronomia Lusitana* 17: I, 1955) [portrait]; Stafleu & Cowan (*TL-2* 5: 758, 1985).
- Sowerby** (James; 1757-1822; England). Born, London; trained as an artist, became a teacher of drawing and painting. Famous illustrator of fungi and plants; also prepared models of larger edible and poisonous fungi, now in the British Museum (Natural History), London; advised British government regarding fungal decay of wooden warships during the Napoleonic wars; his children and their descendants included a dozen naturalists and illustrators. *Publs. Coloured Figures of English Fungi or Mushrooms* 3 vols (1795-1803) [suppl. 1809-1815; for dates of publication see Ramsbottom *TBMS* 18: 167, 1933]. *Biogs, obits etc.* Ainsworth (*Mycologist* 2: 125, 1988) [portrait]; Anon. (*Oxford Dictionary of National Biography* concise edn 3: 2802, 1993); Grumann (1974: 381); Stafleu & Cowan (*TL-2* 5: 759, 1985).
- Sowerbyella** Nannf. (1938), Pyronemataceae. 16, Europe; China. See Jeppson (*Göteborgs Svampklubbs Årsskr.* 9, 1980; key 3 spp.), Moravec (*Mycol. Helv.* 1: 427, 1985; key 9 spp.), Moravec (*Česká Mykol.* 42: 193, 1988; key 12 spp.), Klofac & Voglmayr (*Öst. Z. Pilzk.* 12: 141, 2003; Austria), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Yao & Spooner (*Fungal Diversity* 22: 267, 2006; UK), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- soy sauce**, see shoyu.
- Spadicesporium** V.N. Boriss. & Dvořinos (1982) ? = *Cladosporium* fide Sutton (*in litt.*).
- Spadicoides** S. Hughes (1958), anamorphic *Tengiomyces*, Hso. ≡ eP.27. 42, widespread. See Wang (*Mem. N. Y. bot. Gdn* 28: 218, 1976), Sinclair *et al.* (*TBMS* 85: 736, 1985), Kuthubutheen & Nawawi (*MR* 95: 163, 1991), Goh & Hyde (*CJB* 76: 1698, 1998), Réblová (*Mycotaxon* 70: 387, 1999; teleomorph), Ho *et al.* (*Mycol.* 94: 302, 2002; SE Asia), Cai *et al.* (*Sydowia* 56: 222, 2004; China).
- Spadonia** Fr. (1829) nom. dub., ? Fungi.
- Spalovia** Nieuwl. (1916) ≡ *Spermotrichum*.
- spalted** (of wood), with dark zone lines (q.v.) due to the interactions of different fungal colonies, and with paler, darker or otherwise differently coloured areas marked off by those zone lines; as caused, e.g. by *Diatrype disciformis*; generally brittle, short-grained, and easily breaking through decay; if harvested before the decay is too advanced, such wood may be decorative and highly prized for some non-structural woodwork, such as wooden bowls or other artefacts.
- Sparassidaceae** Herter (1910), Polyporales. 2 gen. (+ 1 syn.), 6 spp.
Lit.: Donk (*Persoonia* 3: 199, 1964), Burdsall & Miller (*Mycotaxon* 31: 199, 1988), Burdsall & Miller (*Mycotaxon* 31: 591, 1988), Desjardin *et al.* (*Mycol.* 96: 1010, 2004), Wang *et al.* (*Mycol.* 96: 1015, 2004), Dai *et al.* (*Mycol.* 98: 584, 2006).
- Sparassiella** Schwarzman (1964), Sparassidaceae. 1, former USSR. See Schwarzman (*Flora Sporovykh Rastenii Kazakhstana* 4: 159, 1964).
- Sparassis** Fr. (1819), Sparassidaceae. 5, widespread (north temperate). *Sparassis crispa* is edible. See Burdsall & Miller (*Mycotaxon* 31: 199, 1988), Desjardin *et al.* (*Mycol.* 96: 1010, 2004; Thailand), Wang *et al.* (*Mycol.* 96: 1015, 2004), Blanco-Dios *et al.* (*MR* 110: 1227, 2006; Spain).
- sparassoid**, composed of interlaced flabelliform branches forming ball-like structures recalling *Sparassis* basidiomata. Known also in *Pezizales* (Korf, *Rept Tottori mycol. Inst.* 10: 389, 1973).
- sparassol**, orsellinic acid monomethyl ether from *Sparassis ramosa*; antifungal.
- Sparrow** (Frederick Kroeber; 1903-1977; USA). PhD, Harvard (1929); Instructor, Dartmouth College (1929-1932); Research Fellow, Woods Hole Oceanographic Institution (1934-1936); Assistant Professor (1936-1949) then Professor of Botany (1949-1973) and Director of the Biological Station (1968-1973), University of Michigan, Ann Arbor. President of the second International Mycological Congress, Tampa, Florida (1977). *Publs. Aquatic Phycomycetes* (1943) [edn 2, 1960]; (with Ainsworth & Sussman) *The Fungi, an Advanced Treatise* 4 vols (1965-1973). *Biogs, obits etc.* Grumann (1974: 297); Paterson (*Mycol.* 70: 213, 1978) [bibliography, portrait]; Stafleu & Cowan (*TL-2* 5: 775, 1985).
- Sparrowia** Willoughby (1963), Chytridiaceae. 2 (on ? *Pythium* and chytrids), British Isles; USA. See Willoughby (*Nova Hedwigia* 5: 336, 1963).
- Sparsitubaceae** Jülich (1982) = Polyporaceae.
- Sparsitubus** L.W. Hsu & J.D. Zhao (1980), Polyporaceae. 1, China. See Hsu & Zhao (*Acta Microbiol. Sin.* 20: 236, 1980).
- Spartiella** Tuzet & Manier ex Manier (1968), Legeriomycetaceae. 2 (in *Ephemeroptera*), Europe; C. America. See Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986), Lichtwardt (*Revta Biol. trop.* 45: 1349, 1997; Costa Rica).
- Spathaspora** Nguyen, S.O. Suh & M. Blackw. (2006), Saccharomycetales. Anamorph *Candida*. 1 (associated with bark-boring beetles), USA. See Nguyen *et al.* (*MR* 110: 1237, 2006).
- Spathularia** Pers. (1797), Cudoniaceae. 12, widespread (north temperate). See Maas Geesteranus (*Proc. K. ned. Akad. Wet. Ser. C, Biol. Med. Sci.* 75: 243, 1972), Benkert (*Gleditschia* 10: 141, 1983), Stellmacher (*Abh. Naturhist. Ges. Nürnberg* 40: 78, 1985), Ohenoja (*Op. Bot.* 100: 193, 1989; nomencl.), Landvik *et al.* (*Mycoscience* 37: 237, 1997; phylogeny), Döring & Triebel (*Cryptog. Bryol.-Lichénol.* 19: 123, 1998; phylogeny), Gernandt *et al.* (*Mycol.* 93: 915, 2001; phylogeny), Wang *et al.* (*Mycol.* 94: 641, 2002), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006; phylogeny).
- Spathulariopsis** Maas Geest. (1972) = *Spathularia* fide Otani (*Rep. Crypt. Study Nepal*: 75, 1982), Wang *et al.* (*Mycol.* 94: 641, 2002).
- spathulate**, like a spoon in form (Fig. 23.19).
- Spathulea** Fr. (1825) ≡ *Spathularia*.
- Spathulina** Pat. (1900) nom. dub., Agaricomycetes.
- Spathulospora** A.R. Caval. & T.W. Johnson (1965), Spathulosporaceae. 5 (on *Ballia* spp.), widespread. See Kohlmeyer & Kohlmeyer (*Marine Mycology*, 1979; key), Walker *et al.* (*TBMS* 73: 193, 1979; host-parasite interface), Inderbitzin *et al.* (*MR* 108: 737, 2004; phylogeny), Campbell *et al.* (*MR* 109: 556, 2005; phylogeny), Zhang *et al.* (*Mycol.* 98: 1076,

2006; phylogeny).

Spathulosporaceae Kohlm. (1973), Lulworthiales. 2 gen., 6 spp.

Lit.: Kohlmeyer (*Mycol.* 65: 614, 1973), Kohlmeyer & Kohlmeyer (*Mycol.* 67: 629, 1975), Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 34: 1, 1991), Nakagiri & Ito (*Mycol.* 89: 484, 1997), Inderbitzin *et al.* (*MR* 108: 737, 2004).

Spathulosporales Kohlm. (1973) = Lulworthiales.

Spathulosporomycetidae, Locq. (1984), see *Sordariomycetes*.

Spatulosporonites Z.C. Song (1999), Fossil Fungi. 1. See Song *et al.* (*Fossil Spores and Pollen of China* 1: 825, 1999).

spawn (1) (n.), mycelium, esp. that used for starting mushroom cultures (q.v.); (2) (v.), to put inoculum (spawn) into a mushroom bed or other substrate.

special form (*forma specialis*, f. sp.; *formae speciales*, ff. spp., pl.), an informal rank in a Classification (q.v.) not regulated by the Code (see Nomenclature) and used for parasitic fungi characterized from a physiological standpoint (e.g. by the ability to cause disease in particular hosts) but scarcely or not at all from a morphological standpoint; e.g. *Fusarium oxysporum* f.sp. *cubense* (Panama disease of banana) and f.sp. *elaeidis* (wilt of oil palm); first used by Eriksson (*Ber. dtsch bot. Ges.* 12: 292, 1894) in rusts, and now extensively used in some genera (over 120 ff. spp. in *F. oxysporum*; Armstrong & Armstrong in Nelson *et al.* (Eds), *Fusarium: diseases, biology, taxonomy*: 391, 1981), although not always in a parallel manner; best viewed as a temporary category while further research as to taxonomic status is in progress (Hawksworth, in Hawksworth (Ed.), *The identification and characterization of pest organisms*: 93, 1994); comparable to 'pathovar' as used for plant pathogenic bacteria (Young *et al.*, *ROPP* 70: 211, 1991). See Plant pathology.

species (1) (colloquially), one sort of organism; (2) (scientifically), the lowest principal rank in the nomenclatural hierarchy (see Classification), consisting of two elements (a binomial): a generic name and a species epithet.

There is much debate as to how species should be defined, and a variety of concepts have been proposed: (1) **morpho** - (**morphological** -, **phenetic** -), the traditional approach recognizing units that could be delimited on the basis of morphological characters, and ideally by discontinuities in several such; (2) **biological** - (**cryptic**-, **sibling** -), actually or potentially interbreeding populations reproductively isolated from other such groups, whether or not they are distinguishable morphologically; (3) **phylogenetic** - (**evolutionary** -), based on measureable differences in biochemical, molecular or any other characters assessed by cladistic analysis (see Cladistics) and especially well-suited for groups in which no sexual reproduction is known (e.g. **clonal** -, **anamorphic** fungi); (4) **ecological** -, based on adaptation to particular niches rather than reproductive isolation (e.g. to particular hosts); (5) **polythetic** -, based on a combination of characters, not all of which are necessarily present in each individual. The **aggregate** - (**aggr.**), rarely used in mycology, has been used for groups of closely related morphospecies only distinguishable with difficulty.

The morphospecies concept has predominated in mycology, although in the past some mycologists

have frequently taken the host of a parasitic fungus into account (in some cases giving different specific names to like forms on unlike hosts). Population studies (see Population biology) and molecular data are, however, increasingly showing that many morphospecies comprise several biological and(or) phylogenetic species; it is likely that species characterized other than by morphology will increasingly be recognized, especially where these cause different plant diseases (see also special forms).

In lichen-forming fungi, - **pairs** (**Artenpaare**) are also recognized. Otherwise identical species one of which is fertile (the **primary** -), and the other reproduces vegetatively (the **secondary** -). Primary and secondary species generally have identical secondary metabolites, but the secondary species tend to have much wider geographical ranges. Molecular data are starting to challenge this interpretation of speciation. See Culberson & Culberson (*Science* 180: 196, 1973), Poelt (*Vortr. bot. Ges.*, n.f. 4: 187, 1970, *Bot. Notiser* 125: 77, 1972), Mattsson & Lumbsch (*Taxon* 38: 238, 1989), Tehler (*Taxon* 31: 708, 1982), Myllys *et al.* (*Mycol.* 93: 335, 2001; molecular characterization).

Lit.: Andersson (*Taxon* 39: 375, 1990; ecological spp.), Brasier (in Rayner *et al.* (Eds), *Evolutionary biology of the fungi*: 231, 1987; dynamics fungal speciation), Burges (in Lousley (Ed.), *Species studies in the British flora*: 65, 1955), Ciferri (*Ann. Myc.* 30: 122, 1932), Claridge & Boddy (in Hawksworth (Ed.), *Identification and characterization of pest organisms*: 261, 1994; recognition systems), Burnett (*TBMS* 81: 1, 1983; speciation in fungi), Ereshefsky (Ed.) (*The units of evolution: essays on the nature of species*, 1992; collected key papers), Hawksworth (*Mycologist's handbook*, 1974), Heywood (*Taxon* 27: 26, 1963; aggregate spp.), Mason (*TBMS* 24: 115, 1940), Perkins (in Bennett & Lasare (Eds), *More gene manipulations in fungi*: 3, 1991), Poelt (in Hawksworth (Ed.), *Ascomycete systematics*: 273, 1994; concepts in lichens), Regenmortel (*Interviol.* 31: 241, 1990; polythetic spp.), Rieppel (in Scotland *et al.* (Eds), *Models in phylogeny reconstruction*: 31, 1994; phylogenetic spp.).

Speerschneidera Trevis. (1861), Ramalinaceae (L). 1, N. America. See Hafellner & Egan (*Lichenologist* 13: 11, 1981), Ekman (*Op. bot.* 127: 148 pp., 1996; N America), Lumbsch *et al.* (*Mol. Phylogen. Evol.* 31: 822, 2004; phylogeny), Lumbsch *et al.* (*Mol. Phylogen. Evol.* 34: 512, 2005; phylogeny).

Spegazzini (Carlo Luigi; 1858-1926; Italy, later Argentina). Acting professor (c. 1880-1884) then Assistant Professor of Botany (1884-1887), Universidad de Buenos Aires; Director of the Provincial University, La Plata (1887-1912); Director, Ministry of Agriculture (1912 onwards). Father of South American mycology, with pioneering works on the fungi of Argentina, Brazil, Chile, Paraguay and Uruguay; after Saccardo (q.v.) responsible for more nomenclatural novelties than any other mycologist; shipwrecked, Tierra del Fuego (1882); the Spegazzini Glacier in southern Argentina, and the Asociación Spegazzini (the Argentine society for non-medical mycology) are named in his honour. Collections in the Instituto de Botánica C. Spegazzini, La Plata (LPS). *Publs* [see also Farr, An annotated list of Spegazzini's fungus taxa. *Bibliotheca Mycologica* 35, 2 vols, 1978]. Fungi Argentini. *Anales de la Sociedad Científica*

- Argentina* (1880-1882); Fungi Guaranitici. *Anales de la Sociedad Científica Argentina* (1883-1889); Fungi Patagonici. *Boletín de la Academia Nacional de Ciencias Córdoba* (1887); Fungi Fuegiani. *Boletín de la Academia Nacional de Ciencias Córdoba* (1887). *Biogs, obits etc.* Grumann (1974: 522); Molfino (*Anales de la Sociedad Científica Argentina* 108: 7, 1929); Murrill (*Mycol.* 16: 200, 1924); Stafleu & Cowan (*TL-2* 5: 776, 1985); see also *Spegazzini - Dibujos de Hongos, una Biblioteca Digitalizada / Spegazzini's Drawings of Fungi, a Digitized Library* www.cybertruffle.org.uk/spegazzini.
- Spegazzinia** Sacc. (1879), anamorphic *Pezizomycotina*, Hso/Hsp.0bP.27. 7, widespread. See Hughes (*Mycol. Pap.* 50, 1953), Roquebert (*Revue Mycol.* Paris 42: 309, 1978; conidiogenesis), Chen & Tzean (*Fungal Science Taipei* 15: 81, 2000; Taiwan).
- Spegazziniella** Bat. & I.H. Lima (1959) ? = *Myriangiella* fide Luttrell in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 135, 1973).
- Spegazzinites** Félix (1894), Fossil Fungi. 1 (Neogene, Pleistocene), widespread.
- Spegazzinula** Sacc. (1883) ≡ *Dubitatio* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Speira** Corda (1837) = *Dictyosporium* fide Guéguen (*BSMF* 21: 98, 1905).
- Speiropsis** Tubaki (1958), anamorphic *Pezizomycotina*, Hso.1bH.10. 7, widespread. See Petersen (*Mycol.* 55: 26, 1963), Kuthubutheen & Nawawi (*TBMS* 89: 584, 1987; key), Keshava Prasad & Bhat (*Mycotaxon* 82: 127, 2002; India).
- Spelaomyces** Fresen. (1863) ? = *Daedalea* fide Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974).
- sperm**, a male sex cell, typically motile; **-atiophore**, a spermatia-producing or -supporting structure; **-atium** (pl. **-a**), a 'sex' (+ or -) cell, e.g. a pycniospore; a microconidium in discomycetes and pyrenomycetes; a non-motile gamete, as in *Laboulbeniales*; **-atization**, the placing of spermatia on structures (receptive hyphae, etc.) for diploidization; **-odochidium**, a fruit-body having spermodochia in a lysigenous cavity in the susceptible tissue (Whetzel, *Mycol.* 35: 337, 1943); **-odochium**, a spermogonium having no wall (Whetzel, *Mycol.* 29: 135, 1937); **-ogonium** (**-agone**, **-agonium**), a walled structure in which spermatia are produced, as in ascomycetes; a pycnium of a rust; a lichen pycnidium (obsol.).
- Spermatodermia** Wallr. (1833) ≡ *Spermodermia*.
- Spermatodium** Fée ex Trevis. (1860) ≡ *Endophis* fide Aguirre-Hudson (*Bull. Br. Mus. nat. hist. Bot.* 21: 85, 1991), Hafellner & Kalb (*Biblthca Lichenol.* 57: 161, 1995).
- Spermatoloncha** Speg. (1908), anamorphic *Pezizomycotina*, Hso.1bH.10. 1, S. America; Africa.
- Spermochaetella** Cif. (1954), anamorphic *Pezizomycotina*, Cpd.1eP.?. 1, S. America. See Ciferri (*Sydowia* 8: 245, 1954).
- Spermodermia** Tode (1790) ? = *Hypoxylon* Bull. fide Höhnelt (*Mykol. Unters.* 1: 362, 1923).
- Spermoedia** Fr. (1822) = *Claviceps* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Spermophthora** S.F. Ashby & W. Nowell (1926) = *Eremothecium* fide de Hoog *et al.* in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 201, 1998).
- Spermophthoraceae** Guillerm. (1928) = *Metschnikowiaceae*.
- Spermophthorales** = *Saccharomycetales*.
- Spermophyllosticta** Kamilov (1972) nom. nud., anamorphic *Mycosphaerellaceae*.
- spermoplane**, the surface of a seed; **spermosphere**, the microhabitat around a seed in soil (Verona, *Ann. Inst. Pasteur* 105: 75, 1963). Cf. phylloplane; rhizoplane.
- Spermosporella** R. Sprague (1948), anamorphic *Pezizomycotina*, Hso.1≡ eH.1/10. 10, widespread. See Deighton (*TBMS* 51: 41, 1968), MacGarvie & O'Rourke (*Iran. J. agric. Res.* 8: 151, 1969), Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 1: 236, 1995; key).
- Spermosporella** Deighton (1969), anamorphic *Pezizomycotina*, Hso.1≡ eH.10. 3 (on *Meliola*), Sierra Leone; Uganda. See Deighton (*Mycol. Pap.* 118: 21, 1969), Matsushima & Matsushima (*Matsush. Mycol. Mem.* 8: 45, 1995), Johnston (*N.Z. J. Bot.* 37: 289, 1999; contrast with *Annellospermosporella*).
- Spermosporella** U. Braun (1993) nom. rej. = *Plectosporium* fide Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 1: 245, 1995; key), Gams *et al.* (*Taxon* 53: 193, 2004; nomencl.).
- Spermotrichum** Kuntze (1898), anamorphic *Pezizomycotina*, Ccu.0fH.?. 1, Paraguay.
- Sphacelia** Lév. (1827), anamorphic *Claviceps*, Cpd.0eH.?. 7, widespread. See Loveless (*TBMS* 47: 205, 1964; identification), Frederickson *et al.* (*MR* 93: 497, 1989; conidiation), White (*Neotyphodium/Grass Interactions Proceedings of the Third International Symposium on Acremonium/Grass Interactions, held May 28-31, 1997, in Athens, Georgia*: 27, 1997), Hodge (*Mycology Series* 19: 75, 2003), Pažoutová *et al.* (*MR* 108: 126, 2004), Walker (*Australas. Pl. Path.* 33: 211, 2004).
- Sphaceliopsis** Speg. (1910) = *Ephelis* fide Diehl (*USDA agric. Monogr.* 4, 1950).
- sphacelium**, the structure forming conidia in *Claviceps* from which the sclerotium develops (Frederickson *et al.*, *MR* 95: 1101, 1991).
- Sphaceloma** de Bary (1874), anamorphic *Elsinöe*, Cac.0eH.16. 52, widespread. Causing anthracnose and scab diseases. *S. rosarum* (rose leaf spot). See Jenkins & Bitancourt (*Mycol.* 33: 338, 1941), Sivanesan & Gómez (*TBMS* 85: 370, 1985), Gonzalez & Pons (*Ernstia*: 1, 1986; *S. manihoticola*, disease), Spiers & Hopcroft (*N.Z. J. Bot.* 30: 353, 1992; ontogeny), Song & Koh (*Korean J. Pl. Path.* 14: 303, 1998; on *Citrus*), Alvarez & Molina (*Pl. Dis.* 84: 423, 2000; on *Manihot*), Swart *et al.* (*Mycol.* 93: 366, 2001; on *Proteaceae*), Alvarez *et al.* (*Pl. Dis.* 87: 1322, 2003; on *Manihot*), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Sphacelotheca** de Bary (1884), *Microbotryaceae*. 7 (on *Polygonaceae*), widespread. See Langdon & Fullerton (*Mycotaxon* 6: 421, 1978; gen. delimitation), Vánky & Oberwinkler (*Beih. Nova Hedwigia* 107, 1994) cf. *Sporisorium*.
- Sphaerangium** Seaver (1951) [non *Sphaerangium* Schimp. 1860, *Musci*] = *Pezicula* Tul. & C. Tul. fide Verkley (*Stud. Mycol.* 44: 180 pp., 1999).
- Sphaerella** (Fr.) Rabenh. (1856) [non *Sphaerella* Sommerf. 1824, *Algae*] ≡ *Mycosphaerella* fide Corlett (*Mycol. Mem.* 18, 1991; list of names), Aptroot (*CBS Diversity Ser.* 5, 2006; nomenclator).
- Sphaerella** Ces. & De Not. (1863) = *Mycosphaerella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Sphaerellaceae** Nitschke (1869) = *Mycosphaerella*

- ceae.
- Sphaerellopsis** Cooke (1883), anamorphic *Eudarluca*, St.1-≡ eH.15/19. 3 (on *Uredinales*), widespread. See Mel'nik (*Nov. Sist. niz. Rast.* 13: 91, 1976), Sutton (*Mycol. Pap.* 141, 1977), Sutton (*The Coelomycetes*, 1980), Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993), Yuan *et al.* (*MR* 102: 866, 1998; on *Phragmidium violaceum*), Driesen *et al.* (*Australas. Pl. Path.* 33: 463, 2004; Australia), Liesebach & Zaspel (*Forest Pathology* 34: 293, 2004; genetic diversity on willow rusts), Liesebach & Zaspel (*Rust Diseases of Willow and Poplar*: 231, 2005; Europe), Nischwitz *et al.* (*MR* 109: 421, 2005; phylogeny, host specialization), Bayon *et al.* (*MR* 110: 1200, 2006; genetic diversity).
- Sphaerellopsis** Kleb. (1918) = *Venturia* Sacc. fide Holm (*Taxon* 24: 275, 1975), von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Sphaerellothecium** Zopf (1897), *Mycosphaerellaceae*. 4 (on lichens), widespread. See Roux & Triebel (*Bull. Soc. linn. Provence* 45: 451, 1994; descr. 4 spp.).
- Sphaeria** Haller (1768) nom. rej. = *Hypoxydon* Bull. Formerly used for most fungi with either perithecia or pycnidia. fide Wakefield (*TBMS* 24: 286, 1940), Donk (*Regnum veg.* 34: 16, 1964).
- Sphaeriaceae** Fr. (1825) = *Xylariaceae*. s. str. (obsol.).
- Sphaeriala** Sousa da Câmara (1926) ? = *Sphaerulina* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Sphaeriales** S. str., see *Xylariales*; s. lat., see *Sordariomycetes*.
- Sphaerialites** Venkatach. & R.K. Kar (1969), Fossil Fungi ? Fungi. 1 (Tertiary), India.
- Sphaericeps** Welw. & Curr. (1868) = *Battarraea* fide Cunningham (*Gast. Austr. N.Z.*: 131, 1944).
- Sphaeridiobolus** (Boud.) Boud. (1885) = *Ascobolus* fide van Brummelen (*Persoonia Suppl.* 1: 1, 1967).
- Sphaeridium** Fresen. (1852), anamorphic *Pezizomycotina*, Hsy.0eH.?. 5, widespread.
- Sphaerioidaceae** Sacc. (1884). (syn. *Phomaceae*, *Sphaeropsidaceae*). See *Sphaeropsidales*.
- Sphaeriopsis** Geyl. (1887), Fossil Fungi, *Pyronemataceae*. 1 (Eocene), Indonesia. = *Sphaerites* (Fossil fungi) fide Meschinelli (1892).
- Sphaeriestromella** Bubák (1916), anamorphic *Pezizomycotina*, St.0fH.?. 1, Europe.
- Sphaeriothyrium** Bubák (1916), anamorphic *Pezizomycotina*, St.0eH.15. 2, Europe.
- Sphaerites** Unger (1850), Fossil Fungi. 110 (Cretaceous, Tertiary), Europe; N. America.
- Sphaerobasidioscypha** Agerer (1983), *Cyphellaceae*. 2, New Zealand; Venezuela. See Agerer (*Mitt. bot. StSamml. Münch.* 19: 294, 1983).
- Sphaerobasidium** Oberw. (1965), *Hydnodontaceae*. 4, widespread. See Oberwinkler (*Sydowia* 19: 57, 1965).
- Sphaerobolaceae** J. Schröt. (1889) = *Geastraceae*.
- Sphaerobolales** = *Geastrales*.
- Sphaerobolus** Tode (1790), *Geastraceae*. 2 (on wood or coprophilous), widespread. See Ingold (*TBMS* 58: 179, 1972; review), Flegler (*Mycol.* 76: 944, 1984; cultural char.), Geml *et al.* (*Mycol.* 97: 680, 2005; systematics).
- Sphaerocarpus** Ehrh. (1793), *Lecanorales* (L.). 1, Europe.
- Sphaerocephalum** Weber ex F.H. Wigg. (1780) ? = *Calicium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Sphaerocephalus** Battarra ex Earle (1909) [non *Sphaerocephalus* Lag. ex DC. 1812, *Compositae*] = *Tricholoma* fide Singer (*Agaric. mod. Tax.*, 1951).
- Sphaerochaetia** Bat. & Cif. (1962) = *Chaetothyrium* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Sphaerocista** Preuss (1852) = *Topospora* fide Groves (*CJB* 43: 1195, 1965).
- Sphaerocladia** Stüben (1939) = *Blastocladiella* fide Couch & Whiffen (*Am. J. Bot.* 29: 582, 1942).
- Sphaerocolla** P. Karst. (1892), anamorphic *Pezizomycotina*, Hsp.0eH.3. 2, Europe; S. America. See Donk (*Taxon* 11: 99, 1962).
- Sphaerocordyceps** Kobayasi (1981), ? *Clavicipitaceae*. 2, widespread. See Kobayasi (*Bull. natn. Sci. Mus. Tokyo*, B 7: 2, 1981).
- Sphaerocreas** Sacc. & Ellis (1882) = *Glomus* fide Gerdemann & Trappe (*Mycol. Mem.* 5, 1974).
- Sphaerocybe** Magrou & Marneffe (1946), anamorphic *Pezizomycotina*, Hsy.?.?. 1, Europe.
- sphaerocysts**, globose cells in tissues of fungi, e.g. *Russula* and *Lactarius*.
- Sphaeroderma** Fuckel (1875) = *Melanospora* Corda fide Cannon & Hawksworth (*J. Linn. Soc. Bot.* 84: 115, 1982).
- Sphaerodermatella** Seaver (1909) ? = *Coniochaeta* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Sphaerodermella** Höhn. (1907) = *Coniochaeta* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Sphaerodes** Clem. (1909), *Ceratostomataceae*. 12, widespread. See Cannon & Hawksworth (*J. Linn. Soc. Bot.* 84: 115, 1982; key), García *et al.* (*Stud. Mycol.* 50: 63, 2004; Spain), Schoch *et al.* (*MR* 111: 154, 2007; phylogeny).
- Sphaerodothella** C.A. Pearce & K.D. Hyde (2001), *Phyllachoraceae*. 1, Australia. See Pearce & Hyde (*Fungal Diversity* 6: 83, 2001), Pearce & Hyde (*Fungal Diversity Res. Ser.* 17: 308 pp., 2006).
- Sphaerodopsis** (Sacc. & P. Syd.) Shear (1909), *Phyllachoraceae*. 21 (on palm leaves), S.E. Asia. Now restricted to palm-inhabiting species. See Joly (*Bull. Res. Counc. Israel* D 10: 187, 1961; key), Cannon (*Stud. Mycol.* 31: 49, 1989; on *Gramineae*), Hyde & Cannon (*Mycol. Pap.* 175: 114, 1999).
- Sphaerognomonina** Potebnia ex Höhn. (1917) = *Apiosporopsis* fide Reid & Dowsett (*CJB* 68: 2398, 1990).
- Sphaerognomoniella** Naumov & Kusnezowa (1952), ? *Diaporthales*. 1, former USSR. See Naumov & Kusnezowa (*Bot. Mater. Otd. Sporov. Rast. Bot. Inst. Komarova Akad. Nauk S.S.S.R.* 8: 153, 1952).
- Sphaerographium** Sacc. (1884), anamorphic *Helotiales*, St.0fH.15. 11, widespread (north temperate). See Verkley (*Mycol.* 93: 205, 2001), Verkley (*Nova Hedwigia* 75: 433, 2002; revision), Rossman *et al.* (*Mycol. Progr.* 3: 275, 2004; phylogeny).
- Sphaerolina** Fuckel (1860) = *Schizoxylon* fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932), Sherwood (*Mycotaxon* 6: 215, 1977).
- Sphaeromma** H.B.P. Upadhyay (1964), anamorphic *Pezizomycotina*, Cpd.≡ eH.?. 1 (lichenicolous), Brazil. See Upadhyay (*Publções Inst. Micol. Recife* 402: 4, 1964), Matzer (*Mycol. Pap.* 171: 202 pp., 1996).
- Sphaeromonas** E. Liebet. (1910), *Chytridiomycetes*. 1, Europe. See Orpin (*J. gen. Microbiol.* 94: 270, 1976).
- Sphaeromphale** A. Massal. (1854) = *Staurothele* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8,

- 1995).
- Sphaeromphale** Rchb. (1828) $\equiv$ Segestria.
- Sphaeromyces** G. Arnaud (1954) nom. inval., anamorphic *Pezizomycotina*.
- Sphaeromyces** Mont. (1845) ? = *Aspergillus*.
- Sphaeromycetella** G. Arnaud (1954) = *Chloridium* fide Gams & Holubová-Jechová (*Stud. Mycol.* 13, 1976).
- Sphaeromyxa** Spreng. (1827) $\equiv$ *Sphaeronaema*.
- Sphaeronaema** Fr. (1815), anamorphic *Pezizomycotina*, St.0eH.?. 50, widespread. See Jaczewski (*Nouv. Mem. Soc. nat. Moscou* 15: 277, 1898), Petch (*TBMS* 25: 167, 1941; monotypic), Sutton (*Mycol. Pap.* 141, 1977).
- Sphaeronaemella** P. Karst. (1884), Microascales. Anamorph *Gabarnaudia*. 1 or 5 (on fungi and dung), widespread (north temperate). See Cannon & Hawksworth (*J. Linn. Soc. Bot.* 84: 115, 1982), Hausner *et al.* (*CJB* 71: 52, 1993; posn), Seifert *et al.* in Wingfield *et al.* (Eds) (*Ceratocystis and Ophiostoma Taxonomy, Ecology and Pathogenicity*: 269, 1993), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Hausner & Reid (*CJB* 82: 752, 2004; phylogeny).
- Sphaeronaemina** Höhn. (1917) $\equiv$ *Sphaeronaema*.
- Sphaeronemopsis** Speg. (1910) = *Melanospora* Corda fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Sphaeropezia** Sacc. (1884) = *Odontotrema* fide Sherwood-Pike (*Mycotaxon* 28: 137, 1987).
- Sphaeropeziella** P. Karst. (1885) ? = *Xylogramma* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Sphaerophoma** Petr. (1924), anamorphic *Pezizomycotina*, St.0eH.?. 1, N. America.
- Sphaerophoraceae** Fr. (1831), Lecanorales (L). 5 gen. (+ 10 syn.), 32 spp.
Lit.: Henssen *et al.* (*Bot. Acta* 105: 457, 1992), Wedin (*Pl. Syst. Evol.* 187: 213, 1993; cladistics), Wedin (*Acta univ. upsal.* 77, 1994; keys 23 S. Hemisph. spp.), Gargas *et al.* (*Science* N.Y. 268: 1492, 1995), Wedin (*Symb. bot. upsal.* 31: 102 pp., 1995; S. hemisphere), Chen (*Acta Mycol. Sin.* 15: 105, 1996), Tibell (*Symb. bot. upsal.* 32 no. 1: 291, 1997), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998), Wedin *et al.* (*Pl. Syst. Evol.* 209: 75, 1998), Wedin *et al.* (*Pl. Syst. Evol.* 209: 75, 1998), Döring *et al.* (*Aust. J. Bot.* 47: 783, 1999), Sarrión *et al.* (*Mycotaxon* 71: 169, 1999), Wedin & Döring (*MR* 103: 1131, 1999; phylogeny), Döring & Wedin (*Pl. Biol.* 2: 361, 2000), Wedin *et al.* (*Lichenologist* 32: 171, 2000; phylogeny), Högnabba & Wedin (*Cladistics* 19: 224, 2003), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny).
- Sphaerophoron**, see *Sphaerophorus*.
- Sphaerophoronomyces** Cif. & Tomas. (1953) $\equiv$ *Sphaerophorus*.
- Sphaerophoropsidaceae** Elenkin (1929) = *Cladoniaceae*.
- Sphaerophoropsis** Vain. (1890), *Cladoniaceae* (L). 2, S. America; New Zealand. See Ahti (*Lichenology in Latin America. History, Current Knowledge and Applications* [Proceedings of GLAL-3, Terceiro Encontro do Grupo Latino-Americano de Lichenólogos, São Paulo, Brazil, 24-28 September, 1997]: 109, 1998).
- Sphaerophorum** Schrad. (1794) nom. rej. prop. = *Sphaerophorus* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Sphaerophorus** Pers. (1794) nom. cons., *Sphaerophoraceae* (L). 8, widespread. See Wedin (*Nordic Jl Bot.* 10: 539, 1990; ontogeny), Wedin (*Lichenologist* 24: 119, 1992; S. hemisph.), Wedin (*Pl. Syst. Evol.* 187: 213, 1993; cladistics), Wedin (*Symb. Bot. Upsal.* 31 no. 1, 1995; key, monograph), Tibell (*Symb. bot. upsal.* 32: 291, 1997; anamorphs), Wedin & Döring (*MR* 103: 1131, 1999; phylogeny), Döring & Wedin (*Pl. Biol.* 2: 361, 2000; ontogeny, anatomy), Wedin *et al.* (*Lichenologist* 32: 171, 2000; phylogeny), Högnabba & Wedin (*Cladistics* 19: 224, 2003; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Sphaerophragmiaceae** Cummins & Y. Hirats. (1983) = *Raveneliaceae*.
- Sphaerophragmium** Magnus (1891), *Raveneliaceae*. 18 (on *Annonaceae*, most on *Leguminosae*), widespread (tropical). See Hiremath & Pavgi (*Norw. Jl Bot.* 21: 17, 1974; morphology), Lohsomboon *et al.* (*MR* 98: 907, 1994; key), Piepenbring (*Mycol. Progr* 4: 161, 2005; Panama).
- sphaeroplast**, see *protoplast*.
- Sphaeropleum** Link (1833) nom. dub., ? *Fungi*.
- Sphaeroporalites** Hemer & Nygreen (1967), Fossil *Fungi* ? *Fungi*. 1, Libya.
- Sphaeropsidales** (obsol.). Traditionally used for anamorphic fungi with pycnidial conidiomata (*Phomales*, *Phyllostictales*, etc.). Not accepted by Sutton (1973, 1980) or by Nag Raj (1981).
- Sphaeropsis** Flot. (1847) $\equiv$ *Thelocarpon*.
- Sphaeropsis** Lév. (1842) nom. rej., anamorphic *Pezizomycotina*. See Hawksworth & Sherwood (*Taxon* 30: 338, 1981).
- Sphaeropsis** Sacc. (1880) nom. cons., anamorphic *Botryosphaeriaceae*, Cpd.1eP.1. 3 (assoc. with canker or die-back), widespread. *S. sapinea* on conifers. See Phillips *et al.* (*Persoonia* 21: in press, 2008).
- Sphaeropus** Paulet (1793) = *Onygena* fide Saccardo (*Syll. fung.* 20: 230, 1911).
- Sphaeropyxis** Bonord. (1864) = *Coniochaeta* fide Petrini (*Sydowia* 44: 169, 1993).
- Sphaerosoma** Klotzsch (1839), *Pyronemataceae*. 3 (hypogeous), N. America; Europe. See Gamundí (*Sydowia* 28: 339, 1976; gen. concept), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Sphaerosomataceae** Bail (1858) = *Pyronemataceae*.
- Sphaerosperma** Preuss (1853) = *Diatrypella* fide Saccardo (*Syll. fung.* 1: 203, 1882).
- Sphaerospora** (Sacc.) Sacc. (1889) [non *Sphaerospora* Klatt 1864, *Iridaceae*] $\equiv$ *Sphaerosporula*.
- Sphaerosporella** (Svrček) Svrček & Kubička (1961), *Pyronemataceae*. 2, widespread. See Häffner (*Beitr. Kenntn. Pilze Mitteleur.* 3: 413, 1987), Yao & Spooner (*Kew Bull.* 51: 385, 1996), Landvik *et al.* (*Nordic Jl Bot.* 17: 403, 1997; DNA), Wang (*Mycotaxon* 80: 197, 2001; Taiwan), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Sphaerosporiites** Babajan & Tasl. (1977), Fossil *Fungi*. 1 (Tertiary), former USSR.
- Sphaerosporium** Schwein. (1832), anamorphic *Pezizomycotina*, Hso.0eH.3. 2, widespread. See Damon & Downing (*Mycol.* 46: 214, 1954), Partridge & Morgan-Jones (*Mycotaxon* 84: 69, 2002).
- Sphaerosporula** Kuntze (1898) = *Scutellinia* fide Denison (*Mycol.* 51: 605, 1959).
- Sphaerostilbe** Tul. & C. Tul. (1861) = *Nectria* fide

- Rogerson (*Mycol.* 62: 865, 1970), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Sphaerostilbella** (Henn.) Sacc. & D. Sacc. (1905), Hypocreaceae. Anamorph *Gliocladium*. 4 (decaying fungi and wood), widespread. See Seifert (*Stud. Mycol.* 27, 1985), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Pöldmaa (*Stud. Mycol.* 45: 83, 2000), Rossman *et al.* (*Mycol.* 93: 100, 2001; phylogeny), Castlebury *et al.* (*MR* 108: 864, 2004; phylogeny), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Sphaerostylidium** (A. Braun) Sorokīn (1882) = Rhizophydium fide Fischer (*Rabenh. Krypt.-Fl.* 4 2.1: 25, 1892).
- Sphaerothallia** Nees ex Eversm. (1831) nom. rej. = *Aspicilia*. Includes the 'manna lichens'; *S. esculenta* may be one of the types of manna in The Bible, and can be used in bread production. fide Follmann & Crespo (*An. Inst. bot. A.J. Cavanilles* 31: 325, 1974), Rogers in Seaward (Ed.) (*Lichen ecology*: 211, 1977; thalli unattached and blown in the wind), Crespo & Barreno (*Acta Bot. Malac.* 4: 55, 1978), Hafellner (*Acta Bot. Malac.* 16: 133, 1991).
- Sphaerotheca** Desv. (1817) nom. rej. = *Aecidium* fide Berndt (*in litt.*).
- Sphaerotheca** Lév. (1851) nom. cons. = *Podosphaera* fide Saenz & Taylor (*CJB* 77: 150, 1999; phylogeny), Braun & Takamatsu (*Schlechtendalia* 4: 3, 2000), Braun *et al.* (*Schlechtendalia* 7: 45, 2001), Takamatsu (*Mycoscience* 45: 147, 2004; phylogeny).
- Sphaerothyrium** Wallr. (1833) = *Eustegia*.
- Sphaerotrachys** Fayod (1889) = *Cortinarius* fide Kauffman (*N. Amer. Fl.* 10, 1932).
- Sphaerozone** Zobel (1854), Pezizaceae. 4 (hypogeous), widespread. See Beaton & Weste (*TBMS* 71: 164, 1978), Dissing (*Mycotaxon* 30: 2, 1980), Hansen *et al.* (*Mycol.* 93: 958, 2001; phylogeny), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Sphaerososma** Corda (1842) = *Sphaerosoma* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Sphaerula** Pat. (1883) = *Pistillaria* Fr. fide Corner (*Ann. Bot. Mem.* [A monograph of *Clavaria* and allied genera] 1, 1950).
- Sphaerulina** Sacc. (1878), ? *Mycosphaerellaceae*. 41, widespread. *S. rehmana* (rose leaf scorch), *S. taxi* (yew (*Taxus*) leaf spot), *S. rubi* (raspberry (*Rubus*) leaf spot). See Boerema (*Neth. JI Pl. Path.* 69: 76, 1963), Evans *et al.* (*MR* 97: 59, 1993), Crous *et al.* (*Sydowia* 55: 136, 2003; polyphyly).
- Sphaerulomyces** Marvanová (1977), anamorphic *Pezizomycotina*, Hso.0eH.3. 1 (aquatic), Slovakia. See Marvanová (*TBMS* 68: 485, 1977).
- Sphagnicola** Velen. (1934) = *Ciliatula*.
- Sphagnomphalia** Redhead, Moncalvo, Vilgalys & Lutzoni (2002) = *Gyroflexus*.
- Sphaleromyces** Thaxt. (1894), Laboulbeniaceae. 3, widespread. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- Spheconisca** (Norman) Norman (1876), ? *Verrucariaceae* (L). 20, Europe. See Bachmann (*Nyt Mag. naturv.* 64: 170, 1926).
- Spheconiscomyces** Cif. & Tomas. (1953) = *Spheconisca* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Sphenospora** Dietel (1892), Raveneliaceae. 8 (mostly on monocots), America (tropical); Africa. See Linder (*Mycol.* 36: 464, 1944), Olive (*Mycol.* 39: 409, 1947; cytology), Pereira *et al.* (*Brazilian Journal of Microbiology* 33: 155, 2002; on orchid).
- spheridium**, see capitulum.
- Spherites** Dijkstra (1949), Fossil Fungi. 1 (Devonian), Netherlands.
- spheroplast**, see protoplast.
- Spheropsis** Raf. (1815) nom. dub.; nom. nov. for '*Sphaeria* Pers.', ? *Pezizomycotina*. No spp. included.
- Spherospora** J.J. Garcia (1991), Microsporidia. 1.
- spherule** (1) a sporangium-like structure in *Coccidioides* (Baker & Mrak, *Am. J. trop. Med.* 21: 589, 1941); (2) a multinucleate cell of a resting myxomycete plasmodium.
- spherulin**, spherule phase coccidioidin (q.v.) (Sclarone *et al.*, *Sabouraudia* 11: 222, 1973).
- Sphinctrina** Fr. (1825), Sphinctrinaceae (±L). 8 (on lichens), widespread. See Löfgren & Tibell (*Lichenologist* 11: 109, 1979; key 5 Eur. spp.), Tibell (*Beih. Nova Hedwigia* 79: 597, 1984), Wedin & Tibell (*CJB* 75: 1236, 1997; phylogeny), Tibell (*Nordic Lichen Flora* 1. Introductory Parts; Calicioid Lichens and Fungi: 20, 1999; Nordic spp.), Tibell & Vinuesa (*Taxon* 54: 427, 2005; phylogeny), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny).
- Sphinctrinaceae** M. Choisy (1950), Mycocaliciales (±L). 2 gen. (+ 2 syn.), 9 spp.
Lit.: Tibell (*Symb. bot. upsal.* 27 no. 1: 279 pp., 1987), Otto & Krebs (*Boletus* 17: 97, 1993), Wedin & Tibell (*CJB* 75: 1236, 1997; phylogeny), Sarrión *et al.* (*Mycotaxon* 71: 169, 1999), Tibell & Wedin (*Mycol.* 92: 577, 2000).
- Sphinctrinella** Nádv. (1942) = *Mycocalicium* fide Tibell (*Beih. Nova Hedwigia* 79: 597, 1984), Tibell *et al.* (*Mycotaxon* 87: 3, 2003).
- Sphinctrinopsis** Woron. (1927), Caliciaceae. 1 (on *Pertusaria*), former USSR. See Tibell (*Beih. Nova Hedwigia* 79: 597, 1984).
- Sphinctrosporium** Kunze (1828) = *Cladotrichum* fide Saccardo (*Syll. fung.* 4: 374, 1886).
- Sphondylocephalum** Stalpers (1974), anamorphic *Pezizomycotina*, Hso.0eH.6. 1, N. America. See Stalpers (*Proc. K. Ned. Akad. Wet. Ser. C, Biol. Med. Sci.* 77: 400, 1974).
- Sphyridiomyces** E.A. Thomas ex Cif. & Tomas. (1953) = *Baeomyces* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Sphyridium** Flot. (1843) = *Baeomyces* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Spicaria** Harting (1846) nom. conf., anamorphic *Pezizomycotina*. See Brown & Smith (*TBMS* 40: 22, 1957).
- Spicariopsis** R. Heim (1939) ? = *Paecilomyces* fide Samson (*Stud. Mycol.* 6, 1974).
- Spicellum** Nicot & Roquebert (1976), anamorphic *Hypocreales*, Hso.0eH.10. 1, France. See Nicot & Roquebert (*Revue Mycol. Paris* 39: 272, 1975), Seifert *et al.* (*Mycol.* 89: 250, 1997).
- Spicularia** Chevall. (1826) = *Exidia*.
- Spicularia** Pers. (1822), anamorphic *Pezizomycotina*, Hso.0eP.?. 1 or 2, Europe; America.
- spicule (spiculum)** (Tulasne; obol.), see sterigma.
- Spiculogloea** P. Roberts (1996), Spiculogloaeales. 4, Europe. See Roberts (*Mycotaxon* 60: 112, 1996).
- Spiculogloaeales** R. Bauer, Begerow, J.P. Samp., M. Weiss & Oberw. (2006). Agaricostilbomycetes. 1 gen., 4 spp. No families recognized.
- spiculospore**, a spore formed at the tip of a pointed structure often elongate and so resembling a spike, as

- in *Hirsutella* and *Akanthomyces* (Subramanian, *Curr. Sci.* 31: 410, 1962).
- Spiculostilbella** E.F. Morris (1963) = *Phaeoisaria* fide de Hoog & Papendorf (*Persoonia* 8: 408, 1976).
- spiculum** (pl. **spicula**), see sterigma.
- Spilobolus** Link (1833) = *Amphisphaerella* fide Gams (*Taxon* 43: 265, 1994).
- Spilocaea** Fr. (1819) nom. rej. = *Fusicladium* fide Ellis (*DH*, 1971), Ellis (*MDH*, 1976), Braun *et al.* (*Taxon* 51: 557, 2002; nomencl.), González-Lamothe *et al.* (*FEMS Microbiol. Lett.* 210: 149, 2002; phylogeny), Schubert *et al.* (*Schlechtendalia* 9, 2003), Beck *et al.* (*Mycol. Progr.* 4: 111, 2005; phylogeny).
- Spilodinium** A. Massal. (1856) = *Arthonia* fide Hawksworth (*TBMS* 74: 363, 1980).
- spilodinium**, introduced by Lettau (*Beih. Feddes Rep.* 69: 62, 1932) for the minute round blackish structures on the thallus of *Dirina massiliensis* caused by *Milospium graphideorum*.
- Spilodochium** Syd. (1927), anamorphic *Pseudoparodiella*, Hsp.0-1eP.?. 3, C. America; Australia. See Sivanesan (*TBMS* 86: 187, 1986; teleomorph).
- Spiloma** Ach. (1803) = *Xylographa* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Spilomataceae** Chevall. (1826) = *Trapeliaceae*.
Lit.: Lumbsch *et al.* (*MR* 111: 1133, 2007).
- Spilomela** (Sacc.) Keissl. (1920) ≡ *Pleospilis*.
- Spilomium** Nyl. (1858) ≡ *Sclerococcum* fide Hawksworth (*Taxon* 55: 528, 2006; nomencl.).
- Spilomyces** Petr. & Syd. (1927) = *Neottiospora* fide Sutton (*Mycol. Pap.* 141, 1977).
- Spilonema** Bornet (1856), *Coccocarpiaceae* (L.). 4, widespread. See Henssen (*Symb. bot. upsal.* 18 no. 1, 1963).
- Spilonematopsis** Å.E. Dahl (1950) = *Ephebe* fide Henssen (*Symb. bot. upsal.* 18 no. 1, 1963).
- Spilonematopsis** Vain. (1909) nom. nud. = *Spiloma* fide Henssen (*Symb. bot. upsal.* 18 no. 1, 1963).
- Spilonemella** Henssen & Tonsberg (2000), *Coccocarpiaceae* (L.). 2, Japan; USA. See Henssen & Tønsberg (*Bryologist* 103: 108, 2000).
- Spilonemopsis** Vain. (1909) nom. nud. = *Spilonema* fide Henssen (*Symb. bot. upsal.* 18 no. 1, 1963).
- Spilopezis** Clem. (1909) = *Pseudopeziza* fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).
- Spilopodia** Boud. (1885), *Helotiales*. Anamorphs *Discogloeum*, *Melanodiscus*. 4, Europe. See Müller (*Sydowia* 41: 219, 1989; excl. sp.).
- Spilopodiella** E. Müll. (1989), *Helotiales*. 1, Switzerland. See Müller (*Sydowia* 41: 219, 1989).
- Spilosphaeria** Rabenh. (1857) = *Septoria* Sacc. fide Saccardo (*Syll. fung.* 4: 474, 1884).
- Spilosphaerites** A. Massal. (1857), *Fossil Fungi*. 2 (Miocene), Italy.
- Spilosticta** Syd. (1923) = *Venturia* Sacc. fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Spinalia** Vuill. (1904), ? *Dimargaritales*. 1, Europe. See Benjamin (*Aliso* 4: 321, 1959), Benjamin in Kendrick (Ed.) (*The Whole Fungus* 2: 573, 1979), Wrzoczek & Gajowniczek (*Acta Mycologica Warszawa* 33: 269, 1998; Poland).
- spindle**, see fuseau.
- spindle pole body**, microtubule organizing center, functionally homologous to the animal cell centrosome.
- spindle-organ**, see turbinate cell.
- spine**, a narrow sharply pointed process; **spinule**, a small spine (in lichens see Fig. 22C); **spiny**, having spines; **spinose** (dim. **spinulose**), delicately spiny. Fig. 20.2.
- Spinellus** Tiegh. (1875), *Phycomycetaceae*. 3 (parasitic on agarics, esp. *Mycena*), widespread (north temperate). See Zycha *et al.* (*Mucorales*, 1969; key), Overton (*Notes on the genus Spinellus with comparisons to other Zygomycetes found in fungicolous associations with Basidiomycetes*, 1997), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny).
- Spiniger** Stalpers (1974), anamorphic *Heterobasidion*, *Dichostereum*, *Laurilia*. 2, widespread. See Carmichael *et al.* (*Genera of Hyphomycetes*, 1980; refs).
- Spinomyces** Bat. & Peres (1961) nom. inval. ? = *Echinoplaca* fide Lücking *et al.* (*Lichenologist* 30: 121, 1998).
- Spinosporonites** R.K. Saxena & S. Khare (1991), *Fossil Fungi*. 1, India. See Saxena & Khare (*Geophytology* 21: 40, 1991).
- Spinulosphaeria** Sivan. (1974), *Chaetosphaerellaceae*. 1 (from wood), widespread. See Nannfeldt (*Svensk bot. Tidskr.* 69: 289, 1975), Barr (*Mycotaxon* 39: 43, 1990; posn), Subramanian & Sekar (*Kavaka* 18: 19, 1993; placement in *Nitschkiaceae*), Huhndorf *et al.* (*Mycol.* 96: 368, 2004; phylogeny).
- Spinulospora** Deighton (1973), anamorphic *Pezizomycotina*, Hsp.0eH.1. 1 (on *Puccinia*), W. Africa. See Deighton (*TBMS* 61: 195, 1973).
- spiral hypha**, a hypha ending in a spiral or helical coil, as in *Trichophyton* (Davidson & Gregory, *TBMS* 21: 98, 1937).
- Spiralia** Grigoraki (1925) [non *Spiralia* Toulou 1900, fossil ? *Algae*] = *Trichophyton* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Spiralotrichum** H.S. Yates (1918) nom. dub., anamorphic *Pezizomycotina*. See Mulder (*TBMS* 65: 518, 1975).
- Spiralum** J.L. Mulder (1975), anamorphic *Pezizomycotina*, Hso.0-≡ hP.10. 2, Asia. See Mulder (*TBMS* 65: 518, 1975).
- Spirechina** Arthur (1907) = *Kuehneola* fide Jackson (*Mycol.* 23: 96, 1931).
- spirits**, high alcohol-content drinks obtained by distilling grape wine (**brandy**), malted barley (**whisky**), fermented rye or maize worts (**gin**), or fermented molasses (**rum**). See also pulque.
- Spirodactylon** R.K. Benj. (1959), *Kickxellaceae*. 1, USA. See Benjamin (*Aliso* 4: 408, 1959).
- Spirodecospora** B.S. Lu, K.D. Hyde & W.H. Ho (1998), *Xylariaceae*. 2, Hong Kong; Russia. See Lu *et al.* (*Fungal Diversity* 1: 170, 1998), Mel'nik & Hyde (*Fungal Diversity* 12: 151, 2003).
- Spiroglugea** L. Léger & E. Hesse (1924), *Microsporidia*. 1.
- Spirogramma** Ferd. & Winge (1909) = *Xylaria* Hill ex Schrank fide Cannon (*SA* 6: 171, 1987).
- Spirographa** Zahlbr. (1903), *Odontotremataceae*. 3 (on lichens), Europe. See Santesson (*The lichens and lichenicolous fungi of Sweden and Norway*, 1993), Holien & Triebel (*Lichenologist* 28: 307, 1996).
- Spirographomyces** Cif. & Tomas. (1953) ≡ *Spirographa*.
- Spirogyromyces** Tzean & G.L. Barron (1981), ? *Kickxellomycotina*. 1 (in gut of *Rhabditis*), Canada. See Tzean & Barron (*CJB* 59: 1861, 1981), Barron (*Biodiversity of Fungi Inventory and Monitoring Methods*: 435, 2004).
- Spiroidium** Saito (1949) nom. dub., *Fungi*. q.v.
- Spiromastix** Kuehn & G.F. Orr (1962), ? *Ajellomyces*

- taceae. 5, widespread. See Currah & Locquin-Linard (*CJB* 66: 1135, 1988; key 2 spp.), Sugiyama *et al.* (*Mycoscience* 40: 251, 1999; DNA), Udagawa & Uchiyama (*Mycoscience* 40: 291, 1999), Sugiyama & Mikawa (*Mycoscience* 42: 413, 2001; phylogeny), Untereiner *et al.* (*Stud. Mycol.* 47: 25, 2002; phylogeny), Untereiner *et al.* (*Mycol.* 96: 812, 2004), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny).
- Spiromyces** R.K. Benj. (1963), Kickxellaceae. 2, USA. See Benjamin (*Aliso* 5: 273, 1963), Mikawa (*TMSJ* 16: 146, 1975), O'Donnell *et al.* (*Mycol.* 90: 624, 1998), James *et al.* (*Nature* 443: 818, 2006; phylogeny), White *et al.* (*Mycol.* 98: 872, 2006; phylogeny).
- Spiropes** Cif. (1955), anamorphic *Pezizomycotina*, Hso.≡ eP.10. 30 (on *Meliolaceae*), widespread (esp. tropical). See Ellis (*Mycol. Pap.* 114, 1968; key), Seifert & Hughes (*N.Z. J. Bot.* 38: 489, 2000).
- Spirosphaera** Beverw. (1953), anamorphic *Helotiales*, Hso.0≡ hH.1. 8 (aquatic), Europe; Japan. See Hennebert (*TBMS* 51: 13, 1968), Abdullah *et al.* (*Nova Hedwigia* 43: 507, 1986; 2 spp. from Japan), Voglmayr (*CJB* 75: 1772, 1997), Marvanová & Bärlocher (*Mycotaxon* 68: 33, 1998), Voglmayr (*Stud. Mycol.* 50: 221, 2004), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Spirospora** L. Mangin & Vincens (1920) = *Acrospeira* fide Wiltshire (*TBMS* 21: 233, 1938).
- Spirospora** Scherff. (1926), Microsporidia. 1.
- Spirotremesporites** Dueñas (1979), Fossil Fungi. 3 (Eocene – Pleistocene), Colombia; USA.
- Spirotrichum** Saito ex J.F.H. Beyma (1940) = *Tritirachium* fide Langeron (*Revue Mycol. Paris* 14: 133, 1949), Paulitz & Menge (*Mycol.* 76: 99, 1984).
- Spitzenkörper**. A labile vesicle-rich and actin-rich structure present in growing tips of most, but not all, fungi, whose behaviour correlates with tip growth rate and direction (Grove & Bracker, *J. Bact.* 104: 989, 1970, López-Franco & Bracker, *Protoplasma* 195: 90, 1996, Bourett & Howard, *Protoplasma* 163: 199, 1991). See also Virag & Harris (*MR* 110: 4, 2006; review of molecular research).
- Spizellomyces** D.J.S. Barr (1980), Spizellomycetaceae. 8, widespread. See Barr (*CJB* 58: 2384, 1980).
- Spizellomycetaceae** D.J.S. Barr (1980), Spizellomycetales. 6 gen. (+ 1 syn.), 25 spp.
Lit.: Longcore *et al.* (*CJB* 73: 1389, 1995), Chen *et al.* (*Bot. Bull. Acad. sin. Taipei* 41: 73, 2000), Barr in McLaughlin *et al.* (Eds) (*The Mycota A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research* 7A: 93, 2001).
- Spizellomycetales** D.J.S. Barr (1980). Chytridiomycetes. 2 fam., 7 gen., 27 spp. Monocentric; development endogenous or exogenous; saprobic or parasitic, predominantly from soil on organic substrata including other fungi, cellulose, keratin, pollen, plant debris; cosmop.
- A segregate from *Chytridiales* (q.v.) which they resemble except: zoospores of most species have more than one lipid globule, they may move in an amoeboid fashion, rhizoid tips are blunt. The order was defined using ultrastructural characters of the zoospore (Barr, *CJB* 58: 2380, 1980). Fams:
- (1) **Caulochytriaceae**
 - (2) **Olpidiaceae**
 - (3) **Spizellomycetaceae**
- Lit.*: Barr (*CJB* 62: 1171, 1984; key spp. in culture), Barr & Désaulniers (*CJB* 64: 561, 1986), James *et al.* (*Mycol.* 98: 860, 2006; molecular phylogeny), Hibbett *et al.* (*MR* 111: 109, 2007), and see under *Families*.
- Spizomycetes**. Class within the *Chytridiomycota* (Cavalier-Smith, in Rayner *et al.* (Eds), *Evolutionary biology of the fungi*: 339, 1987) including only *Spizellomycetales*.
- Splanchnomyces** Corda (1831) = *Rhizopogon* fide Kuyper (*in litt.*).
- Splanchnomycetaceae** Corda (1842) = *Rhizopogonaceae*.
- Splanchnonema** Corda (1829), Pleomassariaceae. Anamorph *Myxocyclus*. 35, Europe; N. America. See Barr (*Mycotaxon* 15: 349, 1982), Barr (*Mycotaxon* 42: 129, 1993; key 27 N. Am. spp.), Tanaka *et al.* (*Mycoscience* 46: 248, 2005; Japan).
- Splanchospora** L.N. Vasil'eva (1998), Pyrenulales. 1, Europe. See Vasil'eva (*Nizshie Rasteniya, Griby i Mokhoobraznye Dalnego Vostoka Rossii* Griby. Tom 4. Pirenomitsety i Lokuloaskomitsety 4: 237, 1998).
- splash (splashing) cup**, an open cup-like structure (as in *Cladonia*, *Cyathus*, and the liverwort *Marchantia*), from which the reproductive bodies are discharged by falling drops of water. See Brodie (*CJB* 29: 593, 1951); bird's nest fungi.
- Spogotteria** Dyko & B. Sutton (1979) = *Plectronidium* fide Sutton & Pascoe (*TBMS* 87: 249, 1986).
- Spolverinia** A. Massal. (1856) = *Phyllactinia*. Also used for lichenicolous fungi. fide Junell (*Svensk bot. Tidskr.* 58: 55, 1964), Hoffmann & Hafellner (*Biblthca Lichenol.* 77: 181 pp., 2000).
- Spondylocladiella** Linder (1934), anamorphic *Pezizomycotina*, Hso.≡ eP.24. 1 (on *Corticium*), Europe; N. America.
- Spondylocladiopsis** M.B. Ellis (1963), anamorphic *Pezizomycotina*, Hso.≡ eH.10. 1, Europe. See Ellis (*Mycol. Pap.* 87: 15, 1963), Treigienė & Markovskaja (*Botanica Lithuanica* 9: 285, 2003).
- Spondylocladium** Mart. ex Sacc. (1880) = *Stachylidium* fide Hughes (*CJB* 36: 747, 1958).
- Spongiasclerotes** Stach & Pickh. (1957), Fossil Fungi. 1 (Carboniferous), Germany. See Stach & Pickhardt (*Palaeontologische Zeitschrift* 31: 140, 1957).
- Spongioides** Lázaro Ibiza (1916) nom. dub., Polyporales.
- spongiostratum**, used for the hypothallus of *Anzia* and *Pannoparmelia* (Hannemann, *Bibl. Lich.* 1, 1973). See Henssen & Dobelmann (*Bibl. Lich.* 25: 103, 1987).
- Spongiosus** Lloyd ex Torrend (1920) ≡ *Phaeolus*.
- Spongipellis** Pat. (1887), Polyporaceae. 8, widespread. See Gilbertson & Ryvarden (*N. Amer. Polyp.* 2: 723, 1987), Ipulet & Ryvarden (*Syn. Fung.* 20: 87, 2005; Uganda).
- Spongiporus** Murrill (1905) = *Postia* fide Jülich (*Per-sonia* 11: 423, 1982).
- Sponheimeria** Kirschst. (1941) = *Lasiobelonium* Ellis & Everh. fide Baral (*SA* 13: 113, 1994).
- Spooneromyces** T. Schumach. & J. Moravec (1989), Pyronemataceae. 3, Europe. See Schumacher & Moravec (*Nordic J. Bot.* 9: 425, 1989), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- spora**, the spore content of a particular place or ecological niche; of air, see *Air spora*.
- sporabola**, the curve made by a basidiospore after discharge from its sterigma (Buller, *Researches* 1; Ingold, 1971: 111).
- Sporacestra** A. Massal. (1860) ≡ *Bacidia* fide Coppins (*Bull. Br. Mus. nat. hist. Bot.* 11: 203, 1983).

Sporadospora Reinsch (1875) nom. dub., Fungi. Based on appressoria. See Racovitza (*Mém. Mus. natn Hist. nat. Paris Bot.* 10: 223, 1959; synonym of *Pseudonectria*), Lowen (*SA* 9: 26, 1991).

sporangial vesicle, vesicle produced at the mouth of the sporangium during planont maturation and discharge. See homohylic vesicle, plasmamembranic vesicle, precipitative vesicle.

sporangiocyst (of *Chytridiales*), a resting sporangium (A. Fischer); cf. cystosorus.

sporangiolum (**sporangiote**), (1) (of *Mucorales*), a small sporangium with or without a columella, generally having a small number of spores; (2) a degenerating arbuscule (Janse, 1897) (obsol.).

sporangiophore, thallus element (usually morphologically differentiated) subtending one or more sporangia.

sporangiosorus, group of spherical sporangia fused together and formed from a single plasmodium; also one or more lobed sporangia formed from a single plasmodium.

sporangiospore, walled spore produced in a sporangium; **primary infestation** - (of *Eccrinales*), 1-4-nucleate, thick-walled spore which serves to transmit an infestation from one host individual to another after passage through the gut; **secondary infestation** - (of *Eccrinales*), multinucleate, thin-walled spore which germinates in the same gut as where they were produced.

sporangium (**sporange**), an organ enclosing endogenously generated spore(s), the walls of the spore(s) not being derived from the supporting or containing structure.

Sporastatia A. Massal. (1854), Catillariaceae (L). 4, widespread. See Grube & Poelt (*Fragm. Flor. geobot. Suppl.* 2: 113, 1993), Buschbom & Mueller (*Mol. Phylogen. Evol.* 32: 66, 2004; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).

spore, a general term for a reproductive structure in fungi, bacteria, and cryptogamic plants. In fungi, a differentiated morphological form which may be: (a) specialized for dissemination; (b) produced in response to, and resistant to, adverse conditions; and/or (c) produced during or as a result of a sexual or asexual reproductive process. Commonly 1-celled, but in fungi frequently a multicelled structure (e.g. phragmospore, spore ball, etc.) which is in effect a group of 1-celled spores because every cell may produce one or more germ tubes. Thick- or thin-walled, pigmented or not, motile or non-motile.

More attention has been given to the spore than to any other fungal structure. Spore morphology (e.g. flagellation of zoospores) and development (e.g. of ascospores and basidiospores; sexual and asexual spores) provide basic taxonomic criteria and biologically spores may be differentiated into groups disseminated by wind, water, insects and other animals, etc., and those which allow a fungus to survive conditions unfavourable for growth (e.g. resting spores), although one type of spore may serve several functions (Sutton, *TBMS* 86: 1, 1986). Vuillemin (1912) defined spores morphologically (e.g. motile and non-motile) and biologically and borrowed or coined terms for his different spore types. Most of these terms have never been in current use but the naming of spores continues (see Spore terminology).

Lit.: Chapela (*Sydowia* 43: 1, 1991; measurement

with Coulter counter), De Toledo (*Mycotaxon* 52: 259, 1994; descriptions of), Madelin (Ed.) (*The fungus spore*, 1966), Weber & Hess (Eds) (*The fungal spore. Form and function*, 1976), Turian & Hohl (Eds) (*The fungal spore: morphogenetic controls*, 1981), Cole & Hoch (*The fungal spore and disease initiation in plants and animals*, 1991), Beakes (in Gow & Gadd (Eds), *The growing fungus* 339, 1995; sporulation), and the following entries.

spore ball, a unit of dispersal comprised of a more or less firmly aggregated group of spores (e.g. *Sorosporium*, *Tolyposporium*) or spores and sterile cells (e.g. *Urocystis*).

Spore charge. Airborne spores carry either a positive or negative electrostatic charge, fide Buller (1: 192, 1909). This charge may play an important role in dispersal and, in the case of filiform spores, may result in a change in the spore's shape: if the ends are attracted to each other, the spore will have the aerodynamics of a quoit rather than a javelin. See Allitt (*TBMS* 72: 147, 1979), Webster *et al.* (*TBMS* 91: 193, 1988), Gregory (*Nature* 180: 330, 1957; *Ganoderma applanatum*, etc.), Swinbank *et al.* (*Ann. Bot., Lond.* 28: 239, 1964; *Serpula*).

Spore discharge and dispersal. A wide range of mechanisms for spore discharge and dispersal can be found in the fungi. Most involve air, animals, water or some combination of these. To be discharged, spores must escape from, or overcome the adhesive forces attaching them to the cell(s) in or on which they developed, and in many cases also the fruitbody in or on which those cells were produced.

Air dispersal. Most spores dispersed in this way do not travel far, but a tiny proportion may travel for thousands of km. This usually implies a very low rate of successful colonization by the dispersed spores. Spores must cross the laminar boundary layer of static air that surrounds all surfaces and enter the turbulent layer beyond. Many mechanisms have developed in fungi to enable their spores readily to become airborne.

Dry passive methods of air dispersal are independent of water availability and so can occur in the absence of rain and at low humidities. Some (*Agaricales*, *Myxomycetes*) have tall sporophores which lift spores well into or through the laminar boundary layer. Release and dispersal without mechanical disturbance can occur at low wind speeds in myxomycetes with raised fruiting bodies, e.g., *Dictydium*, and with fungi producing cup-shaped fruitbodies (e.g. *Cyttaria*, *Lachnellula*, *Peziza*, many lichen-forming species) in which double eddies may occur as a result of wind blowing across the surface. However, removal of conidia from conidiophores by wind requires speeds of at least 0.4-2.0 m/s, which are seldom achieved in crops except in gusts. Passive shedding as a result of gravity or in convection currents remains of uncertain importance.

Other passive methods of air dispersal involve mechanical disturbance such as rainsplash. Although water is required to activate them, rain tap and puff & bellows mechanisms are often used to disperse dry spores. In the first, rain striking a stem causes vibration which loosens spores while the cushion of air which precedes the splash disturbs the laminar boundary layer and blows spores into the air. Bellows mechanisms are seen in *Lycoperdon* and similar fungi which have a thin, flexible, unwettable perid-

ium covering the spore mass which is depressed momentarily by raindrops or drips from foliage, expelling a puff of air carrying millions of spores from the aperture. Similarly, open cup-shaped structures ('splash cups', q.v.) produced by bird's nest fungi (*Nidulariales*), e.g., *Cyathus* spp., *Crucibulum vulgare*, and podetia lined with soredia produced by *Cladonia* use the energy of raindrops to project their contents up to 1 m.

Mist pickup has been described for *Cladosporium*. Rain and drip splash are important for fungi with spores embedded in slimy masses, e.g., *Colletotrichum lindemuthianum*, and for other non-slimy species whose spores are easily released by rain, e.g. *Venturia inaequalis*, or which also have active dispersal mechanisms, e.g. *Phytophthora infestans*.

Bubble scavenging concentrates particles, e.g. spores of aquatic fungi, from water suspension and these may then be projected into the air when surface bubbles burst. Droplets from breaking waves and waterfalls fulfil a similar function.

Active mechanisms activated by changing humidity and drying are seen in the violent twisting movements of some *Oomycota* and in water rupture mechanisms. Release through hygroscopic movement is characteristic of sporangiophores of *Phytophthora infestans* and *Peronospora hyoscyami* (syn. *P. tabacina*) and may also serve to loosen spores of some hyphomycetes, e.g. *Botrytis cinerea*, *Cladosporium*, *Drechslera*, before subsequent deflation. Water rupture occurs when tension is sufficient for the cohesion between water molecules or their adhesion to cell walls to fail resulting in the sudden formation of a gas bubble. A spore-bearing cell which had been collapsing as water was withdrawn by evaporation then suddenly returns to its former size as the gas bubble forms, flicking off the spores. The catapult effect may be enhanced by differential thickening of the conidiophore, as seen in *Deightonella torulosa* and *Zygosporium oscheoides*.

Squirt gun mechanisms are characteristic of many *Ascomycota*, in which the spores are ejected explosively from turgid cells to a distance of 1-2 cm for small ascospores and up to 60 cm for larger ascospores, e.g. *Ascobolus immersus*. This type of discharge may result in the spore becoming electrostatically charged (see Spore charge). Asci may discharge singly from perithecia or many simultaneously from apothecia, e.g., *Sclerotinia sclerotiorum* producing a visible puff. About 0.2 mm rainfall is necessary for discharge of ascospores from perithecia of *Venturia inaequalis* in apple leaves or of *Mycosphaerella pinodes* in pea straw but at least 1.2 mm for ascospores from stromata of *Eutypa armeniacae*. Ascospores are usually dispersed as single spores but in *Pyrenopeziza brassicae* groups, usually of four spores, may be dispersed together.

Squirting mechanisms are also found in *Pilobolus* spp., *Basidiobolus ranarum*, *Entomophthora muscae*, *Pyricularia oryzae* and *Nigrospora sphaerica*. The sudden rounding of turgid cells can cause spores of *Conidiobolus coronata* to travel up to 4 cm and also occurs in *Epicoccum nigrum*, *Arthrimum cuspidatum*, *Sclerospira philippinensis* and the anamorph of *Xylaria furcata*.

Discharge of ballistospores and basidiospores is activated by water. The formation of a drop of liquid at the hilum end of the spore is characteristic; this is

termed Buller's drop (q.v.) and has a crucial role in spore discharge. The spore is ejected 0.01-0.02 cm, sufficient for it to be able to fall freely between the gills or through pores into the free air below.

Water dispersal. Aquatic phycomycetes (*Chytridiomycota*, *Chromista*) may be dispersed in water as self-motile zoospores. Some water-dispersed spores (e.g. conidia of *Rubikia*) have many empty (vacated) cells and the air trapped within these cells may enable them to function as float chambers.

Animal dispersal. The success rate of colonization is often higher with animal-dispersed spores than with air- or water-dispersed spores. Arthropods are probably the dominant animal group involved in fungal spore dispersal. Examples include insects carrying the anamorphs of *Claviceps* spp. to new host plants, flies dispersing spores of *Phallus*, and laboulbeniomyces being transmitted from one insect to another by touch. Other animal groups are also, however, important. Truffles and other hypogeous fungi are usually dispersed when pigs, rodents or other mammals drop fruitbody fragments while feeding. *Pilobolus* and other coprophilous fungi may be spread by animals and even require ingestion for their spores to germinate. However, they may also have an airborne dispersal phase. Humans may aid discharge and dispersal of spores through disturbance caused by agricultural practices such as mechanical harvesting and threshing.

Dispersal of spores depends on their size, shape, roughness and other characteristics and, for air dispersed spores, on wind speed and turbulence. Spore dispersal mechanisms determine the periodicity of spore release (see Air spora). Spore size and surface roughness affect the rate at which spores fall through the air and their ability to impact on stems and other obstacles. Fall rate or terminal velocity is a function of the square of the spore radius while the efficiency with which spores impact onto obstacles increases with their size. Many spores in crops and similarly dense vegetation either fall to the ground or impact onto stems and fail to escape into the air. Most that do escape are deposited within 100 m and few travel long distances. Spore clouds are spread both horizontally and vertically by eddies as they travel downwind from their source and concentrations decrease following theories of diffusion. Nevertheless, clouds of spores released in successive days and nights have been identified up to 600 km downwind of the British coast (Hirst & Hurst, *Symp. Soc. gen. Microbiol.* 17: 307, 1967). Dispersal is ended by impaction of particles onto obstacles and by washout in rain.

It should be remembered that successful dispersal ends in deposition and results in colonization of new substratum. Many spores therefore have adaptations enabling them to adhere to suitable surfaces (e.g. mucous sheaths, radiating arms).

Lit.: Buller (1-6), Edmonds (*Aerobiology, the ecological systems approach*, 1979), Gregory (*TBMS* 21: 26, 1945, *Microbiology of the atmosphere*, edn 2, 1973), Gregory & Monteith (*Airborne microbes*, 1967), Ingold (*Fungal spores, their liberation and dispersal*), 1971), Malloch & Blackwell (*in* Carroll & Wicklow, *The fungal community*, edn 2 : 147, 1992).

spore dormancy, see Spore germination.

Spore germination. Germination and dormancy in fungi have been reviewed by Sussman (*in* Ainsworth & Sussman (Eds), *The Fungi* 2: 733, 1966), Sussman

& Douthit (*Ann. Rev. Pl. Physiol.* **24**: 311, 1973), and Gottlieb (*The germination of fungus spores*, 1978). A simple descriptive kinetics model of filamentous fungi spore germination is given by Bosch *et al.* (*Process biochemistry* **30**: 599, 1995).

Germination usually involves production of one or more germ tubes accompanied by synthesis of new wall material. Protoplasm pressure and enzymic degradation of the spore wall results in emergence of the germ-tube through the spore wall. Fungal spore germination is influenced mainly by temperature, humidity, daylight and various types of radiation (Schenck *et al.*, *Mycol.* **67**: 1189, 1975; Jack & Tansey, *Mycol.* **69**: 109, 1977). Spores of basidiomycetes and some of conidial fungi are distinctly stimulated by mucin that is chemically similar to the natural spore matrix (Mahuku & Goodwin, *European Journal of Plant Pathology* **104**: 849, 1998). Oxygen is required for swelling of spores and the process is energy dependent. Thus aeration is necessary for formation of germ tubes during cultivation in solid state fermentation (Augur *et al.*, *Micología Aplicada Internacional* **19**: 7, 2007). Various light wavelengths may affect the capacity of fungal spores (e.g. *Puccinia graminis*) to germinate (Calpouzos & Chang, *Plant Physiology* **47**: 729, 1971; Lucas *et al.*, *Plant Physiology* **56**: 847, 1975). Darkness increases germination of *Alternaria alternata* spores (Hatzipapas *et al.*, *MR* **106**: 1349, 2002). Radiation normally inhibits spore germination, but fungal strains with long-term exposure may show enhanced germination rates (Tugay *et al.*, *Mycol.* **98**: 521, 2006). See also Radiation and fungi.

Molecular and biochemical events during early stages of spore germination involve cAMP signalling (Fillinger *et al.*, *Mol. Microbiol.* **44**: 1001, 2002), net synthesis of lipids, with large production and later net degradation of free fatty acids (Mumford & Pappelis, *Mycopathologia* **64**: 63, 1978; Beilby & Kidby, *Journal of Lipid Research* **21**: 739, 1980). Germination can be highly dependent on the ratio of non-nutritive (not metabolizable), non-toxic carbohydrates such as L-sorbose and cellulose. Time of the spore germination is poorly correlated with water activity (Pham *et al.*, *J. Agric. Food Chem.* **47**: 4976, 1999).

Inhibition of fungal spore germination has been studied for biocontrol of plant diseases. Some plant extracts (e.g. of *Cichorium intybus*, *Eryngium creticum*, *Melia azedarach* and *Salvia fruticosa*) can suppress spore germination in species of *Alternaria*, *Botrytis*, *Cladosporium*, *Fusarium* and *Penicillium* (Abou-Jawdah, *et al.* (*J. Agric. Food Chem.* **50**: 3208, 2002; Chu *et al.*, *Plant Disease* **90**: 858, 2006). Similarly, pollen and stigma extracts of *Sorghum* can suppress spore germination of *Claviceps africana* (Prom, *Asian Journal of Plant Pathology* **1**: 12, 2007). Mandibular gland secretions of leaf-cutting ants have been shown to inhibit spore germination of conidial ascomycetes and zygomycetes which occur in their nests (Marsaro *et al.*, *Neotrop. Entomol.* **30**: 403, 2001; Rodrigues *et al.*, *Braz. J. Microbiol.* **39**: 64, 2008).

In lichenized fungi the ascospores germinate readily in water films at moderate temperatures. Percentage germination is lowest in areas of high air pollution (Kofler *et al.*, *Mém. Soc. bot. Fr.* 1968: 219, 1969). In *Xanthoria parietina* ascospores remain dormant until contact with the photobiont is made

(Werner, *Mém. Soc. Sci. nat. phys. Maroc* **27**: 7, 1931). See Lichens.

Lit.: Abou-Jawdah *et al.* (*J. Agric. Food Chem.* **50**: 3208, 2002), Augur *et al.* (*Micología Aplicada Internacional* **19**: 7, 2007), Beilby & Kidby (*Journal of Lipid Research* **21**: 739, 1980), Bosch *et al.* (*Process biochemistry* **30**: 599, 1995), Calpouzos & Chang (*Plant Physiology* **47**: 729, 1971), Chu *et al.* (*Plant Disease* **90**: 858, 2006), Fillinger *et al.* (*Mol. Microbiol.* **44**: 1001, 2002), Hatzipapas *et al.* (*Mycological Research* **106**: 1349, 2002), Jack & Tansey (*Mycol.* **69**: 109, 1977), Lucas *et al.* (*Plant Physiology* **56**: 847, 1975), Mahuku & Goodwin (*Eur. J. Plant Path.* **104**: 849, 1998), Marsaro *et al.* (*Neotrop. Entomol.* **30**: 403, 2001), Merrill (*Ann. Rev. Phytopath.* **8**: 281, 1970), Mumford & Pappelis (*Mycopathologia* **64**: 63, 1978), Pham *et al.* (*J. Agric. Food Chem.* **47**: 4976, 1999), Prom (*Asian J. Plant Path.* **1**: 12, 2007), Rodrigues *et al.* (*Braz. J. Microbiol.* **39**: 64, 2008), Schenck *et al.* (*Mycol.* **67**: 1189, 1975), Tugay *et al.* (*Mycol.* **98**: 521, 2006). See also *Lit.* under Spore discharge and dispersal.

spore groups, for Saccardo's spore groups see Anamorphic fungi. Also see Conidial nomenclature, Sphaeriales.

spore horn, see cirrus.

spore longevity, see Longevity.

spore print, the deposit of basidioma obtained by allowing spores from a basidiocarp to fall onto a sheet of paper (white or coloured) placed below the lamellae or pores. See Singer (1975: 5).

spore specific gravity, Buller (1: 153, 1909) determined the Specific Gravity (SG) of various agaric spores as 1.02-1.43.

spore terminology, see abospore, acro-, adia-, aecio-, aleurio-, alpha-, amero-, amphi-, annello- (under annellidic), aplano-, arthro-, asco-, azygo-, ballisto-, basidio-, beta-, blasto-, botryo-aleurio-, botryoblasto-, chlamydo-, clostero-, conidiole, conidium, cyst, deuterconidium, dia-, dictyochlamydo-, dictyoporo-, dictyo-, didymo-, diploconidium, dispersal -, di-, dry -, ecto-, endoconidium, endo-, fragmentation -, fuseau, ganglio-, gasteroconidium, gastero-, gemma, gonosphere, haploconidium, helico-, hemi-asco-, hemi-, isthmo-, loculo- (see Loculomycetes), macroconidium, macro-, meio-, memno-, meri-, meristem arthro-, meristem blasto-, meso-, microconidium, micro-endo-, micro-, mischoblastiomorph, mito-, mono-, myceloconidium, myxo-, nimbo-, oidium, oo-, papulo-, part -, partheno-, peri-, phialoconidium (under phialidic), phragmo-, placodiomorph, plasmagamo-, polarilocular-, poroconidium, poro-, primo-, promycelial -, protero-, protoconidium, proto-, pseudoidium, pseudo-, pycnidio-, pycnio-, pycno-, radula -, ramoconidium, repeating -, resting -, scoleco-, secondary -, seio-, sicyo-, simblo-, slime -, smut -, spiculo-, sporangio-, sporidesm, sporidiole, sporidium, stalagmo-, statismo-, stauro-, stylo-, summer -, sympodioconidium, synchrono-, teleutosporodesm, telio-, terminus -, tetra-, texo-, thallo-, theca-, tetroconidium (under tetric), tricho-, ustilo-, usto-, winter -, xeno-, zoo-, zygo-.

Spore wall. Conventional or electron microscopy shows the spore wall to be layered. The terminology of these layers by different authors is somewhat confused (see the comparison by Payak, 1964: 33). Five layers (the spore wall proper; **eusporium**) which have been distinguished are, from within outwards:

(1) **endosporium** (endospore, corium), which is usually thin and is the last to develop during sporogenesis; (2) **episporium**, the thick, fundamental layer which determines the shape of the spore; (3) **exosporium** (exospore, epitunica, trachytectum, tunica), a layer derived from (2) but chemically distinct and frequently responsible for the ornamentation; (4) **perisporium** (= mucostratum, myxosporium), a layer, frequently fugacious, enveloping the whole spore and limited by (5), the hardly visible **ectosporium** (sporotheceum). On this disappearance of (4) and (5) (3) is the outer spore layer. (1)-(3) are thus the spore wall proper; (4) and (5) of extrasporal origin. See Heim (*Rev. Mycol.* 27: 199, 1962), Payak (*in* Nair (Ed.), *Recent advances in palynology*, 1964), Pyatt (*TBMS* 52: 167, 1969; lichens), Pegler & Young (*TBMS* 72: 356, 1979; basidiospores). See Fig. 5; cf. Cell wall chemistry.

Sporendocladia G. Arnaud ex Nag Raj & W.B. Kendr. (1975), anamorphic *Ceratocystidaceae*, Hso.0eH.22. 7, widespread. See Wingfield *et al.* (*TBMS* 89: 609, 1987; separation from *Phialocephala*), Crous & Wingfield (*Sydowia* 46: 193, 1994; Switzerland), Onofri *et al.* (*MR* 98: 745, 1994; key), Jacobs *et al.* (*Mycol.* 95: 637, 2003; phylogeny).

Sporendonema Desm. (1827), anamorphic *Pezizomycotina*, Hso.0eP.40. 3, widespread. See Sigler & Carmichael (*Mycotaxon* 4: 376, 1976).

Sporhaplus H.B.P. Upadhyay (1964), anamorphic *Pezizomycotina*, Cpd.0eH.?. 1 (lichenicolous), Brazil. See Hawksworth (*Bull. Br. Mus. nat. Hist. Bot.* 9: 1, 1981), Matzer (*Mycol. Pap.* 171: 202 pp., 1996).

Sporhelminthium Speg. (1918) = *Clasterosporium* fide Hughes (*CJB* 36: 727, 1958).

Sporichthya M.P. Lechev., H. Lechev. & Holbert (1968), *Actinobacteria*. q.v.

sporidesm (**sporodesm**), a compound spore or spore-ball, the components of which are merispores. See teleutosporodesm.

Sporidesmiella P.M. Kirk (1982), anamorphic *Melanommataceae*, Hso.1-≡ eP.19. 18, widespread. See Zhang *et al.* (*Mycotaxon* 18: 243, 1983; conidiogenesis), Kuthubutheen & Nawawi (*MR* 97: 1305, 1993; review), Castañeda Ruiz *et al.* (*MR* 102: 548, 1998), Wu & Zhuang (*Fungal Diversity Res. Ser.* 15, 2005), Shenoy *et al.* (*MR* 110: 916, 2006; phylogeny).

sporidesmin (and **sporodesmolides**), toxins (oligopeptides) of *Pithomyces chartarum* (teleomorph *Lepptosphaerulina chartarum*); the cause of facial eczema in sheep and cattle, esp. in NZ.

Sporidesmina Subram. & Bhat (1989), *Xylariales*. See Sutton (*in litt.*), Shenoy *et al.* (*MR* 110: 916, 2006; phylogeny).

Sporidesmiopsis Subram. & Bhat (1989) = *Brachysporiella* fide Sutton (*in litt.*), Wu & Zhuang (*Fungal Diversity Res. Ser.* 15, 2005; China).

Sporidesmium Link (1809), anamorphic *Pleosporales*, Hso.≡ -#eP.19. 113, widespread. See Ellis (*Mycol. Pap.* 70, 1958; key), Hughes (*CJB* 36: 807, 1958), Moore (*Mycol.* 50: 681, 1958), Bullock *et al.* (*CJB* 67: 313, 1989; morphology, histochem. and germination of *S. sclerotivorum*), Subramanian (*Proc. Indian natn Sci. Acad. Part B. Biol. Sci.* 58: 179, 1992; segregation), Réblová (*Mycotaxon* 71: 13, 1999), Wu & Zhuang (*Fungal Diversity Res. Ser.* 15, 2005; China), Shenoy *et al.* (*MR* 110: 916, 2006; phylogeny, polyphyly).

Sporidiaceae R.T. Moore (1980) = *Sporidiobolaceae*

R.T. Moore.

Sporidiales R.T. Moore (1980), see *Sporidiobolales*.

Sporidiobolaceae Kobayasi (1961) nom. inval. = *Sporidiobolaceae* R.T. Moore.

Sporidiobolaceae R.T. Moore (1980), *Sporidiobolales*. 3 gen., 10 spp.

Lit.: Boekhout & Nakase *in* Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 828, 1998), Fell & Statzell-Tallman *in* Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 678, 1998), Kurtzman & Fell (*Yeasts, a taxonomic study* 4th edn, 1998; taxonomy), Statzell-Tallman & Fell *in* Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 693, 1998), Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 1351, 2000; mol. phylogeny), Hamamoto & Nakase (*Int. J. Syst. Evol. Microbiol.* 50: 1373, 2000), Biswas *et al.* (*Int. J. Syst. Evol. Microbiol.* 51: 1191, 2001), Nagahama *et al.* (*Antonie van Leeuwenhoek* 80: 101, 2001), Bai *et al.* (*Int. J. Syst. Evol. Microbiol.* 52: 2309, 2002), Fell *et al.* (*FEMS Yeast Res.* 1: 265, 2002), Scorzetti *et al.* (*FEMS Yeast Res.* 2: 495, 2002), Libkind *et al.* (*Antonie van Leeuwenhoek* 84: 313, 2003), Sampaio *et al.* (*Mycol. Progr.* 2: 63, 2003), Wang & Bai (*FEMS Yeast Res.* 4: 579, 2004).

Sporidiobolales Doweld (2001). *Microbotryomycetes*. 1 fam., 7 gen., 83 spp. Fam.:

Sporidiobolaceae

Lit.: Moore (1980), Boekhout *et al.* (*Can. J. Microb.* 39: 276, 1993), Swann & Taylor (*Stud. Mycol.* 38: 147, 1995; mol. phylogeny, taxonomy). See also *Lit.* for Yeast.

Sporidiobolus Nyland (1950), *Sporidiobolaceae* R.T. Moore. Anamorphs *Rhodomyces*, *Sporobolomyces*. 7, widespread. See Bandoni *et al.* (*CJB* 49: 683, 1971).

sporidiolae, spore-like bodies produced inside **sporidiomata**, peritheceum-like structures, in *Kathistes* (Malloch & Blackwell, *CJB* 68: 1712, 1990).

sporidiole, a small spore.

Sporidiomycetes. Class used by Moore (1980) for *Sporidiales*, q.v.

sporidium (pl. **sporidia**), (1) a basidiospore of the *Pucciniales* and *Ustilaginales* or, in the latter, any spore other than an ustilospore; (2) ascospore (obso.).

Sporisorium Ehrenb. ex Link (1825), *Ustilaginaceae*. c. 320 (on *Poaceae*), widespread. *S. sorghi* and *S. cruentum* (covered and loose smuts of sorghum); *S. reilianum* (head smut of maize (*Zea*) and sorghum). Many graminicolous smuts originally described as *Sorosporium*, *Sphacelotheca* or *Ustilago* belong here. See Langdon & Fullerton (*Mycotaxon* 6: 421, 1978), Vánky (*Europ. Smut Fungi*: 570 pp., 1994), Vánky & McKenzie (*Fungal Diversity Res. Ser.* 8: 259 pp., 2002; New Zealand), Vánky (*Mycotaxon* 2: 169, 2005; Europe).

Sporoacania A. Massal. (1855) ? = *Lecidea* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Sporoblastia Trevis. (1851) = *Cliostomum* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Sporobolomyces Kluyver & C.B. Niel (1924), anamorphic *Sporidiobolus*. c. 25, widespread. See Fell *et al.* (*Stud. Mycol.* 38: 129, 1995; mol. phylogeny, 2000; mol. phylogeny), Nakase *et al.* (*Stud. Mycol.* 38: 163, 1995; mol. phylogeny), Swann & Taylor (*Stud. Mycol.* 38: 147, 1995; mol. phylogeny), Takashima & Nakase (*Mycoscience* 41: 357, 2000; Thai-

- land), Bai *et al.* (*International Journal of Systematic and Evolutionary Microbiology* **52**: 2309, 2002), Sampaio (*Frontiers in Basidiomycete Mycology*: 49, 2004), Libkind *et al.* (*International Journal of Systematic and Evolutionary Microbiology* **55**: 503, 2005; Argentina), Nagahama (*Journal of General and Applied Microbiology, Tokyo* **52**: 37, 2006), Lumbsch *et al.* (*MR* **111**: 1133, 2007).
- Sporobolomycetales** (mirror or shadow yeasts), anamorphic yeasts with basidiomycetous affinities characteristically producing ballistospores following multiplication by budding (e.g. *Bullera*, *Itersonilia*, *Sporobolomyces*, *Tilletiopsis*). Accepted in *Basidioblastomycetes* by Moore (1980). See Yeast for *Lit.*, also Martin (*Univ. Iowa Stud. nat. Hist.* **19**(3), 1952).
- Sporocadaceae** Corda (1842) = *Amphisphaeriaceae*.
- Sporocadus** Corda (1839), anamorphic *Amphisphaeriaceae*. 1, widespread. See Shoemaker & Müller (*CJB* **42**: 403, 1964), Brockmann (*Sydowia* **28**: 275, 1976), Morelet (*Ann. Soc. Sci. nat. Arch. Toulon & Var* **37**: 233, 1985), Sergeeva *et al.* (*Australas. Pl. Path.* **34**: 255, 2005).
- sporocarp**, a general term for spore-bearing organs; fruit-body (q.v.). Used esp. of *Acrasiomycota*, *Mycozoa* and *Endogonaceae*.
- Sporocarpon** Will. (1878), Fossil Fungi ? Ascomycota. 5 (Carboniferous), Europe; USA. See Hutchinson (*Ann. Bot.* **19**: 428, 1955), Baxter (*Paleont. Contrib. Univ. Kansas* **77**, 1975), Pirozynski (*Ann. Rev. Phytopath.* **14**: 237, 1976).
- Sporocephalum** Chevall. (1826) = *Acladium* fide Hughes (*CJB* **36**: 727, 1958).
- Sporocephalum** Arnaud (1952) ? = *Oedocephalum* fide Kendrick & Carmichael in Ainsworth *et al.* (Eds) (*The Fungi* **4A**: 390, 1973).
- Sporochytriaceae** A. Fisch. (1892) = *Rhizophydiaceae*.
- Sporocladium** Chevall. (1826) = *Cladosporium* fide Hughes (*CJB* **36**: 727, 1958).
- sporocladium**, a special sporogenous branch in the *Kickxellaceae*.
- Sporoclema** Tiesenh. (1912) nom. dub., Fungi. 'phycomycetes'. See Kendrick & Carmichael in Ainsworth *et al.* (Eds) (*The Fungi* **4A**: 323, 1973).
- Sporoctomorpha** J.V. Almeida & Sousa da Câmara (1903), *Pezizomycotina*. 1, Europe.
- Sporocybe** Fr. (1825) = *Periconia* fide Mason & Ellis (*Mycol. Pap.* **56**, 1953), Carmarán & Novas (*Fungal Diversity* **14**: 67, 2003).
- Sporocybomyces** H. Maia (1967) = *Echinoplaca* fide Lücking *et al.* (*Lichenologist* **30**: 121, 1998).
- sporocyst**, a cyst producing asexual spores.
- Sporocystis** Morgan (1902), anamorphic *Pezizomycotina*, Hsp.#eH.?. 2, N. America; Sri Lanka.
- Sporoderma** Mont. (1856) = *Trichoderma* Pers. (1794) fide Höhnelt (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt. 1* **119**: 671, 1910).
- Sporodesmium**, see *Sporidesmium*.
- Sporodictyon** A. Massal. (1852), *Verrucariaceae* (L). 3, Europe.
- Sporodinia** Link (1824) = *Syzygites*.
- Sporodiniella** Boedijn (1959), *Mucoraceae*. 1 (on eggs, larvae & imago of *Membracidae* (*Diptera*, *Homoptera*, *Hymenoptera* & *Lepidoptera*; apparently parasitic), pantropical. See Evans & Samson (*CJB* **55**: 2981, 1977), Gbaja & Young (*Microbios* **42**: 263, 1985; ultrastr.), Chien & Hwang (*Mycoscience* **38**: 343, 1997), Voigt & Wöstemeyer (*Gene* **270**: 113, 2001; phylogeny), Ali-Shtayeh *et al.* (*Mycopathologia* **156**: 235, 2002; Palestine).
- Sporodiniopsis** Höhn. (1903) nom. dub., anamorphic *Pezizomycotina*. See Hawksworth (*Mycol. Pap.* **126**, 1971).
- sporodochium**, conidioma, typical of the *Tuberculariaceae* (q.v.) in which the spore mass is supported by a superficial cushion-like (pulvinate) mass of short conidiophores and pseudoparenchyma; **pionnote** - (**pseudopionnotes**, Sherbakoff, 1915) (of *Fusarium*), minute sporodochia near the surface of the substrate having no stroma, the spores forming a continuous slimy layer. Cf. *acervulus*, *pionnotes*.
- Sporodum** Corda (1837) = *Periconia* fide Mason & Ellis (*Mycol. Pap.* **56**, 1953).
- sporogenesis**, spore development.
- sporogenous**, producing, having or supporting spores; cf. *conidiogenous*.
- Sporoglena** Sacc. (1894), anamorphic *Pezizomycotina*, Hsy.0eP.?. 1, Papua New Guinea.
- sporograph**, the straight-line graph obtained by plotting the ratio (E) of the length (D) to width (d) against the length of the basidiospores of a species of agaric (Corner, *New Phytol.* **46**: 196, 1947). Cf. Q.
- sporoma** (pl. **-omata**), a multicellular structure specially developed to produce spores.
- Sporomega** Corda (1842), *Rhytismataceae*. 1, Europe; N. America. See Eriksson (*Symb. bot. upsal.* **19** no. 4, 1970).
- Sporonema** Desm. (1847), anamorphic *Godronia*, St.0eH.15. 15, widespread (north temperate). See Limber (*Mycol.* **47**: 389, 1955), Sutton (*The Coelomycetes*, 1980).
- Sporonites** R. Potonié (1931), Fossil Fungi ? Fungi. 1.
- sporont**, a thallus on which spores will be produced.
- Sporopachydermia** Rodr. Mir. (1978), *Saccharomycetales*. Anamorph *Candida*. 3, widespread. See Yamada *et al.* (*J. gen. appl. Microbiol.* Tokyo **38**: 179, 1992), Lachance & Phaff in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 395, 1998), Lachance *et al.* (*Int. J. Syst. Evol. Microbiol.* **51**: 237, 2001; phylogeny, species concepts), Suh *et al.* (*Mycol.* **98**: 1006, 2006; phylogeny).
- Sporophaga** Harkn. (1899) nom. dub., ? Fungi.
- Sporophagomyces** K. Pöldmaa & Samuels (1999), *Hypocreaceae*. 3 (fungicolous), widespread. See Pöldmaa *et al.* (*CJB* **77**: 1765, 1999), Pöldmaa & Samuels (*Sydowia* **56**: 79, 2004; Thailand).
- sporophagous**, feeding on spores, as in certain thrips species on fungus spores (Ananthakrishnan *et al.*, *Proc. Ind. Acad. Sci. Anim. Ser.* **92**: 95, 1983), where the dimensions of the mouth parts are related to the sizes of the spores eaten (Ananthakrishnan & Dhileepan, *Proc. Ind. Acad. Sci. Anim. Ser.* **93**: 243, 1984); species lists (Ananthakrishnan *et al.*, 1984).
- Sporophiala** P. Rag. Rao (1970), anamorphic *Pezizomycotina*, Hso.≡ eP.3. 3, India; USA. See Rao (*Mycopathologia* **41**: 317, 1970).
- Sporophleum** Nees ex Link (1824) = *Arthrimum* fide Hughes (*CJB* **36**: 727, 1958).
- Sporophlyctidium** Sparrow (1933), *Chytridiaceae*. 2, USA; North Africa.
- Sporophlyctis** Serbinow (1907), ? *Chytridiaceae*. 2 (on *Draparnaldia* and *Chaetophora*), widespread.
- Sporophora** Luteraan (1952), anamorphic *Pezizomycotina*, Hso.0eH.3. 1, France. See Luteraan (*Rev. Biol. gen. theor. appl.* **2**: 2, 1952).

- sporophore** (1) a spore-producing or -supporting structure, esp. a conidiophore; (2) (of macrofungi), ascoma, basidioma (see Fig. 4); cf. hymenophore; a basidium (sensu Berkeley).
- Sporophormis** Malloch & Cain (1973) = *Warcuprella*.
- Sporophysa** (Sacc.) Vain. (1921) = *Verrucaria* Schrad. fide Keissler (*Rabenh. Krypt.-Fl.* 8: 446, 1930).
- Sporophyta**, see *Cryptogamia*.
- sporophyte**, the diploid or asexual phase in the life-cycle of a plant; diplont; diplophase. Cf. gametophyte.
- sporoplasm**, the spore-producing protoplasm within the epiplasm in a sporangium or ascus (Guilliermond).
- Sporopodiopsis** Sérus. (1997), Ectolechiaceae (L). 2, S.E. Asia. See Sérusiaux (*Abstracta Botanica* 21: 145, 1997).
- Sporopodium** Mont. (1851), Ectolechiaceae (L). 24, widespread (tropical). See Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952), Hafellner (*Beih. Nova Hedwigia* 79: 241, 1984), Elix *et al.* (*Bibliotheca Lichenol.* 58: 81, 1995; chemistry), Lücking & Lumbsch (*Mycotaxon* 78: 23, 2001; chemistry), Sérusiaux *et al.* (*Mycotaxon* 103: 255, 2008; key, chemistry).
- Sporormia** De Not. (1845), Sporormiaceae. 3 (coprophilous or on wood), widespread. See Ahmed & Cain (*CJB* 50: 419, 1972), Dissing (*Persoonia* Suppl. 14: 389, 1992), Berbee (*Mol. Biol. Evol.* 13: 462, 1996; DNA), Kruys *et al.* (*MR* 110: 527, 2006; phylogeny).
- Sporormiaceae** Munk (1957), Pleosporales. 10 gen. (+ 7 syn.), 143 spp.
Lit.: von Arx & van der Aa (*TBMS* 89: 117, 1987; key 6 gen.), Dissing (*Persoonia* Suppl. 14: 389, 1992), Berbee (*Mol. Biol. Evol.* 13: 462, 1996; DNA), Hyde & Steinke (*Mycoscience* 37: 99, 1996), Guarro *et al.* (*MR* 101: 305, 1997), Silva-Hanlin & Hanlin (*MR* 103: 153, 1999), Barr (*Mycotaxon* 76: 105, 2000; keys, *Delitschiaceae*), Liew *et al.* (*Mol. Phylogen. Evol.* 16: 392, 2000), Arenal *et al.* (*Mycotaxon* 89: 137, 2004), Kruys *et al.* (*MR* 110: 527, 2006), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny), Wang *et al.* (*MR* 111: 1268, 2007; phylogeny).
- Sporormiella** Ellis & Everh. (1892), Sporormiaceae. c. 80 (mainly coprophilous), widespread. Used as indicators of megafauna in Quaternary lake deposits. See also *Preussia*. See Ahmed & Cain (*CJB* 50: 419, 1972), Davis (*Quatern. Res.* 28: 290, 1987), Barr (*N. Amer. Fl. ser. 2* 13: 129 pp., 1990), Eriksson & Hawksworth (*SA* 10: 144, 1991), Berbee (*Mol. Biol. Evol.* 13: 462, 1996; DNA), Lumbsch & Lindemuth (*MR* 105: 901, 2001; phylogeny), Burney *et al.* (*Proc. natn Acad. Sci. U.S.A.* 100: 10800, 2003; Holocene extinctions in Madagascar), Prokhorov & Armenskaya (*Mikol. Fitopatol.* 37: 27, 2003; Russia), Arenal *et al.* (*Mycotaxon* 89: 137, 2004; biometrics), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Spororminula** Arx & Aa (1987), Sporormiaceae. 1 (coprophilous), Canary Islands. See von Arx & van der Aa (*TBMS* 89: 117, 1987), Barr (*Mycotaxon* 76: 105, 2000).
- Sporormiopsis** Breton & Faurel (1964) = *Sporormiella* fide von Arx (*Persoonia* 7: 367, 1973), Barr (*Mycotaxon* 76: 105, 2000).
- Sporoschisma** Berk. & Broome (1847), anamorphic *Melanochaeta*, Hsy. = eP.22. 10, widespread. See Nag Raj & Kendrick (*Monogr. Chalara Allied Genera*, 1975), Goh *et al.* (*MR* 101: 1295, 1997; key), Ho *et al.* (*CJB* 76: 1614, 1998), Sivichai *et al.* (*MR* 104: 478, 2000; Thailand).
- Sporoschismataceae** Nann. (1934) = Chaetosphaeriaceae.
- Sporoschismatites** Babajan & Tasl. (1977), Fossil Fungi. 1 (Tertiary), former USSR.
- Sporoschismopsis** Hol.-Jech. & Hennebert (1972), anamorphic *Porosphaerellopsis*, Hso. = eP.22. 5, Europe; N. America. See Goh *et al.* (*MR* 101: 1295, 1997; key).
- Sporoschizon** Riedl (1960), ? Naetrocymbaceae (L). 1, Austria. See Harris (*More Florida Lichens*, 1995; ? synonym of *Naetrocymbe*).
- Sporostachys** Sacc. (1919) = *Melanographium* fide Saccardo (*Syll. fung.* 25: 936, 1931), Somrithipol & Jones (*Fungal Diversity* 19: 137, 2005).
- sporostasis** (adj. **sporostatic**), inhibition of spore germination; cf. mycostasis; sporostatic products of fungi, see Robinson *et al.* (*TBMS* 51: 113, 1968).
- Sporostigma** Grube (2001), Arthoniaceae (L). 1, USA. See Grube (*Lichenologist* 33: 388, 2001).
- sporothallus**, a thallus producing spores; cf. gametothallus.
- Sporotheca** Corda (1829) ? = *Melanconis* fide Mussat (*Syll. fung.* 15: 398, 1901).
- sporothecium** (1) the tip of a basidium bearing basidiospores when the basidiospores are sessile (Cléménçon, *Z. Pilzk.* 36: 113, 1970); (2) see spore wall.
- Sporothrichum**, see *Sporotrichum*.
- Sporothrix** Hektoen & C.F. Perkins (1901), anamorphic *Ophiostoma*. c. 40, widespread. *S. schenckii*, from humans. See Thibaut (*Annls Parasit. hum. comp.* 46: 93, 1971; *S. schenckii*, see sporotrichosis), De Hoog (*Stud. Mycol.* 7, 1974), Kreisel & Schauer (*J. Basic Mycol.* 25: 653, 1985; use of C sources), Findlay & Vismer (*Mycopathologia* 96: 115, 1986; SEM of morphology), Smith & Batenburg-van der Vegte (*J. gen. appl. Microbiol.* Tokyo 32: 549, 1986; ultrastr. septa), Takeda *et al.* (*Mycopathologia* 116: 9, 1991; phylogeny, molecular epidemiology), de Hoog in Wingfield *et al.* (Eds) (*Ceratocystis and Ophiostoma Taxonomy, Ecology and Pathogenicity*: 53, 1993; anamorphs of *Ophiostoma*), Benade *et al.* (*MR* 101: 1108, 1997; conidiogenesis), Okada *et al.* (*CJB* 76: 1495, 1998; phylogeny), Ishizaki *et al.* (*Medical Mycology* 38: 433, 2000; DNA, Africa, Australia), Lin *et al.* (*Mycopathologia* 148: 69, 1999; DNA, China), Mesa-Arango *et al.* (*J. Clin. Microbiol.* 40: 3004, 2002; from human, genetic diversity), de Beer *et al.* (*Mycol.* 95: 434, 2003; clinical spp., phylogeny), Halmschlager & Kowalski (*Mycol. Progr.* 2: 259, 2003; on *Quercus* roots), Hu *et al.* (*J. Clin. Microbiol.* 41: 1414, 2003; molecular detection), Marimon *et al.* (*J. Clin. Microbiol.* 44: 3251, 2006; phylogeny), Marimon *et al.* (*J. Clin. Microbiol.* 45: 3198, 2007; new clinical spp.).
- Sporotrichella** P. Karst. (1887) = *Fusarium* fide Hughes (*CJB* 36: 727, 1958).
- Sporotrichites** Göpp. & Berendt (1945), Fossil Fungi. 4 (Oligocene, Miocene), Baltic.
- Sporotrichopsis** Guég. (1911) nom. inval. = *Sporothrix*.
- Sporotrichopsis** Stalpers (2000), anamorphic *Abortiporus*. 1, widespread.
- sporotrichosis**, a lymphatic disease in humans and animals caused by *Sporothrix schenckii*. See de Beurmann & Gougerot (*Les Sporotrichoses*, 1912), Norden (*Acta Path. Microbiol. Scand., Suppl.* 84,

- 1951).
- Sporotrichum** Link (1809), anamorphic *Laetiporus*, *Phanerochaete*, *Pycnoporellus*, Hso.0eH.10. 3, widespread. See von Arx (*Persoonia* 6: 179, 1971), Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974), Stalpers (*Stud. Mycol.* 24: 15, 1984; list 339 epithets) = *Poria* (Polyp.) fide.
- spot anthracnose**, see anthracnose.
- Spraguea** Weissenberg (1976), Microsporidia. 1.
- Spragueola** Massee (1896) = *Neolecta* fide Korf (*Phytologia* 21: 201, 1971).
- Spumatoria** Massee & E.S. Salmon (1901), ? Ophiostomataceae. 1, Europe. See Malloch & Blackwell (*CJB* 68: 1712, 1990).
- Spumula** Mains (1935), Raveneliaceae. 6 (on *Leguminosae*, mainly *Mimosoideae*), America (tropical); Africa; Indonesia; Philippines. See Berndt (*Pl. Syst. Evol.* 200: 79, 1996).
- spunk**, see touchwood, amadou.
- Squamacidia** Brako (1989), Ramalinaceae (L). 1, widespread (tropical). See Brako (*Mycotaxon* 35: 6, 1989), Okamoto & Iwatsuki (*J. Jap. Bot.* 66: 292, 1991; Japan), Ekman (*Op. bot.* 127: 148 pp., 1996; N America).
- Squamanita** Imbach (1946), Tricholomataceae. 10, widespread. See Bas (*Persoonia* 3: 331, 1965; key), Harmaja (*Karstenia* 27: 71, 1987), Læssøe & Rosendahl (*MR* 98: 88, 1994; mycoparasitism), Redhead *et al.* (*CJB* 72: 1812, 1994), Vizzini & Girlanda (*Allionia* 35, 1997; mycoparasitism), Mondiet *et al.* (*MR* 111: 599, 2007; mycoparasitism).
- Squamaphlegma** Locq. (1979) = *Cortinarius* fide Kuyper (*in litt.*).
- Squamaria** Hoffm. (1789) [non *Squamaria* Ludw. 1757, *Orobanchaceae*] = *Cetraria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Squamarina** Poelt (1958), Stereocaulaceae (L). 28, widespread. See Poelt & Krüger (*Feddes Repert.* 81: 187, 1970), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998; DNA), Peršoh *et al.* (*Mycol. Progr.* 3: 103, 2004; asci, photobionts), Miądlukowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Squamarinaceae** Hafellner (1984) = Stereocaulaceae.
- Squamariomyces** E.A. Thomas (1939) nom. inval. = *Lecanora* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Squamella** S. Hammer (2001), Cladoniaceae (L). 1, Australia. See Hammer (*Bryologist* 104: 561, 2001).
- Squammaria** DC. (1805) = *Squamarina* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- squamose**, having scales.
- Squamotubera** Henn. (1903) ? = *Sarcoxydon* fide Rogers (*Mycol.* 73: 28, 1981).
- squamule**, a small scale.
- squamulose** (1) having small scales; (2) growth form of a lichen thallus (Fig. 21C).
- squarrose**, rough with scales.
- St Anthony's Fire**, see ergot.
- St George's mushroom**, Basidioma of the edible *Calocybe gambosum*.
- stachel**, bullet-like structure in the rohr with its pointed end orientated towards the appressorium and the host cell wall in plasmodiophorids. See also rohr and schlauch.
- Stachybotryella** Ellis & Barthol. (1902), anamorphic *Pezizomycotina*, Hso.0eP.?. 2, N. America.
- Stachybotryna** Tubaki & T. Yokoy. (1971), anamorphic *Pezizomycotina*, Hso.0eH.15. 3, widespread. See Tubaki & Yokoyama (*TMSJ* 12: 18, 1971), Caldach *et al.* (*Mycol.* 94: 355, 2002; Spain, key).
- stachybotryotoxin**, a mycotoxin produced by *Stachybotrys* growing on hay; implicated in serious poisoning of horses (stachybotryotoxicosis).
- Stachybotrys** Corda (1837), anamorphic *Hypocreales*, Hsy.0eP.15. c. 44, widespread. Toxin-producing spp. are frequently encountered in environmental surveys of damp buildings. See Barron (*CJB* 39: 1566, 1961), Verona & Mazzucchetti (*Microfunghi della cellulosa e della carta* □ *I generi Stachybotrys e Memmoniella*, 1968), Jong & Davis (*Mycotaxon* 3: 409, 1976; spp. in cult.), McKenzie (*Mycotaxon* 41: 179, 1991; spp. from *Freycinetia*), Haugland *et al.* (*Mycol.* 93: 54, 2001; phylogeny), Andersen *et al.* (*Mycol.* 94: 392, 2002; from water-damaged buildings), Andersen *et al.* (*Mycol.* 95: 1227, 2003; chemotypes), Koster *et al.* (*CJB* 81: 633, 2003; phylogeny), Taylor *et al.* (*Can. J. Pl. Path.* 25: 49, 2003; molecular detection), Castlebury *et al.* (*MR* 108: 864, 2004; phylogeny), Pinruan *et al.* (*Fungal Diversity* 17: 145, 2004; key), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Stachycoremium** Seifert (1986), anamorphic *Pezizomycotina*, Hsy.1eH.16. 1, USA; E Asia. See Okada (*Microbiol. Culture Coll.* 12: 17, 1996; conidiogenesis).
- Stachylidium** Link (1809), anamorphic *Pezizomycotina*, Hso.0eP.15. 2, widespread. See Hughes (*TBMS* 34: 551, 1951).
- Stachylina** L. Léger & M. Gauthier (1932), Harpellaceae. 29 (in *Diptera*), widespread. See Lichtwardt (*Mycol.* 64: 167, 1972), Moss (*Mycol.* 66: 173, 1974; cytology), Moss in Fuller & Lovelock (Eds) (*Microbial ultrastructure*: 279, 1976; ultrastr.), Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986; key), Lichtwardt *et al.* (*TMSJ* 28: 376, 1987), Lichtwardt & Williams (*Mycol.* 80: 400, 1988; zygospores), Lichtwardt & Williams (*CJB* 68: 1057, 1990), Williams & Lichtwardt (*CJB* 68: 1045, 1990), White & Lichtwardt (*Mycol.* 96: 891, 2004; Norway), White (*MR* 110: 1011, 2006; phylogeny), White *et al.* (*Mycol.* 98: 333, 2006; USA), Valle (*Mycol.* 99: 442, 2007; Spain).
- Stachylinoides** Lichtw. & López-Lastra (1999), Harpellaceae. 1 (in *Diptera*), S. America. See Lichtwardt *et al.* (*Mycol.* 91: 1069, 1999).
- Stachyomphalina** H.E. Bigelow (1979) = *Gamundia* fide Kuyper (*in litt.*).
- stage**, a phase of the life cycle (q.v.). See States of fungi.
- Staginospora** Trivedi & C.L. Verma (1971), Fossil Fungi, anamorphic *Pezizomycotina*. 1 (Tertiary), India.
- Stagnicola** Redhead & A.H. Sm. (1986), Strophariaceae. 1, widespread (north temperate). See Redhead & Smith (*CJB* 64: 645, 1986).
- Stagonopatella** Petr. (1927), anamorphic *Pezizomycotina*, St.0fH.?. 1, Europe.
- Stagonopsis** Sacc. (1884), anamorphic *Pezizomycotina*, Cpd.≡ eH.?. 4, widespread (temperate). See Petrak (*Sydowia* 3: 139, 1949).
- Stagonospora** (Sacc.) Sacc. (1884) nom. cons., anamorphic *Phaeosphaeria*, Cpd.≡ eH.1. c. 209, widespread. *S. nodorum* and *S. avenae*, important cereal pathogens. The genus is polyphyletic as currently circumscribed, and often confused with *Septoria* (q.v.). See Castellani & Germano (*Ann. Fac. Sci. Agric. Univ. Torino* 10: 1, 1977; 77 graminicolous spp.),

Philipson (*New Phytol.* 113: 127, 1989; ultrastr.), Crane & Shearer (*Bull. Ill. St. nat. Hist. Surv.* 34: 1, 1991; nomenclator), McDonald *et al.* (*Phytopathology* 84: 250, 1994; genetic variation), Ueng & Chen (*Phytopathology* 84: 800, 1994; RFLPs), Beck & Ligon (*Phytopathology* 85: 319, 1995; PCR detection), Ueng *et al.* (*Phytopathology* 85: 44, 1995), Czembor & Arseniuk (*Journal of Applied Genetics* 37: 239, 1996; RAPDs), Cunfer (*Pl. Dis.* 81: 427, 1997), Newton *et al.* (*Mycol.* 90: 215, 1998; mating types, VCGs), Ueng *et al.* (*MR* 102: 607, 1998), Caten (*Septoria on Cereals A Study of Pathosystems*: 26, 1999; molecular genetics), Cunfer & Ueng (*Ann. Rev. Phytopath.* 37: 267, 1999), Eyal (*Septoria on Cereals A Study of Pathosystems*: 1, 1999; pathology), Scharen (*Septoria and Stagonospora Diseases of Cereals A Compilation of Global Research. Proceedings of the Fifth International Septoria Workshop, September 20-24, 1999, CIMMYT, Mexico*: 19, 1999), Cunfer (*Can. J. Pl. Path.* 22: 332, 2000), Câmara *et al.* (*Mycol.* 94: 630, 2002; phylogeny), Ueng *et al.* (*Curr. Genet.* 43: 121, 2003; mating type genes), Douaiher *et al.* (*Sydowia* 56: 39, 2004; ontogeny), Solomon *et al.* (*Eur. J. Pl. Path.* 110: 763, 2004; mating types, Australia), Malkus *et al.* (*FEMS Microbiol. Lett.* 249: 49, 2005; phylogeny), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny), Sommerhalder *et al.* (*Phytopathology* 96: 234, 2006; genetics).

Stagonosporella Tassi (1902) = *Stagonospora* fide Saccardo (*Syll. fung.* 18, 1906).

Stagonosporina Tassi (1902), anamorphic *Pezizomycotina*, Cpd.≡ eH.?. 1, widespread.

Stagonosporites Babajan & Tasl. (1970), Fossil Fungi. 1 (Tertiary), former USSR.

Stagonosporopsis Died. (1912) = *Ascochyta* fide Petrak (*Annls mycol.* 23: 5, 1925), Boerema *et al.* (*Phoma Identification Manual Differentiation of Specific and Infra-Specific Taxa in Culture*: 470 pp., 2004).

Stagonostroma Died. (1914) = *Fusarium* fide Sutton (*Mycol. Pap.* 141, 1977).

Stagonostromella Petr. & Syd. (1927), anamorphic *Pezizomycotina*, St.≡ eH.?. 1, Brazil.

Staheliella Emden (1974), anamorphic *Pezizomycotina*, Hso.0eP.39. 1, Surinam. See Emden (*Acta Bot. Neerl.* 23: 251, 1974).

Staheliomyces E. Fisch. (1921), Phallaceae. 1, C. & S. America.

Staibia Bat. & Peres (1966), Leptopeltidaceae. 1, Brazil. See Batista & Peres (*Atas Inst. Micol. Univ. Pernambuco* 3: 142, 1966).

Stains. See also mounting media. Stains are used to highlight fungal structures for viewing with the compound light microscope. Cotton blue (also known as aniline blue) is the most popular stain for the microscopic examination of most groups of fungi and is frequently used at 0.1% with lactic acid or (formerly, but now not recommended) lactophenol to produce permanent mounts. Acid fuchsin, a red stain, is combined with lactic acid to produce lactofuchsin. This gives excellent clarity and is also suitable for permanent preparations for most groups of fungi (Carmichael, *Mycol.* 47: 611, 1955). Erythrosin B in aqueous ammonia gives good differentiation between cell walls and cytoplasm (ideal for elucidating conidial ontogeny) but crystallizes rapidly and is therefore only suitable in temporary mounts. Useful red stains

for fungi also include congo red (Gurr, *Encyclopaedia of microscopic stains*, 1960), orseillin BB (Alcorn & Yeager, *Stain Technology* 12: 158, 1937) and rosazurin (Locquin & Langeron, *Handbook of microscopy*, 1983). Diazonium blue B is used for staining yeasts (Kurtzman & Fell, *The Yeasts, a taxonomic study*, edn 4, 1998) but has also been used as a stain for filamentous fungi (Hopsu-Havu *et al.*, *Mykosen* 10: 23, 1967), Summerbell (*Mycol.* 77: 587, 1985). Use of trypan blue as a stain for fungi was described by Boedijn (*Stain Technology* 31: 115, 1965). Cresyl blue is used for staining spore-walls of basidiomycetes (Locquin, *BSMF* 68: 170, 1952). For use of toluidine blue O in polychromatic staining of fungal structures, see Ghemawat (*Physiol. Plant Path.* 11: 251, 1977). Safranin O is frequently used as a counter-stain but can also be used as a rapid nuclear stain for fungi (Bandoni, *Mycol.* 71: 873, 1979). Black stains include chlorazole-black (Armitage, *TBMS* 27: 131, 1944) and nigrosin, which can be used in combination with picric acid (picro-nigrosin) to stain fungal structures (Fleming & Smith, *TBMS* 27: 13, 1944). Nigrosin is also useful as a negative stain for examining mucilaginous material on the surface of spores and hyphae.

Staining methods for differentiation of fungi in plant tissues include the use of Bruzzese and Hasan's technique (Brusseze & Hasan, *Plant Path.* 32: 335, 1983), periodic acid-Schiff's technique (Dring, *New Phytol.* 54: 277, 1955) and thionin and orange G (Stoughton, *Ann. Appl. Biol.* 17: 162, 1930). For further details of staining methods for fungi in plant tissues see Tuite (*Plant pathological methods. Fungi and bacteria*, 1969) and Fox (*Principles of diagnostic techniques in plant pathology*, 1993).

To differentiate fungi in animal tissues, good results are obtained with the periodic acid-Schiff stain (Kligman & Mescon, *J. Bact.* 60: 415, 1950), Gridley's technique (Gridley, *Am. J. Clin. Path.* 23: 303, 1953), Grocott's modification of the Gomori methenamine silver stain (Grocott, *Am. J. Clin. Path.* 25: 975, 1955) and the standard haematoxylin-eosin stain. Brown and Brenn's modification of Gram's stain is used for examination of *Actinomyces* and *Nocardia* (Brown & Brenn, *Bull. Johns Hopkins Hosp.* 48: 69, 1931). *Cryptococcus* is differentiated using Mayer's mucicarmine stain see Mallory (*Pathological techniques*, 1942). For further details of staining methods in medical fungi see Kwon-Chung & Bennett (*Medical mycology*, edn 4, 1992) and Rippon (*Medical mycology: the pathogenic fungi and the pathogenic actinomycetes*, 1982).

For nuclear staining of fungi, the Giemsa stain is frequently used (Hrushovetz, *CJB* 34: 321, 1956), Duncan & Galbraith (*Stain Technology* 48: 107, 1973). Techniques using carmine as a nuclear stain include the Feulgen-carmine technique (McIntosh, *Stain Technology* 29: 29, 1954) and the propionocarmine squash technique (Lu, *CJB* 40: 843, 1962). A rapid nuclear stain for studying ascocarp development in *Lophodermium* and *Rhytisma* was described by Hulton & Morgan-Jones (*Mycol.* 66: 881, 1974).

For testing the amyloid reaction in basidiomycetes and both lichenized and non-lichenized ascomycetes, Melzer's and Lugol's iodine are used (see mounting fluids). For discussion see Kohn & Korf (*Mycotaxon* 3: 165, 1975 and Baral (*Mycotaxon* 29: 399, 1987).

Stakman (Elvin Charles; 1885-1979; USA). Student,

- University of Minnesota (1902-1906); school teacher (1906-1909); Assistant (1909-1913) then Section Head (1913-1940) then Head (1940-1953), Department of Vegetable [later Plant] Pathology, University of Minnesota; also for many years Director of the Federal Rust Laboratory, St Paul, Minnesota. Stakman is noted for his work on cereal rusts and their physiologic races (stemming from his doctoral thesis) and, in particular, for leading the campaign to eradicate barberry, the alternate host of black-stem rust, from major wheat-growing areas of the USA. A cultured and versatile man, author of more than 300 papers and co-author of two books. *Publs.* A study in cereal rusts. Physiological races. *Minnesota Agricultural Experiment Station Bulletin* 138 (1914); (with J.G. Harrar) *Principles of Plant Pathology* (1957). *Biogs, obits etc.* Anon. *Aurora Sporalis*. E.C. Stakman Day issue 17 May 1979, 1979 [Department of Plant Pathology, University of Minnesota]; Christensen (*Phytopathology* 69: 195, 1979) [portrait]; Christensen (*E.C. Stakman, Statesman of Science*, 1984) [bibliography, biography, portrait]; Stafleu & Cowan (*TL-2* 5: 830, 1985); Wilcoxson & Kommedahl (*Review of Tropical Plant Pathology* 7: 223, 1993).
- Stakmania** Kamat & Sathe (1968) = *Phakopsora* fide Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983).
- Stalactocolumella** S. Imai (1950) nom. nud. ≡ *Circulocolumella*.
- Stalagmites** Theiss. & Syd. (1914), *Nectriaceae*. 1 (branches), Brazil. See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Stalagmochaetia** Cif. & Bat. (1963), anamorphic *Pezizomycotina*, Cpd.0eH.?. 1, USA. See Ciferri & Batista (*Quad. Lab. crittogam., Pavia* 31: 187, 1963).
- stalagmoid** (of spores, **stalagmospores**), like a long tear or drop.
- staling substances**, substances produced by an organism which slow up or stop its growth (iso-antagonism) (see Brown, *Ann. Bot., Lond.* 37: 106, 1923); **inhibitory substances** are similar substances which retard or inhibit the growth of *other* organisms (e.g. penicillin) (hetero-antagonism; cf. antibiotic substances). See Porter & Carter (*Bot. Rev.* 4: 165, 1938).
- Stalpersia** Parmasto (2001), *Auriscalpiaceae*. 1, Primorye. See Parmasto (*Folia cryptog. Estonica* 38: 51, 2001).
- Stamnaria** Fuckel (1870), *Helotiaceae*. Anamorph *Titaospora*. 3, Europe; N. America. See Seaver (*Mycol.* 28: 186, 1936), Künkele *et al.* (*Mycol. bavaria* 7: 3, 2005; Germany).
- stane crottle**, a crottle (q.v.) growing on stone.
- Stanglomyces** Raithelh. (1986), *Tricholomataceae*. 1, S. America. See Raithelhuber (*Metrodiana* 14: 37, 1985).
- Stanhughesia** Constant. (1989), anamorphic *Ceratomyrium*, Hso.1bH.1. 3, Sweden. See Constantinescu (*Stud. Mycol.* 31: 71, 1989).
- Staninwardia** B. Sutton (1971), anamorphic *Chaetothyriales*, Cac.1eP.38. 1, S.E. Asia; Australia; Indian Ocean. See Sutton (*TBMS* 57: 540, 1971), Summerell *et al.* (*Fungal Diversity* 23: 323, 2006).
- Stanjehughesia** Subram. (1992), anamorphic *Miyoshiella*, *Umbrinosphaeria*, Hso.≡ eP.1. 5, widespread. See Subramanian (*Proc. Indian natn Sci. Acad. Part B. Biol. Sci.* 58: 184, 1992), Wu & Zhuang (*Fungal Diversity Res. Ser.* 15, 2005; China), Shenoy *et al.* (MR 110: 916, 2006; phylogeny).
- Stanjemonium** W. Gams, O'Donnell, Schroers & M. Chr. (1999), anamorphic *Bionectriaceae*, Hso.?.?. 4, France; Iraq; USA. See Gams *et al.* (*CJB* 76: 1579, 1998), Rossman *et al.* (*Mycol.* 93: 100, 2001; phylogeny).
- Staphlosporonites** Sheffy & Dilcher (1971), Fossil Fungi. 5 (Eocene, Tertiary), China; USA.
- Staphylotrichum** J. Mey. & Nicot (1957), anamorphic *Pezizomycotina*, Hso.0eH.1. 1, widespread. See Maciejowska & Williams (*Mycol.* 55: 221, 1963), Udagawa (*Tropical Mycology*: 149, 1997; Chile).
- Starbaeckia** Rehm ex Starbäck (1890), *Helotiales*. 1, Europe. See Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).
- Starbaeckiiella** (Sacc. & P. Syd.) Syd. & P. Syd. (1919) = *Pyrenula* Ach. (1809) fide Harris (*Mem. N. Y. bot. Gdn* 49, 1989).
- Starkeyomyces** Agnihothr. (1956) = *Myrothecium* fide Tulloch (*Mycol. Pap.* 130, 1972).
- Starmera** Y. Yamada, Higashi, S. Ando & Mikata (1997), ? *Phaffomycetaceae*. 3, widespread. See Yamada *et al.* (*Biosc., Biotechn., Biochem.* 63: 827, 1999), Starmer *et al.* (*FEMS Yeast Res.* 3: 441, 2003), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Starmerella** C.A. Rosa & Lachance (1998), *Saccharomycetales*. Anamorph *Candida*. 1, Canada. See Rosa & Lachance (*Int. J. Syst. Bacteriol.* 48: 1413, 1998), Teixeira *et al.* (*Int. J. Syst. Evol. Microbiol.* 53: 339, 2003), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- starters**, the pure cultures or mixtures of fungi and bacteria used for starting fermenting processes. Pure culture starters are used in beer making, etc., and frequently in butter and cheese making. Examples of the more complex type are *ragi* (q.v.) used for Javanese *arak* (an alcoholic drink from rice starch), Chinese rice (Mingen or Men) (*Rhizopus oryzae*) the starter for rice wine, the Japanese *Koji* (preparations of *Aspergillus* used in soy and other fermenting processes), and *kephir* grains, a mixture of yeasts and bacteria which is the starter for *kephir*. See Fermented foods and beverages.
- States of fungi.** Since publication of the Tulasnes' *Selecta carpologia fungorum* (1861-1865), it has been accepted that many fungi are pleomorphic, that is, one fungus may produce several sorts of spores which may or may not be coincident in time and may or may not be produced after a nuclear fusion followed by meiosis, a sequence that may be interpreted as sexual. The state characterized by sexual spores (ascospores, basidiospores, etc.) has traditionally been designated the '**perfect**' state (or stage), that characterized by asexual spores (conidia) or the absence of spores the '**imperfect**' state (or stage). Under the code governing scientific names of fungi it is permissible to treat both 'perfect' and 'imperfect' states as species designated by latinized binomials, but when a 'perfect' and 'imperfect' species have been established to be different states of the same fungus the binomial applied to the 'perfect' state also covers that of the 'imperfect' and takes precedence. To increase precision in terminology for states of pleomorphic fungi, Hennebert & Weresub (*Myco-taxon* 6: 207, 1977) introduced new nouns and adjectives: **holomorph**, for the whole fungus in all its morphs, phases, stages or states; **teleomorph**, for the

sexual ('perfect') state (e.g. that characterized by ascomata or basidiomata); and **anamorph**, for the asexual ('imperfect') state (e.g. that characterized only by presence or absence of conidia). **Synanamorph** is applied to any one of two or more anamorphs which have the same teleomorph (Gams, *Mycotaxon* 15: 459, 1982). A holomorph includes a teleomorph and frequently one, or rarely more anamorphs. The term **ana-holomorph** has been used for an 'imperfect' fungus (anamorphic fungus) which appears to lack a 'perfect' state (teleomorph). A name applied under the Code to both perfect and imperfect states of a fungus is a **nomen holomorphosis**; that to the imperfect state a **nomen anamorphosis**. It has also been suggested that **anamorph-genus** and **anamorph-species** should replace the terms 'form genus' and 'form species'.

The morph terminology (which has been adopted for pleomorphic fungi in this *Dictionary*) is discussed in detail in Kendrick (Ed.) (*The whole fungus*, 2 vols, 1979) which also includes a reprint of Hennebert & Weresub's paper. A more recent discussion of the issues is presented in Seifert *et al.* (*Stud. Mycol.* 45, 2000). See Nomenclature.

statismospore, a spore not forcibly discharged. Cf. ballistospore.

Statistical methods and design of experiments, see Johnston & Booth (Eds) (*Plant pathologist's pocket-book*: 353 edn 2, 1983).

statolon, an antiviral substance (which induces interferon formation) from *Penicillium stoloniferum*; the active principle of which is considered to be RNA of viral origin (Banks *et al.*, *Nature* 218: 542, 1968).

Stauriella Sivichai & E.B.G. Jones (2004), anamorphic *Pezizomycotina*. 1, Thailand. See Sivichai & Jones (*Sydowia* 56: 132, 2004).

Staurochaeta Sacc. (1875) ? = *Staurophoma* fide Sutton (*Mycol. Pap.* 141, 1977).

Staurolemma Körb. (1867), Collemataceae (L). 3, widespread. See Jørgensen & Henssen (*Graphis Scripta* 5: 12, 1993), Henssen (*Nova Hedwigia* 68: 117, 1999; Australia), Jørgensen & Henssen (*Bryologist* 102: 22, 1999), Jørgensen (*Bryologist* 107: 392, 2004; N America).

Stauronema (Sacc.) Syd., P. Syd. & E.J. Butler (1916), anamorphic *Pezizomycotina*, Ccu.0eH.19. 6, widespread. See Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993), Abbas *et al.* (*Pakist. J. Bot.* 34: 117, 2002).

Stauronematopsis Abbas, B. Sutton & Ghaffar (2002), anamorphic *Pezizomycotina*, C??.?. 1, USA. See Abbas *et al.* (*Pakist. J. Bot.* 34: 118, 2002).

Staurophallus Mont. (1845) nom. dub., Phallaceae.

Staurophoma Höhn. (1907), anamorphic *Pezizomycotina*, Cpd.0eH.15. 1, S. America; Hong Kong. See Morgan-Jones *et al.* (*Univ. Waterloo Biol. Ser.* 4, 1972), Yanna *et al.* (*Sydowia* 50: 139, 1998).

Staurosphaeria Rabenh. (1858) = *Karstenula* fide Saccardo (*Syll. fung.* 3, 1883).

staurospore (stauroconidium), a non-septate or septate spore with more than one axis; axes not curved through more than 180° (cf. helicospore); protuberances present and >1/4 spore body length (cf. amero-spore). See Anamorphic fungi.

Staurothele Norman (1852) nom. cons., Verrucariales (L). c. 72, widespread. See Swinscow (*Lichenologist* 2: 152, 1963; Brit. spp.), Thomson (*Bryologist* 94: 351, 1991; key 17 spp., N. Am.), Harada (*Nat. Hist.*

Res. 2: 39, 1992; Japan), McCarthy (*Muelleria* 8: 275, 1995; Australia), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny), Harada & Wang (*Lichenology* 5: 13, 2006; China), Gueidan *et al.* (*MR* 111: 1145, 2007; phylogeny), Lumbsch *et al.* (*MR* 111: 257, 2007; phylogeny).

Stearophora L. Mangin & Viala (1905), *Pezizomycotina*. 1, N. Africa.

Stecchericum D.A. Reid (1963), Bondarzewiaceae. 4, widespread (tropics). See Reid (*Kew Bull.* 17: 270, 1963), Hattori (*Mycoscience* 44: 453, 2003; type studies).

Steccherinaceae Parmasto (1968) = Meruliaceae.

Steccherinum Gray (1821), Meruliaceae. 33, widespread. See Maas Geesteranus (*Persoonia* 7: 443, 1974), Saliba & David (*Cryptog. Mycol.* 9: 93, 1988; key Eur. spp.), Legon & Roberts (*Czech Mycol.* 54: 7, 2002; England), Yuan & Dai (*Mycotaxon* 93: 173, 2005; China).

Steganopycnis Syd. & P. Syd. (1916) = *Seynesia* fide Petrak (*Annl. mycol.* 25: 258, 1927), Læssøe (*SA* 13: 43, 1994).

Steganosporium, see *Stegonsporium*.

Stegasphaeria Syd. & P. Syd. (1916), Mesnieraceae. 2 (from living leaves), Philippines; Africa. See Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).

Stegasphaeriaceae Syd. & P. Syd. (1916) = Mesnieraceae.

Stegastroma Syd. & P. Syd. (1916) = *Anisomyces* Theiss. & Syd. fide Müller & von Arx in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 87, 1973).

Stegia Fr. (1818) [non *Stegia* DC. 1805, *Malvaceae*] = *Stegilla*.

Stegiacantha Maas Geest. (1966), ? Meruliaceae. 1, Madagascar. See Maas Geesteranus (*Proc. K. ned. Akad. Wet. C* 69: 317, 1966).

Stegilla Rchb. (1828) nom. dub., Fungi. See Sutton & Pirozynski (*TBMS* 46: 517, 1964).

Stegites Mesch. (1892), Fossil Fungi. 2 (Tertiary), Europe.

Stegobolus Mont. (1845), Thelotremataceae (L). 1, pantropical. See Hale (*Bull. Br. Mus. nat. hist. Bot.* 8: 227, 1981), Frisch & Kalb (*Biblthca Lichenol.* 92: 371, 2006; revision).

Stegocintractia M. Piepenbr., Begerow & Oberw. (1999), Anthracoideaceae. 5 (on *Juncaceae*). See Piepenbring (*Bot. Jb.* 24: 241, 2003).

Stegolerium Strobel, W.M. Hess & E. Ford (2001), anamorphic *Pezizomycotina*. 1, Venezuela. See Strobel *et al.* (*Mycotaxon* 78: 356, 2001).

Stegonsporiopsis Van Warmelo & B. Sutton (1981), anamorphic *Pezizomycotina*, St.#eP.15. 1, N. America. See van Warmelo & Sutton (*Mycol. Pap.* 145: 17, 1981).

Stegonsporium Corda (1827), anamorphic *Splanchnonema*, Cac.#eP.19. 3, widespread. See van Warmelo & Sutton (*Mycol. Pap.* 145, 1981).

Stegopeziza Höhn. (1917) = *Hysterostegiella* fide Hein (*Nova Hedwigia* 38: 669, 1983).

Stegopezizella Syd. (1924) = *Sarcotrochila* fide Korf (*Mycol.* 54: 12, 1962).

Stegophora Syd. & P. Syd. (1916), Sydowiellaceae. Anamorph *Cylindrosporella*. 1 (on *Ulmus*), N. America. See Petrak (*Annl. mycol.* 38: 267, 1940), McGranahan & Smalley (*Phytopathology* 74: 1300, 1984; culture), European and Mediterranean Plant Protection Organization (*Bulletin OEPP EPPO Bulletin* 35: 416, 2005), Rossman *et al.* (*Mycoscience*

- 48: 135, 2007; review).
- Stegophorella** Petr. (1947), Pezizomycotina. 1, Ecuador.
- Stegothyrium** Höhn. (1918), ? Microthyriaceae. 1, Europe.
- Steinera** Zahlbr. (1906), Coccocarpiaceae (L). 4, Australasia. See Henssen & James (*Bull. Br. Mus. nat. hist. Bot.* 10: 227, 1982), Wiklund & Wedin (*Cladistics* 19: 419, 2003; phylogeny), Lumbsch *et al.* (*Mol. Phylogen. Evol.* 31: 822, 2004; phylogeny), Miadlikowska & Lutzoni (*Am. J. Bot.* 91: 449, 2004; phylogeny).
- Steiner's stable PD solution**, *p*-phenylenediamine, 1 g; sodium sulphite (Na₂SO₃), 10 g liquid detergent, *c.* 10 drops; water, 100 ml. Stable for at least 6 months; see Scott (*Lichenologist* 1: 88, 1958). See also Metabolic products.
- Steinhausia** Sprague, Ormieres & Manier (1972), Microsporidia. 2.
- Steinia** Körb. (1873), Aphanopsidaceae (L). 2, Europe; Australia. See Faurel & Schotter (*Bull. Soc. Hist. nat. Afr. Noire* 25: 126, 1954), Hafellner (*Cryptog. Bot.* 5: 99, 1995), Printzen & Rambold (*Lichenologist* 27: 91, 1995), Kantvilas & McCarthy (*Lichenologist* 31: 555, 1999).
- Steirochaete** A. Braun & Casp. (1853) = *Colletotrichum* fide Southworth (*J. Mycol.* 6: 115, 1890).
- Stelechotrichum** Ritgen (1831) nom. inval. ≡ *Cephalotrichum* Link.
- steliogen**, the structure which gives rise to the sporocarp stalk in protostelids.
- Stella** Massee (1889) [non *Stella* Medik. 1787, *Leguminosae*] = *Scleroderma* fide Demoulin (*in litt.*).
- Stellasclerotes** Beneš (1959), Fossil Fungi. 1 (Carboniferous), former Czechoslovakia.
- stellate**, like a star in form; -*seta*, a compound seta having several radiating arms; asterophysis.
- Stellatospora** Tad. Ito & Nakagiri (1994), Chaetomiaceae. 1, Japan. See Ito & Nakagiri (*Mycoscience* 35: 413, 1994).
- Stellatostroma**, see *Asterostroma*.
- Stellifera** Léman (1824) nom. dub., anamorphic *Agaricaceae*.
- Stellifraga** Alstrup & Olech (1993), Pezizomycotina. 1 (on lichens, esp. *Cladonia*), Spitsbergen. See Alstrup & Olech (*Polish Polar Research* 14: 39, 1993).
- Stelligera** R. Heim ex Doty (1948) = *Lachnocladium* fide Corner (*Ann. Bot. Mem.* [A monograph of *Clavaria* and allied genera] 1, 1950).
- Stellomyces** Morgan-Jones, R.C. Sinclair & Eicker (1987), anamorphic *Pezizomycotina*, Hso.0eH.6. 1, S. Africa; India. See Morgan-Jones *et al.* (*Mycotaxon* 28: 447, 1987), Keshavaprasad & Bhat (*Mycotaxon* 84: 61, 2002).
- Stellopeltis** Bat. & A.F. Vital (1959), anamorphic *Pezizomycotina*, Cpt.0eH.?. 2, Brazil. See Batista & Vital (*Mycopath. Mycol. appl.* 11: 88, 1959).
- Stellosetifera** Matsush. (1996), Pseudoperisporiaceae. Anamorph *Penicillifer*. 1, Malaysia. Possibly related to *Wentomyces*. See Matsushima (*Mycol. Mem.* 9, 1996).
- Stellospora** Alcorn & B. Sutton (1984), anamorphic *Pezizomycotina*, Hso.0eH.15. 1 (on *Appendiculella*), Australia; Philippines. See Alcorn & Sutton (*Mycotaxon* 20: 45, 1984).
- Stellothyriella** Bat. & Cif. (1959), anamorphic *Pezizomycotina*, Cpt.1eH.?. 1, USA. See Batista & Ciferri (*Mycopath. Mycol. appl.* 11: 62, 1959).
- Stemastrum** Raf. (1808) nom. dub., Agaricales. 'gasteromycetes'.
- Stemmaria** Preuss (1851) nom. dub. ? = *Mycosylva* fide Seifert (*Sydowia* 45: 103, 1993).
- Stemmatomyces** Thaxt. (1931), Laboulbeniaceae. 3, widespread. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- Stempellia** L. Léger & E. Hesse (1910), Microsporidia. 4.
- Stemphyliites** Babajan & Tasl. (1973), Fossil Fungi. 1 (Neogene), former USSR.
- Stemphyliomma** Sacc. & Traverso (1911) = *Pithomyces* fide Kirk (*TBMS* 80: 449, 1983).
- Stemphyliopsis** A.L. Sm. (1901) = *Stemphylium*. An albino mutant. fide Petch (*TBMS* 23: 146, 1939), Barron & Onions (*CJB* 44: 861, 1966).
- Stemphyliopsis** Speg. (1910) [non *Stemphyliopsis* A.L. Sm. 1910] ≡ *Stemphyliomma*.
- Stemphylium** Wallr. (1833), anamorphic *Pleospora*, Hso.#eP.19. 43, widespread. See Wiltshire (*TBMS* 21: 211, 1938), Simmons (*Mycol.* 61: 1, 1969), Simmons (*Sydowia* 38: 284, 1986), Simmons (*Mem. N. Y. bot. Gdn* 49: 305, 1989), Basallote-Ureba *et al.* (*Pl. Path.* 48: 139, 1999; on *Allium*), Cho & Yu (*Pl. Path. J.* 16: 328, 2000; on *Trifolium*, Korea), Pryor & Gilbertson (*MR* 104: 1312, 2000; phylogeny), Simmons (*Harvard Pap. Bot.* 6: 199, 2001; teleomorph), Câmara *et al.* (*Mycol.* 94: 660, 2002; phylogeny), Mehta *et al.* (*Curr. Microbiol.* 44: 323, 2002; DNA), Zhang *et al.* (*Mycotaxon* 85: 247, 2003; China), Inderbitzin *et al.* (*Proc. natn Acad. Sci. U.S.A.* 102: 11390, 2005; mating systems), Kodsueb *et al.* (*Mycol.* 98: 571, 2006; phylogeny), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Stenella** Syd. (1930), anamorphic *Mycosphaerella*, Hso.≡ eP.10. 155, widespread. See Mulder (*TBMS* 65: 514, 1975), de Hoog *et al.* (*TBMS* 81: 485, 1983; relationship to *Ramichloridium*), Braun (*Cryptog. Mycol.* 20: 155, 1999), Crous *et al.* (*Mycol.* 93: 1081, 2001; phylogeny), Braun *et al.* (*Mycol. Progr.* 2: 197, 2003), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003), Pretorius *et al.* (*Sydowia* 55: 286, 2003; on *Citrus*), Crous *et al.* (*Stud. Mycol.* 50: 457, 2004; on *Acacia*), Crous *et al.* (*Stud. Mycol.* 55: 99, 2006; on *Eucalyptus*), Crous *et al.* (*Stud. Mycol.* 58: 33, 2007; posn).
- Stenellopsis** B. Huguenin (1966), anamorphic *Mycosphaerellaceae*, Hsp.≡ eP.10. 5, New Caledonia. See Huguenin (*BSMF* 81: 695, 1965), Crous *et al.* (*Mycol.* 93: 1081, 2001), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003).
- Stenellopsis** Morgan-Jones (1980) [non *Stenellopsis* B. Huguenin 1966] ≡ *Parastenella*.
- Stenhammara** A. Massal. ex Zahlbr. (1924) = *Lecidea* fide Hertel (*Beih. Nova Hedwigia* 24, 1967).
- Stenhammara** Flot. ex Körb. (1855) ≡ *Stenhammarella*.
- Stenhammarella** Hertel (1967), Porpidiaceae (L). 1, Europe; central Asia. See Hertel (*Nova Hedwigia Beih.* 24: 124, 1967), Buschbom & Mueller (*Mol. Phylogen. Evol.* 32: 66, 2004; phylogeny).
- Stenocarpella** Syd. & P. Syd. (1917), anamorphic *Diaporthales*, Cpd.1≡ eP.15. 2, widespread (tropical). See Sutton (*The Coelomycetes*, 1980), Dorrance *et al.* (*Pl. Dis.* 83: 675, 1999; culture, isozymes), Xia & Achar (*J. Phytopath.* 149: 35, 2001; molecular detection), Crous *et al.* (*Stud. Mycol.* 55: 235, 2006; phylogeny).

- Stenocephalopsis** Chamuris & C.J.K. Wang (1998), anamorphic *Pezizomycotina*, Hso.???. 1, widespread. See Chamuris & Wang (*Mycol.* 90: 464, 1998).
- Stenocephalum** Chamuris & C.J.K. Wang (1990), anamorphic *Pezizomycotina*, Hso.0eH/1eP.10. 1, widespread. See Chamuris & Wang (*Mycol.* 82: 530, 1990), Chamuris & Wang (*Mycol.* 90: 464, 1998).
- Stenocleriella** Marvanová & Descals (1987), anamorphic *Pezizomycotina*, Hso.1bH.10. 2 (aquatic), Europe. See Marvanová & Descals (*TBMS* 89: 507, 1987).
- Stenocybe** Nyl. ex Körb. (1855), Mycocaliciaceae. c. 14, widespread. See Tschermak-Woess (*Lichenologist* 10: 69, 1978; biology), Tibell (*Beih. Nova Hedwigia* 79: 597, 1984), Peterson & Rikkinen (*Mycol.* 90: 1087, 1998), Tibell & Wedin (*Mycol.* 92: 577, 2000), Titov *et al.* (*Botanicheskiĭ Zhurnal* 87: 60, 2002), Döbbeler & Feuerer (*Bibliotheca Lichenol.* 88: 91, 2004; on liverwort), Tibell & Vinuesa (*Taxon* 54: 427, 2005; phylogeny), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny).
- Stenocybella** Vain. (1927) = *Calicium* fide Tibell (*Beih. Nova Hedwigia* 79: 597, 1984).
- Stenographa** Mudd (1861) = *Thalloloma* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Stenospora** Deighton (1969), anamorphic *Pezizomycotina*, Hso.0fH.10. 1 (on *Puccinia*), Sierra Leone. See Deighton (*Mycol. Pap.* 118: 22, 1969).
- Stephanoascus** M.T. Sm., Van der Walt & Johannsen (1976) = *Trichomonascus* fide Traquair *et al.* (*CJB* 66: 926, 1988), Giménez-Jurado *et al.* (*Syst. Appl. Microbiol.* 17: 237, 1994), Smith & Hoog in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 400, 1998), Ueda-Nishimura & Mikata (*Int. J. Syst. Evol. Microbiol.* 52: 463, 2002), Kurtzman & Robnett (*FEMS Yeast Res.* 7: 141, 2007).
- Stephanocyclos** Hertel (1983), Porpidiaceae (L). 1, Antarctica. See Hertel (*Lecideaceae exsiccatae* Fascicle V: no. 96, 1983), Buschbom & Mueller (*Mol. Phylogen. Evol.* 32: 66, 2004; phylogeny).
- stephanocyst**, a structure, typically bicellular (basal cell cup-like, terminal cell globose), found in certain basidiomycetes. See Burdsall (*Mycol.* 61: 915, 1969).
- Stephanoma** Wallr. (1833), anamorphic *Hypomyces*, Hso.0bP.1. 3, widespread. See Butler & McCain (*Mycol.* 60: 955, 1968), Pöldmaa (*Stud. Mycol.* 45: 83, 2000), Samuels *et al.* (*CBS Diversity Ser.* 4, 2006; USA).
- Stephanomyces** Speg. (1917) = *Cucujomyces* fide Thaxter (*Memoirs of the American Academy of Arts and Sciences* 16: 1, 1931).
- Stephanonectria** Schroers & Samuels (1999), Bionectriaceae. 1, British Isles. See Schroers *et al.* (*Sydowia* 51: 116, 1999), Castlebury *et al.* (*MR* 108: 864, 2004; phylogeny).
- Stephanophallus** MacOwan [not traced] = *Anthurus* fide Saccardo (*Syll. fung.* 7: 23, 1888).
- Stephanophoron** Nádv. (1942) = *Nadvornikia* fide Tibell (*Beih. Nova Hedwigia* 79: 597, 1984).
- Stephanophorus** Flot. (1843) = *Leptogium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Stephanopus** M.M. Moser & E. Horak (1975), Cortinariaceae. 5, S. America. See Moser & Horak (*Beih. Nova Hedwigia* 52: 608, 1975; key).
- Stephanospora** Pat. (1914), Stephanosporaceae. 4, Eurasia; New Zealand. See Oberwinkler & Horak (*Pl. Syst. Evol.* 131: 157, 1979), Martín *et al.* (*Mycotaxon* 90: 133, 2004; relationship with *Lindtneria trachyspora*), Larsson (*MR* 111: 1040, 2007), Lawrey *et al.* (*Mol. Phylog. Evol.* 44: 778, 2007).
- Stephanosporaceae** Oberw. & E. Horak (1979), Agaricales. 5 gen. (+ 3 syn.), 21 spp.
Lit.: Oberwinkler & Horak (*Pl. Syst. Evol.* 131: 157, 1979), Pegler & Young (*TBMS* 72: 353, 1979), Beaton *et al.* (*Kew Bull.* 40: 573, 1985), Lebel & Castellano (*Mycol.* 94: 327, 2002), Martín *et al.* (*Mycotaxon* 90: 133, 2004).
- Stephanosporium** Dal Vesco (1961), anamorphic *Pezizomycotina*, Hso.0eP.39. 1, widespread. See Dal Vesco (*Allionia* 7: 182, 1961).
- Stephanotheca** Syd. & P. Syd. (1914), Elsinoaceae. 2, Philippines.
- Stephanothecaceae** Petr. (1931) = Elsinoaceae.
- Stephembruneria** R.F. Castañeda (1988), anamorphic *Pezizomycotina*, Hso.≡ eP.15. 1, Cuba. See Castañeda (*Fungi Cubenses* 3: 14, 1988).
- Stephensia** Tul. (1845), Pyronemataceae. 7 (hypogeous), widespread. See de Vries (*Coolia* 28: 96, 1985), Fontana & Giovannetti (*Mycotaxon* 29: 37, 1987; anamorph), Trappe *et al.* (*Mycotaxon* 64: 431, 1997), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Stephosia** Bat. & H. Maia (1967) = *Porina* Müll. Arg. fide Lücking *et al.* (*Lichenologist* 30: 121, 1998).
- Sterbeeckia** Dumort. (1822) = *Craterellus*.
- Stercum**, see *Stereum*.
- Stereaceae** Pilát (1930), Russulales. 22 gen. (+ 3 syn.), 125 spp.
Lit.: Donk (*Persoonia* 3: 199, 1964), Reid (*Beih. Nova Hedwigia* 18: 484 pp., 1965; stipitate steroid spp.), Jahn (*Westfäl. Pilzbr.* 8: 69, 1971), Rattan (*The resupinate Aphyllophorales of the North West Himalayas* [Bibl. Mycol. 60], 1977), Jülich & Stalpers (*Verh. Kon. Ned. Akad. Wetensch. Afd. Natuurk. sect. 2* 74, 1980), Ginns (*Mycol.* 90: 19, 1998), Tabata *et al.* (*Mycoscience* 41: 585, 2000), Larsson & Hallenberg (*Mycol.* 93: 907, 2001), Miller *et al.* (*Mycol.* 93: 344, 2001), Wu *et al.* (*Mycol.* 93: 720, 2001), Binder & Hibbett (*Mol. Phylogen. Evol.* 22: 76, 2002), Slippers *et al.* (*Mol. Ecol.* 11: 1845, 2002), Larsson & Larsson (*Mycol.* 95: 1037, 2003), Slippers *et al.* (*South African Journal of Science* 99: 70, 2003), Larsson *et al.* (*MR* 108: 983, 2004), Binder *et al.* (*Systematics and Biodiversity* 3: 113, 2005), Küffer & Senn-Irlet (*Mycol. Progr.* 4: 77, 2005).
- Stereales** = Russulales.
- Sterellum** P. Karst. (1889) = *Peniophora* fide Weresub & Gibson (*CJB* 38: 833, 1960).
- Stereocaulaceae** Chevall. (1826), Lecanorales (L). 6 gen. (+ 15 syn.), 247 spp.
Lit.: Jørgensen & Jahns (*Notes R. bot. Gdn Edinb.* 44: 581, 1987), Smith & Øvstedal (*Polar Biol.* 11: 91, 1991), Jahns *et al.* (*Bibliotheca Lichenol.* 58: 181, 1995), Fryday & Coppins (*Lichenologist* 28: 513, 1996), Kivistö (*Sauteria* 9: 25, 1998), Sipman (*Cryptog. Bryol.-Lichénol.* 19: 229, 1998), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998; phylogeny), Stenroos & DePriest (*Curr. Genet.* 33: 124, 1998), Wedin & Döring (*MR* 103: 1131, 1999; DNA), Wedin *et al.* (*Lichenologist* 32: 171, 2000; phylogeny), Ekman & Tønsberg (*MR* 106: 1262, 2002), Printzen & Kantvilas (*Bibliotheca Lichenol.* 88: 541, 2004), Myllys *et al.* (*Taxon* 54: 605, 2005), Högnabba (*MR* 110: 1080, 2006), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Hofstetter *et al.* (*Mol. Phylogen. Evol.*

- 44: 412, 2007; phylogeny).
- Stereocauliscum** Nyl. (1865) ? = *Micarea* Fr. (1825) [nom. cons.] fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Stereocaulomyces** E.A. Thomas ex Cif. & Tomas. (1953) ≡ *Stereocaulon* Hoffm.
- Stereocaulon** (Schreb.) Schrad. (1794) nom. rej. = *Pertusaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Stereocaulon** Hoffm. (1796) nom. cons., *Stereocaulaceae* (L). 137, widespread. See Lamb (*J. Hattori bot. Lab.* 43: 191, 1978; keys), Lamb (*J. Hattori bot. Lab.* 44: 209, 1978; keys), Smith & Øvstedal (*Polar Biol.* 11: 91, 1991; 6 Antarctic spp.), Jahns *et al.* (*Biblthca Lichenol.* 58: 181, 1995; ontogeny), Sipman (*Cryptog. Bryol.-Lichénol.* 19: 229, 1998; New Guinea), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998; phylogeny), Wedin & Döring (*MR* 103: 1131, 1999; DNA), Wedin *et al.* (*Lichenologist* 32: 171, 2000; phylogeny), Stenroos *et al.* (*Mycol. Progr.* 1: 267, 2002; phylogeny), Myllys *et al.* (*Taxon* 54: 605, 2005; phylogeny), Högnabba (*MR* 110: 1080, 2006; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Stereocaulum** Clem. (1909) = *Pertusaria* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Stereochlamydomyces** Cif. & Tomas. (1953) ≡ *Stereochlamys*.
- Stereochlamys** Müll. Arg. (1885) = *Trichothelium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Stereocladium** Nyl. (1875) = *Stereocaulon* Hoffm. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Stereoclamydomyces**, see *Stereochlamydomyces*.
- Stereocrea** Syd. & P. Syd. (1917), *Clavicipitaceae*. 1 (on grasses), widespread (paleotropics). See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Bischoff & White (*Mycology Series* 19: 125, 2003).
- Stereofomes** Rick (1928), *Lachnocladiaceae*. 5, S. America; Japan. See Donk (*Taxon* 6: 114, 1957; a nom. dub.), Boidin & Lanquetin (*Biblthca Mycol.* 114, 1987).
- Stereogloeocystidium** Rick (1940) = *Podoscypha* fide Boidin (*Revue Mycol. Paris* 24: 197, 1959).
- Stereolachnea** Höhn. (1917) = *Scutellinia* fide Denison (*Mycol.* 51: 605, 1959).
- stereome** (of lichens), a scleroplectenchyma which forms the main supporting tissue of the thallus, as in *Alectoria*, *Bryoria*, and *Cladonia*.
- Stereonema** Kütz. (1836) = *Lecidea* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Stereopeltis** Franzoni & De Not. (1861) = *Sarcogyne* Flot. (1851) fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Stereophyllum** P. Karst. (1889) [non *Stereophyllum* Mitt. 1859, *Musci*] ≡ *Cyphellostereum*.
- Stereopodium** Earle (1909) ≡ *Mycena*.
- Stereopsis** D.A. Reid (1965), *Meruliaceae*. 13, widespread (esp. tropical). See Boidin *et al.* (*BSMF* 66: 445, 1998; sub *Phanerochaetaceae*), Douanla-Meli & Langer (*Mycotaxon* 90: 323, 2004).
- Stereosorus** Sawada (1943) = *Burrillia* fide Ling (*Mycol.* 41: 252, 1949).
- Stereosphaeria** Kirschst. (1939), *Clypeosphaeriaceae*. 1 (bark etc.), widespread (temperate). See Barr (*Sydowia* 41, 1989), Hyde *et al.* (*Sydowia* 50: 21, 1998), Kang *et al.* (*Mycoscience* 40: 151, 1999).
- Stereostratum** Magnus (1899), *Pucciniaceae*. 2 (on *Bambusoideae* (*Poaceae*)), China; Japan. See Thirumalachar (*Mycol.* 52: 690, 1961).
- Stereum** Hill ex Pers. (1794), *Stereaceae*. 27, widespread. *S. purpureum* is included in *Chondrostereum*. See Talbot (*Bothalia* 6: 303, 1954; S. Afr.), Boidin (*Rev. Mycol.* 23: 318, 1958), Boidin (*Rev. Mycol.* 24: 197, 1959), Boidin (*Bull. Soc. linn. Lyon* 28: 205, 1959), Boidin (*Bull. Jard. bot. Brux.* 30: 51, 1960; Congo), Boidin (*Bull. Jard. bot. Brux.* 30: 283, 1960; Congo), Welden (*Mycol.* 63: 796, 1971; key genus s.s.), Chamuris (*Mycotaxon* 22: 105, 1985; key N. Am. spp.), Eicker & Louw (*South African Journal of Botany* 64: 30, 1998; S. Afr.).
- Stericium** Raf. (1819) nom. dub., *Fungi*. No spp. included.
- sterigma** (pl. -ata), (1) (of a basidium, q.v.), an extension of the metabasidium composed of a basal filamentous or inflated part (the **proto-**; epibasidium) and an apical spore-bearing projection (the **spiculum**) (Fig. 8F); (2) (of *Aspergillus*, etc.) [a usage not recommended], phialide (**secondary -**); prophialide (**primary -**); metula; (3) (of lichens), a spermatophore (Nylander).
- Sterigmatobotrys** Oudem. (1886), anamorphic *Peizizomycotina*, Hso.≡ eH.10. 3, widespread (esp. north temperate). See Ellis (*Dematiaceous Hyphomycetes*, 1971), Jong & Davies (*Norw. J. Bot.* 18: 177, 1971), Sutton (*Mycol. Pap.* 132, 1973), Chang. (*MR* 95: 1142, 1991).
- sterigmatocystin**, a carcinogenic hepatotoxin (xanthone derivative) from *Aspergillus versicolor* (Van der Walt & Purchase, *Brit. J. exp. Path.* 51: 183, 1970); precursor of aflatoxin B1 (Singh & Hsieh, *Appl. environ. Microbiol.* 31: 743, 1976).
- Sterigmatocystis** C.E. Cramer (1859) = *Aspergillus* fide Raper & Fennell (*The genus Aspergillus*, 1965).
- Sterigmatomyces** Fell (1966), anamorphic *Agaricostilbaceae*, Hso.0eH.10. 2, Atlantic Ocean; Indian Ocean. See Lodder (*Yeasts, a taxonomic study* 2nd edn: 1229, 1970), Yamada *et al.* (*J. gen. appl. Microbiol. Tokyo* 32: 157, 1986; enzyme systems), van der Walt *et al.* (*Antonie van Leeuwenhoek* 53: 137, 1987; key to 3 spp.), Yamada *et al.* (*Agric. Biol. Chem.* 53: 2993, 1989; phylogeny), Guého *et al.* (*Int. J. Syst. Bacteriol.* 40: 60, 1990; partial rRNA sequences), Kurtzman (*Int. J. Syst. Bacteriol.* 40: 56, 1990; DNA relatedness), Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 1351, 2000; mol. phylogeny).
- Sterigmatosporidium** G. Kraep. & U. Schulze (1983), *Cuniculitremaeae*. 1, Germany. See Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 1351, 2000; mol. phylogeny).
- sterile** (1) not producing spores or a sporocarp; (2) free from living microorganisms; sterilized.
- Sterilization**. Making free from living microorganisms, may be done by chemical (see Fungicides) or physical methods. Heat is the most widely used physical agent. Dry heat may be used for glass and other materials; death of even the most resistant bacterial spores takes place within an hour in a hot air oven at 160°C. A flame may frequently be used for the surface sterilization of instruments. Moist heat, especially if the pressure is increased, is even better. Most media may be made sterile by autoclaving for 15 min at 121°C, but when such severe heating is not possible 'discontinuous steaming' (steaming at atmospheric pressure for 20 min every day for 3 days)

is frequently used. In addition, steam is of use for the 'sterilization' (partial (or incomplete) sterilization) of soil for controlling soil-living pathogens, and hot water (about 50°C) has an important application for the control of diseases such as loose smut of wheat (*Ustilago tritici*) in which the pathogen is inside the seed. Though cold will not let growth take place, even great cold may not be lethal to micro-organisms.

Among other physical agents are ultra-violet light (to which the sterilizing effect to sunlight is due) but certain fluorescent dyes, such as eosin, are able to make bacteria sensitive to light of longer wave lengths (Blum, *Physiol. Rev.* 12: 23, 1932), electricity (the effect of low frequency currents being possibly that of the heat or the nascent oxygen (O) or chlorine (Cl) produced), X-rays, radium emanation, and supersonic waves. Desiccation (drying) is frequently lethal, specially to the vegetative phase, but some fungal and bacterial spores are very resistant. It is sometimes possible to make a liquid sterile by filtering out the micro-organisms with a filter of unglazed porcelain. See Rahn (*Bact. Rev.* 9: 1, 1945; physical methods), Russell *et al.* (*Principles and practice of disinfection, preservation and sterilization*, 688 pp., 2004), Sykes (*Disinfection and sterilization. Theory and practice*, 1958, in Norris & Ribbons (Eds), *Methods in microbiology* 1: 77, 1969).

Sterrebekia Link (1816) [non *Sterbeckia* Schreb. 1789, *Papilionaceae*] = *Scleroderma* fide Stalpers (*in litt.*).

Stevensea Trotter (1926) = *Diplothea* Starbäck fide von Arx & Müller (*Stud. Mycol.* 9, 1975).

Stevensiella Trotter (1928) = *Diatractium*.

Stevensomyces E.F. Morris & Finley (1965), anamorphic *Pezizomycotina*, Hsy.0eH.?. 1, Panama. See Morris & Finley (*Mycol.* 57: 483, 1965).

Stevensonula Petr. (1952), anamorphic *Pezizomycotina*, Ccu.1eP.1. 1, USA; New Caledonia. See Sutton (*Nova Hedwigia* 26: 1, 1975).

Stevensula Speg. (1924) = *Leptomeliola* fide Hughes (*Mycol. Pap.* 166, 1993).

Steyaertia Bat. & H. Maia (1960) = *Asterolibertia* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).

Sthughesia M.E. Barr (1987), Capnodiales. See Eriksson & Hawksworth (*SA* 7: 91, 1988), Winton *et al.* (*Mycol.* 99: 240, 2007; phylogeny).

stichobasidium, see basidium.

Stichoclavaria Ulbr. (1928) = *Holocoryne* fide Pine *et al.* (*Mycol.* 91: 994, 1999; considered the correct name for *Multiclavula*).

Stichoclavariaceae Ulbr. (1928) = *Clavariaceae*.

Stichodothis Petr. (1927) = *Auerswaldiella* fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).

Stichomyces Thaxt. (1901), Laboulbeniaceae. 7, widespread. See Santamaria i del Campo (*L'ordre Laboulbenials (Fungi, Ascomycotina) a la Peninsula Ibèrica i Illes Balears [Thesis]:* 669 pp., 1990).

Stichophoma Kleb. (1933) ? = *Sclerophoma* fide Sutton (*Mycol. Pap.* 141, 1977).

Stichopsora Dietel (1899) = *Coleosporium* fide Sydow & Sydow (*Monographia Uredinearum seu Specierum Omnium ad hunc usque Diem Descriptio et Adumbratio Systematica* 3, 1915).

Stichoramaria Ulbr. (1928) = *Clavulina*.

Stichospora Petr. (1927), anamorphic *Pezizomycotina*, St.0eH/1eP.?. 1, Europe.

Stichus D.E. Ether. (1904), Fossil Fungi (mycel.) ?

Fungi. 1 (Cretaceous), Australia.

Sticta (Schreb.) Ach. (1803), Lobariaceae (L). c. 114, widespread (esp. tropical). See Joshi & Awasthi (*Biol. Mem.* 7: 165, 1982; key 13 spp., India), Galloway (*Lichenologist* 26: 223, 1994; key 12 spp. S. Am.), Galloway (*Lichenologist* 29: 105, 1997; NZ), Galloway (*Trop. Bryol.* 15: 117, 1998; Australia), Piovano *et al.* (*Biochemical Systematics and Ecology* 28: 589, 2000; chemistry), Thomas *et al.* (*Bibliotheca Lichenol.* 82: 123, 2001; phylogeny), Tønsberg & Goward (*Bryologist* 104: 12, 2001; N America), McDonald *et al.* (*Bryologist* 106: 61, 2003; USA), Wiklund & Wedin (*Cladistics* 19: 419, 2003; phylogeny), Miadlikowska & Lutzoni (*Am. J. Bot.* 91: 449, 2004; phylogeny), Takahashi *et al.* (*Lichenology* 2: 174, 2004; China), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).

Stictaceae Stizenb. (1862) = Lobariaceae.

Stictidaceae Fr. (1849), Ostropales. 20 gen. (+ 22 syn.), 156 spp.

Lit.: Sherwood (*Mycotaxon* 5: 1, 1977; monogr., keys), Johnston (*Mycotaxon* 24: 349, 1985), Winka *et al.* (*Lichenologist* 30: 455, 1998; DNA), Lücking *et al.* (*Mycol.* 96: 283, 2004), Lumbsch *et al.* (*Mol. Phylogen. Evol.* 31: 822, 2004), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Wedin *et al.* (*MR* 110: 773, 2006), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny).

Stictina Nyl. (1860) nom. rej. = *Pseudocyphellaria* fide Galloway (*Bull. Br. Mus. nat. hist. Bot.* 17, 1988).

Stictis Pers. (1800), Stictidaceae. Anamorph *Stictospora*. c. 68, widespread. See Sherwood (*Mycotaxon* 5: 1, 1977; key), Sherwood (*Mycotaxon* 6: 215, 1977), Winka *et al.* (*Lichenologist* 30: 455, 1998; DNA), Lumbsch *et al.* (*Organ. Divers. Evol.* 1: 99, 2001; phylogeny), Kauff & Lutzoni (*Mol. Phylogen. Evol.* 25: 138, 2002; phylogeny), Wedin *et al.* (*New Phytol.* 164: 459, 2004; ecology, phylogeny), Wedin *et al.* (*Lichenologist* 37: 67, 2005; phylogeny, lichen status), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Wedin *et al.* (*MR* 110: 773, 2006; Scandinavia).

Stictochorella Höhn. (1917) = *Asteromella* fide Clements & Shear (*Gen. Fung.*, 1931).

Stictochorellina Petr. (1922) = *Asteromella* fide Sutton (*Mycol. Pap.* 141, 1977).

Stictoclypeolum Rehm (1904) = *Asterothyrium* Müll. Arg. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Stictographa Mudd (1861) = *Melaspilea* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Stictomyces E.A. Thomas ex Cif. & Tomas. (1953) = *Lobaria*.

Stictopatella Höhn. (1918), anamorphic *Pezizomycotina*, Ccu.0eH.?. 1, Europe.

Stictophacidium Rehm (1888), ? Stictidaceae. Anamorphs *Ebolia*, *Coleophoma*-like. 1, Europe. See Sherwood (*Mycotaxon* 5: 1, 1977).

Stictosepta Petr. (1964), anamorphic *Pezizomycotina*, St.0fH.10. 1, former Czechoslovakia. See Petrak (*Sydowia* 17: 230, 1964), Treigienė (*Botanica Lithuanica* 12: 131, 2006).

Stictosphaeria Tul. & C. Tul. (1863) = *Diatrype* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Stictospora Cif. (1957), anamorphic *Stictis*, St.0eH.?. 1, Europe. See Ciferri (*Atti Ist. bot. Univ. Lab. crittog. Pavia sér.* 5 14: 276, 1957).

- Stictostroma** Höhn. (1917) ? = *Placuntium* fide Sherwood (*Mycotaxon* 5: 1, 1977).
- Stigeosporium** C. West (1916) ? = *Glomus* fide Gerdemann & Trappe (*Mycol. Mem.* 5, 1974).
- Stigmatogora** Trevis. (1853) = *Ocellularia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Stigmastoma** Bat. & H. Maia (1960) = *Pycnothyrium* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Stigmatea** Fr. (1849) = *Stigmea* Fr.
- Stigmateacites** S.L. Zheng & W. Zhang (1986), Fossil Fungi. 2, China.
- Stigmatella** Berk. & M.A. Curtis (1857) ? = *Chondromyces* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Stigmatella** Mudd (1861) = *Sclerophyton* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Stigmatellina** Bat. & H. Maia (1960), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, Belgium. See Batista & Maia (*Nova Hedwigia* 2: 474, 1960).
- Stigmateopsis** Bat. (1960) = *Placonema* fide Sutton (*Kew Bull.* 31: 461, 1977), Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993).
- Stigmatidium** G. Mey. (1825) = *Enterographa* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Stigmatisphaera** Dumort. (1822) nom. dub., *Pezizomycotina*. Used for diverse perithecioid fungi.
- Stigmatochroma** Marbach (2000), *Caliciaceae* (L). 7, widespread. See Marbach (*Bibliotheca Lichenol.* 74: 304, 2000).
- stigmatocyst**, see hyphopodium.
- Stigmatodothis** Syd. & P. Syd. (1914), *Micropeltidaceae*. 1, Philippines; Australia. See Reynolds & Gilbert (*Aust. Syst. Bot.* 18: 265, 2005; Australia).
- Stigmatolemma** Kalchbr. (1882) = *Resupinatus* fide Thorn *et al.* (*Mycol.* 97: 1140, 2005).
- Stigmatomassaria** Munk (1953) = *Splanchnonema* fide Barr (*Mycotaxon* 15: 349, 1982), Barr (*Mycotaxon* 46, 1993).
- Stigmatomma** Körb. (1855) = *Staurothele* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Stigmatomyces** H. Karst. (1869), *Laboulbeniaceae*. 135 (on *Diptera*), widespread. See Santamaría & Rossi (*An. Jard. bot. Madr.* 51: 33, 1993; Iberian spp.), Hedström (*MR* 98: 403, 1994; neotropics), Weir & Rossi (*MR* 99: 841, 1995; key Brit. spp.), Weir & Blackwell (*MR* 105: 1182, 2001; phylogeny), Hughes *et al.* (*Mycol.* 96: 834, 2004; New Zealand, New Caledonia), Rossi *et al.* (*MR* 109: 271, 2005; in amber), Rossi & Weir (*Mycol.* 99: 139, 2007).
- stigmatomycosis** (of cotton (*Gossypium*) bolls, *Phaseolus*, and other plants), damage caused by insect-inoculated fungi such as *Nematospora gossypii* and *N. coryli*. See Leach (*Insect transmission of plant diseases*, 1940), Frazer (*Ann. appl. Biol.* 31: 271, 1944).
- Stigmatopeltis** Doidge (1927) = *Vizella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Stigmatophragma** Tehon & G.L. Stout (1929), *Micropeltidaceae*. 1, N. America.
- stigmatopodium** (**stigmopodium**), see hyphopodium.
- Stigmatopsis** Traverso (1906) = *Cryptosphaeria* Ces. & De Not. fide Barr (*Mycol. Mem.* 7, 1978).
- Stigmatoscolia** Bat. & Peres (1960) = *Lophodermium* fide von Arx (*in litt.*).
- Stigmatula** (Sacc.) Syd. & P. Syd. (1901), *Phyllachoraceae*. Anamorph *Rhodosticta*. 10 (on *Leguminosae*), widespread (temperate). See Cannon (*Mycol. Pap.* 163, 1991), Cannon *in* McKey, D. & Sprent, J. (Eds) (*The Nitrogen Factor. Advances in Legume Systematics* 5: 179, 1994; coevolution), Cannon (*Mycopathologia* 135: 37, 1996).
- Stigme** Syd. & P. Syd. (1917) = *Dimerina* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Stigmea** Bonord. (1864) = *Dothiora* Fr. (1849) fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Stigmea** Fr. (1836), *Dothideomycetes*. 20, widespread.
- Stigmella** Lév. (1842), anamorphic *Pezizomycotina*, Cpd.#eP.1. 27, widespread. See Hughes (*Mycol. Pap.* 49, 1952).
- Stigmidium** Trevis. (1860), *Mycosphaerellaceae*. c. 75 (on lichens), widespread. See David & Hawksworth (*SA* 5: 158, 1986; posn), Roux & Triebel (*Bull. Soc. linn. Provence* 45: 451, 1994; key 17 spp.), Calatayud & Triebel (*Nova Hedwigia* 69: 439, 1999; Spain), Calatayud & Triebel (*Bibliotheca Lichenol.* 78: 27, 2001), Calatayud & Triebel (*Lichenologist* 35: 103, 2003), Roux & Triebel (*Mycotaxon* 91: 133, 2005; anatomy), Crous *et al.* (*Stud. Mycol.* 58: 1, 2007).
- Stigmina** Sacc. (1880) = *Pseudocercospora*. Polyphyletic, with species linked to diverse *Dothideomycetes*. See Philipson (*New Phytol.* 113: 127, 1989; ultrastr.), Sutton & Pascoe (*MR* 92: 210, 1989; taxonomic re-evaluation), Sutton (*Arnoldia* 14: 33, 1997), Crous *et al.* (*Mycol.* 93: 1081, 2001; phylogeny), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003), Braun & Crous (*Taxon* 55: 803, 2006; nomencl.).
- Stigmochora** Theiss. & Syd. (1914), *Phyllachoraceae*. 2 or 9 (living legume leaves), S. America. African species are not congeneric. See Cannon (*Mycol. Pap.* 163, 1991), Cannon (*Mycopathologia* 120: 61, 1992).
- Stigmopeltella** Syd. (1927) = *Stigmopeltis* fide Clements & Shear (*Gen. Fung.*, 1931).
- Stigmopeltis** Syd. (1927), anamorphic *Pezizomycotina*, Cpt.0fH.?. 2, C. America.
- Stigmopeltopsis** Peres (1961) = *Myxothyriopsis* fide von Arx (*in litt.*).
- Stigmopsis** Bubák (1914) = *Cheiromyces* fide Moore (*Mycol.* 50: 681, 1959).
- Stigonema** C. Agardh ex Bornet & Flahault (1887), *Algae*. *Algae*.
- stilbaceous** (obsol.), having synnemata; synnematous (q.v.).
- Stilbechrysomyxa** M.M. Chen (1984), *Coleosporiaceae*. 3 (on *Rhododendron* (II, III) (*Ericaceae*)), Asia. See Chen (*Forest Fungi Phytogeography, Forest Fungi Phytogeography of China, North America, and Siberia and International Quarantine of Tree Pathogens*: 495 pp., 2003) Probably belonging to *Chrysomyxa*.
- Stilbella** Lindau (1900) nom. cons., anamorphic *Hypocreales*, Hsy.0eH.15. c. 44 (from soil, coprophilous, on *Insecta*), widespread. See Morris (*Western Ill. Univ. Ser. biol. Sci.* 3, 1963), Benjamin (*Taxon* 17: 521, 1968), Sutton (*Mycol. Pap.* 132: 18, 1973), Seifert (*Stud. Mycol.* 27: 1, 1985; key), Seifert & Samuels (*Mycol.* 89: 512, 1997), Bischoff *et al.* (*Mycotaxon* 86: 433, 2003).
- Stilbellula** Boedijn (1951), anamorphic *Pezizomycotina*, Hsy.0eH.?. 1, Java. See Boedijn (*Sydowia* 5: 227, 1951), Seifert (*Mem. N. Y. bot. Gdn* 59: 109, 1990).
- Stilbites** Pia (1927), Fossil Fungi. 1 (Eocene), Baltic.

- Stilbochalara** Ferd. & Winge (1910) = *Chalara* fide Nag Raj & Kendrick (*Monogr. Chalara Allied Genera*, 1975).
- Stilbocrea** Pat. (1900), Bionectriaceae. Anamorphs *Stilbella*-like, *Acremonium*-like. 6 (dead plant tissues and fungal stromata), widespread. See Seifert (*Stud. Mycol.* 27, 1985), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Castlebury *et al.* (*MR* 108: 864, 2004; phylogeny).
- Stilbodendron** Syd. & P. Syd. (1916), anamorphic *Penicillioopsis*, Hsy.0eP.38. 1, Africa. See Hsieh & Ju (*Mycol.* 94: 539, 2002).
- Stilbodendrum** Bonord. (1851) = *Syzygites* fide Kirk (*in litt.*).
- Stilbohypoxyton** Henn. (1902), Xylariaceae. 10, widespread (esp. subtropical). See Læssøe (*SA* 13: 43, 1994; ? synonym of *Xylaria*), Rogers & Ju (*MR* 101: 135, 1997), Hladki & Romero (*Sydowia* 55: 65, 2003), Petrini (*Sydowia* 56: 51, 2004; revision), Ju *et al.* (*Mycol.* 99: 612, 2007; phylogeny).
- stilboid**, a sterile, basidioma-like structure (as in *Mycena citricolor* and other agarics) which functions as a propagule (Singer, 1962: 25); gemma (Buller). Cf. carpophoroid.
- Stilbomyces** Ellis & Everh. (1895) nom. dub., anamorphic *Pezizomycotina*. Based on hyphophores of a lichen. See Seifert (*Sydowia* 45: 103, 1993).
- Stilbonectria** P. Karst. (1889) = *Nectria* fide Rossman (*Mycol. Pap.* 150, 1983), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Stilbopeziza** Speg. (1908), ? Helotiales (?L). 1, S. America.
- Stilbophoma** Petr. (1942), anamorphic *Pezizomycotina*, St.0eH.15. 2, India; Africa. See Sutton (*The Coelomycetes*, 1980).
- Stilbospora** Pers. (1794), anamorphic *Pezizomycotina*, Cpd/Cac.≡ eP.19. 16, widespread.
- Stilbothamnium** Henn. (1896), anamorphic *Trichocomaceae*. See Thom & Raper (*Manual of the Aspergilli*, 1945), Roquebert & Nicot (*Advances in Penicillium and Aspergillus Systematics* 102: 221, 1985), Wicklow *et al.* (*Mycotaxon* 34: 249, 1989), Dupont *et al.* (*Modern Concepts in Penicillium and Aspergillus Classification* [NATO ASI Series A: Life Sciences] 185: 335, 1990), Hsieh & Ju (*Mycol.* 94: 539, 2002).
- Stilbotulasnella** Oberw. & Bandoni (1982), Cantharellales. 1, Hawaii. See Bandoni & Oberwinkler (*CJB* 60: 1875, 1982).
- Stilbum** Tode (1790), Chionosphaeraceae. c. 10, widespread (temperate). See Donk (*Taxon* 7: 236, 1958; typification), McLaughlin *et al.* (*Am. J. Bot.* 91: 808, 2004; phylogeny; cf. *Bensingtonia*).
- stilbum**, the erect synnema (q.v.) of *Stilbella* with its head of slime spores.
- stink horns**, basidiomata of certain *Phallales*.
- Stioclettia** Dennis (1975), Diaporthales. 1 (on *Luzula*), British Isles. See Dennis (*Kew Bull.* 30: 362, 1975).
- stipe**, a stalk (Fig. 4D, F-H).
- Stipella** L. Léger & M. Gauthier (1932), Legeriomycetaceae. 2 (in *Diptera*), Europe. See Moss (*TBMS* 54: 1, 1970), Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986), Nelder *et al.* (*Fungal Diversity* 22: 121, 2006; ecology and taxonomy), Valle (*Mycol.* 99: 442, 2007; Spain).
- Stipinella**, see *Stypinella*.
- stipitate**, stalked.
- Stipitochaete** Ryvarden (1985) = *Hymenochaete* fide Léger (*Biblthca Mycol.* 171: 1, 1998).
- Stipitocyphella** G. Kost (1998), Marasmiaceae. 1, Kenya. See Kost (*MR* 102: 505, 1998).
- Stipiza** Raf. (1815) nom. nud., Fungi. See Merrill (*Index Rafinesq.*, 1949).
- Stiptophyllum** Ryvarden (1973), Polyporaceae. 1, Brazil. See Ryvarden (*Norw. J. Bot.* 20: 4, 1973).
- Stirtonia** A.L. Sm. (1926), Arthoniaceae (L). c. 16, widespread (tropical). See Santesson (*Symb. bot. ups. sal.* 12 no. 1: 1, 1952), Makhija & Patwardhan (*Mycotaxon* 67: 287, 1998).
- Stirtoniella** D.J. Galloway, Hafellner & Elix (2005), Ramalinaceae (L). 1, Australasia. See Galloway *et al.* (*Lichenologist* 37: 263, 2005).
- Stirtoniopsis** Groenh. (1938) nom. inval., Arthoniales (L). 2, Java; Morocco.
- stock** (of basidiomycetes), a dikaryotic mycelium (fide Raper, 1966). Cf. strain.
- stolon**, a 'runner', as in *Rhizopus*.
- Stomatisora** J.M. Yen (1971) = *Chrysocelis* fide Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983).
- Stomatogene** Theiss. (1917), Parodiopsidaceae. 2, N. America. See Farr (*Mem. N. Y. bot. Gdn* 49: 70, 1989).
- Stomatogenella** Petr. (1955), Pezizomycotina. 1, Australia. See Petrak (*Sydowia* 9: 507, 1955).
- stomatopodium** (**stomopodium**), a hyphal branch (an appressorium; cf. hyphopodium) or 'plug' above or in a stoma.
- Stomiopeltella** Theiss. (1914) = *Stomiopeltis* fide von Arx & Müller (*Stud. Mycol.* 9, 1975), Reynolds & Gilbert (*Cryptog. Mycol.* 27: 249, 2006).
- Stomiopeltina** Bat. (1963) = *Metathyriella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Stomiopeltis** Theiss. (1914), Micropeltidaceae. Anamorph *Sirothyriella*. 25, widespread. See Batista (*Publções Inst. Micol. Recife* 56, 1959), Ellis (*TBMS* 68: 157, 1977; key Brit. spp.), Reynolds & Gilbert (*Aust. Syst. Bot.* 18: 265, 2005; Australia), Batzer *et al.* (*Mycol.* 97: 1268, 2005; phylogeny).
- Stomiopeltites** Alvin & M.D. Muir (1970), Fossil Fungi. 1 (Cretaceous), British Isles.
- Stomiopeltopsis** Bat. & Cavalc. (1963), Micropeltidaceae. 1, Brazil. See Batista & Cavalcanti (*Publções Inst. Micol. Recife* 392: 30, 1963), Ramaley (*Mycotaxon* 83: 327, 2002).
- Stomiotheca** Bat. (1959), Micropeitidaceae. 1, Brazil. See Batista (*Publções Inst. Micol. Recife* 56: 453, 1959).
- stone rag** (**stone raw**), *Parmelia saxatilis*.
- stone-fungus**, the hard pseudosclerotium of *Polyporus tuberaster*; *Pietraia fungaia*. On being watered, an edible basidioma is produced. The Canadian tuckahoe is the same species (Vanterpool & Macrae, *CJB* 29: 147, 1951).
- stopper**, the *Neurospora* phenotype characterized by irregular cycles of cessation and renewal of growth.
- Straggaria** Reinsch (1888) nom. dub., ? Fungi.
- strain** (1) a group of clonally related individuals or cells. See Yoder *et al.* (*Phytopath.* 76: 383, 1986); (2) a homokaryotic mycelium (fide Raper, 1966), cf. stock.
- Straminella** M. Choisy (1929) = *Lecanora* fide Brodo & Elix (*Biblthca Lichenol.* 53: 19, 1993).
- straminipile** (**straminopile**), colloquial noun for an organism bearing tripartite tubular hairs (Patterson, 1989).
- straminipilous** (**straminopilous**), bearing tripartite

- tubular hairs; applicable to flagella and/or cells, whether uniflagellate, multiflagellate or non-flagellate (the auxiliary cyst of *Saprolegnia* which bears a tuft of tripartite tubular hairs would be a straminipilous cyst), cf. flimmergeissel; -fungi, see *Chromista*, *Straminipila*.
- strand plectenchyma**, plectenchyma in strands forming supporting tissues in a lichen thallus.
- strangle fungus**, *Epichloë typhina*; see choke.
- Strangospora** Körb. (1860), Lecanorales (L). c. 10, widespread (north temperate). See Harris *et al.* (*Evansia* 5: 26, 1988; posn), Hafellner (*Cryptog. bot.* 5: 99, 1995), Reeb *et al.* (*Mol. Phylogen. Evol.* 32: 1036, 2004; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Strangulidium** Pouzar (1967) = *Oligoporus* fide Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974).
- Strasseria** Bres. & Sacc. (1902), anamorphic *Pezizomycotina*, St.0eH.15. 1, widespread. *S. geniculata* (black rot of apple). See Dennis (*Gdnrs' Chron.* 114: 221, 1943), Parmelee & Cauchon (*CJB* 57: 1660, 1979), Sutton (*The Coelomycetes*, 1980).
- Strasseriosis** B. Sutton & Tak. Kobay. (1970), anamorphic *Pezizomycotina*, St.1eH.15. 1, Japan. See Sutton & Kobayashi (*Mycol.* 61: 1068, 1969).
- Stratiphoromyces** Goh & K.D. Hyde (1998), anamorphic *Pezizomycotina*, Hso.?.?. 2, Brunei; Andaman Islands. See Goh & Hyde (*MR* 102: 1149, 1998).
- Stratisporella** Hafellner (1979), ? Patellariaceae. 1 (on lichens, *Tremotylum*), Angola. See Kutorga & Hawksworth (*SA* 15: 1, 1997).
- stratose thallus**, a lichen thallus having the tissue in horizontal layers.
- Strattonia** Cif. (1954), Lasiosphaeriaceae. 9 (coprophilous), widespread. See Lundqvist (*Symb. bot. upsal.* 20 no. 1, 1972; key), Barr (*Mycotaxon* 39: 43, 1990; posn), Abdullah *et al.* (*Nova Hedwigia* 69: 211, 1999), Huhndorf *et al.* (*Mycol.* 96: 368, 2004; phylogeny), Miller & Huhndorf (*Mol. Phylogen. Evol.* 35: 60, 2005; phylogeny), Cai *et al.* (*MR* 110: 359, 2006; phylogeny), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- straw mushrooms** (paddy straw or Chinese mushroom), the edible *Volvariella volvacea* and *V. diplasia*. These agarics are widely used in the tropics. In Myanmar, where *V. diplasia* is cultured, wet rice ('paddy') straw is made into a bed about 1 × 1 × 5 m which is inoculated with 'pure culture' spawn (cf. mushroom culture), and kept wet. Mushrooms are first seen after 2-3 weeks; 4 kg or so being obtained from one bed. An air temperature of at least 21°C is necessary. See Thet & Seth (*Indian Fmg* 1: 332, 1940), Chang (*Econ. Bot.* 31: 374, 1977), Sukara *et al.* (*Bull. BMS* 19: 129, 1985), Edible fungi.
- Streblema** Chevall. (1826) nom. dub., anamorphic *Xylariaceae*. 1, France. Composed only of stroma zone lines.
- Streblacaulium** Chevall. (1837) = *Conoplea* fide Kendrick & Carmichael in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 390, 1973).
- Streblomyces** Thaxt. (1920) = *Nycteromyces* fide Tavares (*Mycol. Mem.* 9, 1985).
- Streimannia** G. Thor (1991), Roccellaceae (L). 1, Australia. See Thor (*Op. bot.* 103: 84, 1991), Grube (*Bryologist* 101: 377, 1998).
- Strelitziana** Arzanlou & Crous (2006), anamorphic *Chaetothyriales*. 1, S. Africa. See Arzanlou & Crous (*Fungal Planet* no. 8: [1], 2006).
- Streptobotrys** Hennebert (1973), anamorphic *Streptotinia*, Hso.0eH.7. 3, N. America. See Hennebert (*Persoonia* 7: 191, 1973), Hong *et al.* (*Pl. Path. J.* 20: 192, 2004).
- Streptomyces** Waksman & Henrici (1943), Actinobacteria. q.v.
- streptomycin**, a broad spectrum aminoglycoside antibiotic produced by *Streptomyces griseus*. Active against *Mycobacterium tuberculosis*, staphylococci, some gram-negative bacteria, and inhibiting vegetative growth of some fungi.
- Streptopodium** R.Y. Zheng & G.Q. Chen (1978), anamorphic *Pleochaeta*, Hso.0eH.1. 5, widespread. See Zheng & Chen (*Acta Microbiol. Sin.* 18: 183, 1978), Saenz (*McIlvainea* 13: 33, 1998; phylogeny), Liberato *et al.* (*MR* 108: 1185, 2004; on *Carica*), Kiss *et al.* (*MR* 110: 1301, 2006).
- Streptosporangium** Couch (1955), Actinobacteria. q.v.
- Streptotheca** Vuill. (1887) = *Ascozonus* fide Bergman & Shanor (*Mycol.* 49: 879, 1957), Eckblad (*Nytt Mag. Bot.* 15: 1, 1968).
- Streptothrix** Corda (1839) = *Conoplea* fide Hughes (*CJB* 36: 727, 1958).
- Streptotinia** Whetzel (1945), Sclerotiniaceae. Anamorph *Streptobotrys*. 2, USA.
- Streptotrichites** Mesch. (1892), Fossil Fungi. 1 (Oligocene), Baltic.
- Streptovercillium** E. Bald. (1958), Actinobacteria. q.v.
- Striadiporites** C.P. Varma & Rawat (1963), Fossil Fungi. 3 (Tertiary), India; USA.
- Striadyadosporites** Dueñas (1979), Fossil Fungi. 2 (Pleistocene), Colombia.
- Striainaperturites** Y.K. Mathur (1966), Fossil Fungi. 1.
- Striatasclerotes** Stach & Pickh. (1957), Fossil Fungi. 1 (Carboniferous), Germany. See Stach & Pickhardt (*Palaeontologische Zeitschrift* 31: 140, 1957).
- striate**, marked with delicate lines, grooves or ridges (Fig. 20.13).
- Striatodecospora** D.Q. Zhou, K.D. Hyde & B.S. Lu (2000), Xylariaceae. 1, Hong Kong. See Zhou *et al.* (*Mycotaxon* 76: 141, 2000).
- Striatosphaeria** Samuels & E. Müll. (1979), Chaetosphaeriaceae. Anamorph *Dictyochaeta*. 1 (from dead wood), C. & S. America. See Samuels & Müller (*Sydowia* 31: 126, 1978), Réblová *et al.* (*Sydowia* 51: 49, 1999), Réblová (*Stud. Mycol.* 45: 149, 2000; review), Réblová & Winka (*Mycol.* 92: 939, 2000; phylogeny), Huhndorf *et al.* (*Mycol.* 96: 368, 2004; phylogeny), Fernández *et al.* (*Mycol.* 98: 121, 2006; phylogeny).
- Striatospora** I.V. Issi & Voronin (1986), Microsporidia. 1.
- Strickeria** Körb. (1865), *Pezizomycotina*. c. 9, widespread. See Wakefield (*TBMS* 24: 282, 1940), Eriksson (*SA* 10: 144, 1991).
- Stridiporosporites** Ke & Shi (1978), Fossil Fungi. 6 (Oligocene, Tertiary), China.
- Striglia** Adans. (1763) = *Daedalea* fide Donk (*Persoonia* 1: 284, 1960).
- Strigopodia** Bat. (1957), Euantennariaceae. Anamorphs *Antennatula*, *Capnophialophora*, *Hyphosoma*, *Racodium*. 3, widespread (temperate-boreal). See Hughes (*CJB* 46: 1009, 1968), Reynolds (*Mycotaxon* 27: 377, 1986).
- strigose**, rough with sharp-pointed hairs; hispid.
- Strigula** Fr. (1823), Strigulaceae (L). Anamorph *Dis-*

- cosiella*. c. 118 (many foliicolous), widespread (esp. tropical). See Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952; foliicolous spp.), Margot (*Lichenologist* 9: 51, 1977; host relationship), Nag Raj (*CJB* 59: 2519, 1981; asci, pycnidia), Hawksworth (*Taxon* 35: 787, 1986; nomencl.), McCarthy *et al.* (*Lichenologist* 28: 239, 1996), McCarthy (*Lichenologist* 29: 513, 1997), Sérusiaux (*Bryologist* 101: 147, 1998), Aptroot & Lücking (*MR* 105: 510, 2001; on ferns), Roux *et al.* (*Bibliotheca Lichenol.* 90: 96 pp., 2004), Schmitt *et al.* (*Mycol.* 97: 362, 2005; phylogeny), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny), Tretiach & Rinaldi (*Nova Hedwigia* 83: 451, 2006), Aptroot *et al.* (*Bibliotheca Lichenol.* 97, 2008; Costa Rica).
- Strigulaceae** Zahlbr. (1898), Chaetothyriomycetidae (inc. sed.) (L). 4 gen. (+ 22 syn.), 123 spp.
Lit.: Lücking (*Nova Hedwigia* 52: 267, 1991), Lücking & Lücking (*Herzogia* 11: 143, 1995), Huhndorf & Harris (*Brittonia* 48: 551, 1996), McCarthy *et al.* (*Lichenologist* 28: 239, 1996), Lücking *et al.* (*Lichenologist* 30: 121, 1998), Sérusiaux (*Bryologist* 101: 147, 1998), Roux *et al.* (*Bibliotheca Lichenol.* 90: 96 pp., 2004), Schmitt *et al.* (*Mycol.* 97: 362, 2005).
- Strigulomyces** Cif. & Tomas. (1953) = *Strigula* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Strilia** Gray (1821) = *Coltricia* fide Parmasto (*in litt.*) See, Donk (*Verh. K. ned. Akad. Wet.* tweede sect. 62: 49, 1974).
- Striodiplodia** Zambett. (1955) nom. inval. = *Lasioidiplodia* fide Sutton (*Mycol. Pap.* 141, 1977), Verkley & Aa (*Mycotaxon* 65: 113, 1997).
- Strionemadiplodia** Zambett. (1955) nom. inval., anamorphic *Pezizomycotina*, Cpd.1eP.?. 3, widespread. See Zambettakis (*BSMF* 70: 233, 1954), Verkley & Aa (*Mycotaxon* 65: 113, 1997).
- Striosphaeropsis** Verkley & Aa (1997), anamorphic *Pezizomycotina*, Cpd.?.?. 1, Papua New Guinea. See Verkley & Aa (*Mycotaxon* 65: 115, 1997).
- strobiliform**, like a fir-cone in form.
- Strobilofungus** Lloyd (1915) = *Boletellus* fide Singer (*Farlowia* 2: 223, 1945).
- Strobilomyces** Berk. (1851), Boletaceae. c. 20, cosmopolitan. See Ying & Ma (*Acta Mycol. Sin.* 4: 95, 1985; China), Lakhanpal & Sharma (*Kavaka* 16: 27, 1988; NW Himalaya), Watling *et al.* (*British Fungus Flora. Agarics and Boleti* Rev. & Enl. Edn 1: 173 pp., 2005; Brit. sp.).
- Strobilomycetaceae** E.-J. Gilbert (1931) = Boletaceae.
- Strobiloscypha** N.S. Weber & Denison (1995), *Pezizales*. 1, USA. Perhaps a member of the *Sarcosomataceae*, but molecular data do not clearly support this. See Weber & Denison (*Mycotaxon* 54: 129, 1995), Harrington *et al.* (*Mycol.* 91: 41, 1999; phylogeny), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny).
- Strobilurus** Singer (1962), Physalacriaceae. 10, widespread (temperate). See Redhead (*CJB* 58: 68, 1980).
- stroma** (pl. **stromata**), a mass or matrix of vegetative hyphae, with or without tissue of the host or substrate, sometimes sclerotium-like in form, in or on which spores or fruit bodies bearing spores are produced. Many ascomycetes (esp. *Xylariales*) and anamorphic fungi have stromata; a few *Pucciniales* and other fungi. **ecto-** (**epi-**, **Fuisting**), a -, normally conidial, formed in the periderm and frequently breaking through the bark; **endo-** (**ento-**) (**hypho-**, **Fuist-**ing), a perithecial - formed under the **ecto-**; **eu-**, one of fungal tissue only (Fig. 10P-R); **pseudo-** see under pseudostroma. Ruhland's name for the ostiolar disc is **placodium**, forms (as in *Diatrype*) from the **endo-** being **ento-placodial**, those (at least in part) from the **ecto-** being **ecto-placodial**. A species having ecto- and endo- is **diplostromatic**; one with only one **haplostromatic**. See Miller (*Mycol.* 20: 188, 1928). Cf. sclerotium.
- Stromaster** Höhn. (1930), Phyllachoraceae. 1, S. America. Affinities are uncertain. See Petrak (*Sydowia* 5: 354, 1951).
- Stromatella** Henssen (1989), Lichinaceae (L). 1, Bermuda. See Henssen (*Lichenologist* 21: 111, 1989), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key).
- Stromateria** Corda (1837) = *Tubercularia* Tode fide Saccardo (*Syll. fung.* 4: 646, 1886).
- Stromatinia** (Boud.) Boud. (1907), Sclerotiniaceae. Anamorph *Sclerotium*. 7, Europe; N. America. See Schumacher (*Agarica* 5: 111, 1984), Holst-Jensen *et al.* (*Mycol.* 89: 885, 1997; phylogeny).
- Stromatocrea** W.B. Cooke (1952), anamorphic *Hypocreopsis*, Hsp.0eH.15. 1, USA. See Petrak (*Sydowia* 6: 336, 1952), Cauchon & Quellette (*Mycol.* 56: 453, 1964).
- Stromatocyphella** W.B. Cooke (1961), Marasmiaceae. 3, N. America. See Cooke (*Beih. Sydowia* 4: 104, 1961).
- Stromatographium** Höhn. (1907), anamorphic *Fluviostroma*, Hsy.0eP.15. 1, widespread (tropical). The genus is polyphyletic; some species are referable to the *Diaporthales*. See Seifert (*CJB* 65: 2196, 1987), Okada *et al.* (*CJB* 76: 1495, 1998; 18S rDNA), Verkley (*Mycol.* 93: 205, 2001), Decock *et al.* (*Antonie van Leeuwenhoek* 88: 231, 2005; phylogeny).
- stromatolites** (lichen), laminar calcretes formed abiotically in rock and sometimes wrongly interpreted as fossils (Klappa, *Sediment. Petrol.* 49: 387, 1979).
- Stromatoneurospora** S.C. Jong & E.E. Davis (1973), Xylariaceae. 2, widespread (tropical). See Dennis (*Revista Biol.* 1: 175, 1958), Jong & Davis (*Mycol.* 65: 458, 1973), Rogers *et al.* (*Mycol.* 84: 166, 1992).
- Stromatopogon** Zahlbr. (1897), anamorphic *Pezizomycotina*, Cpd.#eH.?15. 3 (on lichens, *Usnea*), Australia. See Diederich (*Lichenologist* 24: 371, 1992; re-descr.), Diederich & Sérusiaux (*Bibliotheca Lichenol.* 86: 103, 2003), Etayo & Breuss (*Öst. Z. Pilzk.* 13: 277, 2004).
- Stromatopycnis** A.F. Vital (1956), anamorphic *Pezizomycotina*, Cpd.0eH.?. 1, Brazil. See Vital (*Publicações Inst. Micol. Recife* 15: 5, 1956).
- Stromatoscypha** Donk (1951) = *Porothelium*.
- Stromatoscyphaceae** Jülich (1982) nom. illegit. = *Schizophyllaceae*.
- Stromatosphaeria** Grev. (1824) nom. rej. = *Daldinia*.
- Stromatostilbella** Samuels & E. Müll. (1980) = *Stromatographium* fide Seifert (*CJB* 65: 2196, 1987).
- Stromatostysanus** Höhn. (1919), anamorphic *Pezizomycotina*, Hsy.0eH.?. 1, Europe. See Braun (*Sydowia* 45: 81, 1993).
- Stromatothecia** D.E. Shaw & D. Hawksw. (1971), Odontotremataceae. 1 (on *Nothofagus*), Papua New Guinea. See Shaw & Hawksworth (*Proc. Papua New Guinea Sci. Soc.* 22: 24, 1971), Sherwood-Pike (*Mycotaxon* 28: 137, 1987).
- Stromatothelium** Trevis. (1861), ? Pyrenulales (L). 4, widespread (tropical).
- Stromne** Clem. (1909) = *Engleromyces*.

- Strongwellsea** A. Batko & Weiser (1965), Entomophthoraceae. 2, USA. See Batko & Weiser (*J. Invert. Path.* 7: 455, 1965), Weiser & Batko (*Folia Parasit.* 13: 144, 1966), Humber (*Mycol.* 68: 1042, 1976; emend., key), Remaudière & Keller (*Mycotaxon* 11: 323, 1980; syn. of *Erynia*), Humber (*Mycotaxon* 15: 167, 1982), Eilenberg *et al.* (*Entomophaga* 37: 65, 1992; isolation), Eilenberg & Michelsen (*J. Invert. Path.* 73: 189, 1999; host range), Keller & Petrini (*Sydowia* 57: 23, 2005; key), Keller (*Sydowia* 59: 75, 2007; Switzerland, n.sp.).
- Strongyleuma** Vain. (1927) = *Chaenothecopsis* fide Tibell (*Beih. Nova Hedwigia* 79: 597, 1984).
- Strongylium** (Ach.) Gray (1821) = *Calicium* fide Tibell (*Beih. Nova Hedwigia* 79: 597, 1984).
- Strongyloopsis** Vain. (1927) = *Microcalicium* fide Tibell (*Bot. Notiser* 131: 229, 1978).
- Strongylothallus** Bat. & Cif. (1959), anamorphic *Pezizomycotina*, Cpt.-.-. 1, Brazil. See Batista & Ciferri (*Mycopath. Mycol. appl.* 11: 97, 1959).
- Stropharia** (Fr.) Quél. (1872) = *Psilocybe* (Fr.) P. Kumm. fide Kuyper (*in litt.*).
- Strophariaceae** Singer & A.H. Sm. (1946), Agaricales. 18 gen. (+ 46 syn.), 1316 spp.
Lit.: Fogel (*Mycol.* 77: 72, 1985), Pegler & Young (*Notes R. bot. Gdn Edinb.* 44: 437, 1987), Watling & Gregory (*British Fungus Flora* 5, 1987), Jacobsson (*Windahlia* 19: 1, 1990), Bougher & Castellano (*Mycol.* 85: 285, 1993), Johnston & Buchanan (*N.Z. J. Bot.* 33: 379, 1995), Holec (*Mykol. Listy* 57: 1, 1996), Bresinsky & Binder (*Z. Mykol.* 64: 79, 1998), Kytövuori (*Karstenia* 39: 11, 1999), Reijnders (*MR* 104: 900, 2000), Bougher & Lebel (*Aust. Syst. Bot.* 14: 439, 2001), Peintner *et al.* (*Am. J. Bot.* 88: 2168, 2001), Binder & Bresinsky (*Mycol.* 94: 85, 2002), Boekhout *et al.* (*MR* 106: 1251, 2002), Moncalvo *et al.* (*Mol. Phylogen. Evol.* 23: 357, 2002), Bon & Roux (*Docums Mycol.* 33: 3, 2003), Cléménçon & Roffler (*Mycol. Progr.* 2: 235, 2003), Matsumoto *et al.* (*Mycoscience* 44: 197, 2003), Francis & Bougher (*Australasian Mycologist* 23: 1, 2004), Guzmán & Kasuya (*Mycoscience* 45: 295, 2004), Peintner *et al.* (*Mycol.* 96: 1042, 2004), Walther *et al.* (*MR* 109: 525, 2005), Matheny *et al.* (*Mycol.* 98: 982, 2006; phylogeny), Moreau *et al.* (*Mol. Phylogen. Evol.* 38: 794, 2006).
- Stropholoma** (Singer) Balletto (1989) nom. inval. = *Psilocybe* (Fr.) P. Kumm. fide Kuyper (*in litt.*).
- Strossmayeria** Schulzer (1881), Helotiaceae. Anamorph *Pseudospiropes*. 16, widespread. See Iturriaga & Korf (*Mycotaxon* 36: 119, 1990; monogr.), Hosoya (*Memoirs of the National Science Museum Tokyo* 34: 241, 2000; Japan).
- Strumella** Fr. (1849), anamorphic *Urnula*, Hsp.0eP.?. 8, widespread. *S. coryneoidea*, canker of oak (*Quercus*) and sometimes of other trees. See Wolf (*Mycol.* 50: 837, 1959).
- Strumelloopsis** Höhn. (1909), anamorphic *Pezizomycotina*, St.0eP.?. 2, Java.
- Stuartella** Fabre (1879), Dothideomycetes. Anamorph *Bactrodesmium*. 3, Europe; N. America. See LaFlamme & Müller (*Sydowia* 29: 278, 1977), Funk & Shoemaker (*CJB* 61: 2277, 1983).
- stuffed** (of a stipe), having the inside of a different structure from that of the outer layer (Fig. 4F).
- stupose**, of tissue formed from hyphae which are not gelatinized.
- Stygiomyces** Coppins & S.Y. Kondr. (1995), anamorphic *Pezizomycotina*, Cpd.0fH.15. 1 (on *Pseudocyphellaria*), Tasmania. See Coppins & Kondratyuk (*Edinb. J. Bot.* 52: 229, 1995).
- Stylaspergillus** B. Sutton, Alcorn & P.J. Fisher (1982), anamorphic *Pezizomycotina*, Hso.0fH.15. 1, widespread. Synanamorph *Parasymphodiella*. See Tokumasu (*TMSJ* 28: 19, 1987).
- Stylina** Syd. (1921), Graphiolaceae. 1 (on *Livistona*), China.
- Stylobates** Fr. (1837) nom. dub., Agaricales.
- Stylodothis** Arx & E. Müll. (1975), Dothideaceae. 2, widespread. See von Arx & Müller (*Stud. Mycol.* 9: 11, 1975), Lumbsch & Lindemuth (*MR* 105: 901, 2001; phylogeny), Lumbsch *et al.* (*Mol. Phylogen. Evol.* 34: 512, 2005; phylogeny), Prado *et al.* (*MR* 110: 511, 2006; phylogeny), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Styloletendrea** Weese (1924) nom. nud. = *Nectria*. Anamorph name. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Stylonectria** Höhn. (1915) = *Cosmospora* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Stylonectriella** Höhn. (1915) ? = *Nectriella* Nitschke ex Fuckel fide Sutton (*Mycol. Pap.* 141, 1977).
- Stylopage** Drechsler (1935), Zoopagaceae. 17, widespread. See Drechsler (*Mycol.* 27: 197, 1935), Drechsler (*Mycol.* 27: 206, 1935), Drechsler (*Mycol.* 28: 241, 1936), Drechsler (*Mycol.* 30: 137, 1938), Drechsler (*Mycol.* 31: 388, 1939), Drechsler (*Mycol.* 37: 1, 1945), Drechsler (*Mycol.* 40: 85, 1948), Duddington (*Ann. Bot. Lond.* 17: 127, 1953), Duddington (*Mycol.* 47: 245, 1955), Peach & Juniper (*TBMS* 38: 431, 1955), Dyal (*Sydowia* 27: 293, 1976; keys parasites of nematodes and amoebae, bibliogr.), Wood (*TBMS* 80: 368, 1983), Saikawa (*Mycol.* 78: 309, 1986; ultrastr.), Blackwell & Malloch (*Mycol.* 83: 360, 1991; life history), Mo & Bi (*Mycosystema* 20: 129, 2001; China).
- stylospore** (1) a spore on a pedicel or hypha, esp. a urediniospore (obsol.); (2) an elongated pycnidiospore (obsol.); (3) the sporangium (the 'Stielgemmen' of Linnemann, 1941) of *Mortierella*.
- Stypella** Möller (1895), Auriculariales. 4, widespread. See Martin (*Stud. nat. Hist. Univ. Iowa* 16: 143, 1934), Donk (*Persoonia* 4: 241, 1966), Roberts (*Mycotaxon* 69: 209, 1998; key), Weiss & Oberwinkler (*MR* 105: 403, 2001; phylogeny).
- Stypinella** J. Schröt. (1888) = *Helicobasidium*.
- Stysanopsis** Ferraris (1909) = *Cephalotrichum* Link fide Hughes (*CJB* 36: 727, 1958).
- Stysanus** Corda (1837) = *Cephalotrichum* Link fide Hughes (*CJB* 36: 727, 1958).
- suaveolent**, having a sweet smell.
- sub-** (prefix), under; below; frequently in the sense of approximating to the condition qualified, slightly, somewhat.
- Subbaromyces** Hesselt. (1953), ? Pleosporales. Anamorph *Hyalobelelemnospora*. 2 (on filter beds), N. America; India. See Cole *et al.* (*CJB* 52: 2453, 1974; development, ultrastr.), Malloch & Blackwell (*CJB* 68: 1712, 1990), Blackwell *et al.* (*Mycol.* 95: 987, 2003; phylogeny).
- subcentric**, see centric.
- subcutis**, see cutis.
- subglobose**, not quite spherical (Fig. 23.1).
- subhymenium**, generative tissue below the hymenium; sometimes used as equivalent to medullary exciple or hypothecium.

- Subhysteropycnis** Wedin & Hafellner (1998), anamorphic *Arthonia*, Cpd.?? (L). 1, Chile. See Wedin & Hafellner (*Lichenologist* 30: 69, 1998).
- Subicularium** M.L. Farr & Goos (1989), anamorphic *Pezizomycotina*, Hsp.#eP.1. 1, Venezuela. See Eriksson (*SA* 8: 77, 1989).
- Subiculicola** Speg. (1924) = *Melioliphila* fide Rossman (*Mycol. Pap.* 157, 1987).
- subiculum** (subicule), a net-, wool-, or crust-like growth of mycelium under fruit-bodies.
- Submersisphaeria** K.D. Hyde (1996), *Annulatascaeae*. 5 (submerged wood), Australia. See Hyde (*Nova Hedwigia* 62: 171, 1996), Wong *et al.* (*SA* 16: 17, 1998), Campbell *et al.* (*Mycol.* 95: 41, 2003; phylogeny), Pinnoi *et al.* (*Sydowia* 56: 72, 2004; key).
- suboperculate**, see ascus.
- Subramanella** H.C. Srivast. (1962) = *Phomopsis* (Sacc.) Bubák. fide Sutton (*Mycol. Pap.* 141, 1977).
- Subramania** D. Rao & P. Rag. Rao (1964), anamorphic *Pezizomycotina*, Hso.0eP.3. 1, India. See Rao & Rao (*Trans. Am. microsc. Soc.* 83: 403, 1964).
- Subramanianospora** Narayanan, J.K. Sharma & Minter (2003), anamorphic *Pezizomycotina*. 1, India. See Narayanan *et al.* (*Indian Phytopath.* 56: 160, 2003).
- Subramaniomyces** Varghese & V.G. Rao (1980), anamorphic *Pezizomycotina*, Hso.0eP.3. 3, India. See Varghese & Rao (*Kavaka* 7: 83, 1979), Crous *et al.* (*MR* 110: 264, 2006).
- Subramaniula** Arx (1985), *Chaetomiaceae*. 2, S. Africa; India. See von Arx (*Proc. Indian Acad. Sci. Pl. Sci.* 94: 341, 1985), Cannon (*TBMS* 86: 56, 1986; key), von Arx *et al.* (*Beih. Nova Hedwigia* 94, 1988).
- substrate** (substratum), although these two terms are frequently treated as synonyms by mycologists both have useful special senses: (1) **substrate**: (in enzymology) is applied to the substance on which an enzyme acts and in microbiology to the substances (e.g. culture medium constituents) utilized by a microorganism for growth in distinction to the material; (2) **substratum** (pl. **substrata**): (in ecology), the material on which an organism is growing or to which it is attached.
- substroma**, pseudostroma (q.v.) in which the vegetative hyphae of the host predominate (Johnston, *Ann. Mo. bot. Gdn* 27: 31, 1940).
- Subulariella** Höhn. (1915) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- subulate**, slender and tapering to a point; awl-shaped (Fig. 23.34).
- Subulicium** Hjortstam & Ryvarden (1979), *Hymenochaetales*. 3, widespread (north temperate). See Hjortstam & Ryvarden (*Mycotaxon* 9: 511, 1979).
- Subulicystidiaceae** Jülich (1982) = *Hyphodermataceae*.
- Subulicystidium** Parmasto (1968), *Hydnodontaceae*. Anamorph *Aegeritina*. 7, widespread. See Jülich (*Persoonia* 8: 187, 1975), Duhem & Michel (*Cryptog. Mycol.* 22: 163, 2001).
- Subulispora** Tubaki (1971), anamorphic *Pezizomycotina*, Hso.0fH.10. 12, widespread (north temperate). See Sutton (*TBMS* 71: 167, 1978), de Hoog (*Stud. Mycol.* 26: 54, 1985; key), Castañeda Ruiz *et al.* (*Mycotaxon* 67: 9, 1998), Marvanová & Laichmanová (*Fungal Diversity* 26: 241, 2007; key).
- subuniversal veil**, see protoblem.
- Sucinaria** Syd. (1925) = *Coccodiella* fide Müller & von Arx in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 87, 1973).
- Sufa** Adans. (1763) = *Lycoperdon* Pers. fide Mussat (*Syll. fung.* 15: 408, 1901).
- sufu** (Chinese cheese), an oriental food composed of *Actinomucor* or *Mucor* fermented soybeans (Hesseltine, *Mycol.* 57: 164, 1965, *Mycologist* 5: 162, 1991); see Fermented food and drinks.
- sugar fungus**, a fungus attacking decaying substances and only able to utilize simple sugars, amino acids, and other relatively simple organic compounds (Thom & Morrow, *J. Bact.* 33: 77, 1937).
- Sugiyamaella** Kurtzman & Robnett (2007), *Trichomonascaceae*. 1. See Kurtzman (*FEMS Yeast Res.* 7: 1046, 2007; from forests), Kurtzman & Robnett (*FEMS Yeast Res.* 7: 141, 2007).
- Sugiyamaemyces** I.I. Tav. & Balazuc (1989), *Laboulbeniaceae*. 1, Borneo. See Tavares & Balazuc (*Mycotaxon* 34: 566, 1989).
- Suillaceae** Besl & Bresinsky (1997), *Boletales*. 3 gen. (+ 15 syn.), 54 spp.
Lit.: Samson & Fortin (*Mycol.* 80: 382, 1988), Baura *et al.* (*Mycol.* 84: 592, 1992), Bruns *et al.* (*Mol. Ecol.* 7: 257, 1998), Dahlberg & Finlay (*Ectomycorrhizal Fungi*: 33, 1999), Noordeloos (*Coolia* 43: 1, 2000), Noordeloos (*Coolia* 43: 75, 2000), Manian *et al.* (*FEMS Microbiol. Lett.* 204: 117, 2001), Binder & Hibbett (*Mol. Phylogen. Evol.* 22: 76, 2002), Moncalvo *et al.* (*Mol. Phylogen. Evol.* 23: 357, 2002), Ding & Wen (*Nova Hedwigia* 76: 459, 2003), Muller *et al.* (*Mol. Ecol.* 16: 165, 2006).
- Suillellus** Murrill (1909) = *Boletus* Fr. fide Singer (*Farlowia* 2: 223, 1945).
- Suillosporium** Pouzar (1958), *Botryobasidiaceae*. 2, Europe; N. America. See Eriksson *et al.* (*Cortic. N. Europ.* 7, 1984), Langer & Langer (*Frontiers in Basidiomycote Mycology*: 303, 2004; Ecuador).
- Suillus** (Haller) Kuntze (1898) = *Boletus* Fr. fide Stalpers (*in litt.*).
- Suillus** Gray (1821), *Suillaceae*. 50 (associated with conifers), widespread (north temperate; introduced in southern hemisphere). See Pantidou & Groves (*CJB* 44: 1371, 1966; cultural studies), Thiers (*Beih. Nova Hedwigia* 51, 1975; key N. Am. spp.), Bruns & Palmer (*J. Mol. Evol.* 28: 349, 1989; evolution), Baura *et al.* (*Mycol.* 84: 592, 1992; gastroid form), Engel (*Schmier- und Filzröhrlinge s.l. in Europe*, 1996; key Eur. spp.), Kretzer *et al.* (*Mycol.* 88: 776, 1996; taxonomy, phylogeny), Kretzer & Bruns (*Mycol.* 89: 586, 1997; gastroid form), Dahlberg & Finlay (*Suillus – Ectomycorrhizal fungi, key genera in profile*, 1999; ecology), Wu *et al.* (*Mol. Phylog. Evol.* 17: 37, 2000; phylogeny, biogeography), Consiglio (*Rivista di Micologia* 44: 99, 2001), Estades & Lannoy (*Bulletin Mycologique et Botanique Dauphiné-Savoie* 44: 3, 2004; European spp.), Šutara (*Czech Mycol.* 57: 1, 2005; Central European genera), Watling *et al.* (*British Fungus Flora. Agarics and Boleti Rev. & Enl. Edn* 1: 173 pp., 2005; British spp.).
- Suillus** P. Karst. (1882) ≡ *Gyroporus*.
- Suillus** P. Micheli ex Adans. (1763) = *Boletus* Fr. fide Donk (*Persoonia* 8: 279, 1975).
- Sulcaria** Bystrek (1971), *Parmeliaceae* (L). 3, Asia; USA. See Brodo & Hawksworth (*Op. bot. Soc. bot. Lund* 42, 1977), Awasthi & Awasthi (*Candollea* 40: 305, 1985; India, Nepal), Brodo (*Mycotaxon* 27: 113, 1986; USA), Peterson *et al.* (*Bryologist* 101: 112, 1998; USA), Obermayer & Elix (*Bibliotheca Lichenol.*

86: 33, 2003; Tibet, chemistry).

sulcate, grooved.

Sulcatisclerotes Beneš (1959), Fossil Fungi. 2 (Carboniferous), former Czechoslovakia.

Sulcatistroma A.W. Ramaley (2005), Calosphaeriales. 1, USA. See Ramaley (*Mycotaxon* 93: 140, 2005).

Sulcispora, see *Sulcospora*.

Sulcospora Shoemaker & C.E. Babcock (1989), Phaeosphaeriaceae. 1, Europe. See Shoemaker & Babcock (*CJB* 67: 1500, 1989).

Sulcopyrenula H. Harada (1999), Pyrenulaceae. 4, widespread. See Harada (*Lichenologist* 31: 567, 1999).

Sulcospora Kohlm. & Volkm.-Kohlm. (1993) ≡ *Arop-siclus*.

sulcus, a furrow or groove.

sulphur polypore (sulphur shelf-mushroom), basidioma of the edible *Laetiporus sulphureus*.

Sulphurina Pilát (1953) = *Lindtneria* fide Hjortstam (*in litt.*).

summer spore, a spore germinating without resting, frequently living only a short time; cf. resting spore.

Sungaicola Fryar & K.D. Hyde (2004), Sordariomycetes. 1, Brunei. See Fryar & Hyde (*Cryptog. Mycol.* 25: 250, 2004).

super- (prefix), above; used in combination with the names of taxonomic categories to give additional ranks in (e.g. superfamily); only recently permitted under the botanical Code.

superficial, on the surface of the substratum.

superior (of an annulus), near the top of the stipe.

supine (of fructifications), closely applied to the substratum.

supra- (prefix), above; **-generic**, all taxonomic ranks above that of genus; **-specific**, all taxonomic ranks above that of species; also used at other ranks of the hierarchy; cf. *infra-*.

suprahilar plage (of basidiospores, esp. of *Lactarius* and *Russula*), the area above the hilar appendage on which the eusporial ornamentation is lacking or reduced (Kühner, 1926).

surculicolous (of *Exobasidium* infections), monocarpic (q.v.) and systemic in annual shoots (Nannfeldt, 1981).

Surculiseries Okane, Nakagiri & Tad. Ito (2001), anamorphic *Pezizomycotina*. 1, Japan. See Okane *et al.* (*Mycoscience* 42: 116, 2001).

surfactant, an agent which reduces the surface tension of a liquid, e.g. detergent.

suscept, a living organism which is **susceptible** to (able to be attacked by; non-immune to) a given disease, pathogen, or toxin.

suspensor, a hypha supporting a gamete, gametangium, or esp. a zygospore (Fig. 27C).

Sutravarana Subram. & Chandrash. (1977), anamorphic *Pezizomycotina*, Hsy.0eH.10. 1, India. See Subramanian & Chandrashekhara (*CJB* 55: 251, 1977).

Suttonia S. Ahmad (1961) [non *Suttonia* A. Rich. 1832, *Myrsinaceae*] ≡ *Suttoniella*.

Suttoniella S. Ahmad (1961), anamorphic *Pezizomycotina*, St.1bH.16. 3, Asia; Australia. See Sutton (*TBMS* 59: 285, 1972), Punithalingam (*MR* 107: 917, 2003; cytology), Hoyo & Gómez-Bolea (*Mycotaxon* 89: 39, 2004).

Suttonina H.C. Evans (1984), anamorphic *Pezizomycotina*, Cac.1 ≡ eP.38. 1, Guatemala. See Evans (*Mycol. Pap.* 153: 92, 1984).

Svrcekia Kubička (1960) = *Boudiera* Cooke fide Dissing (*SA* 6: 153, 1987).

Svrcekomyces J. Moravec (1976) = *Pseudombrophila* fide van Brummelen (*Libri Botanici* 14: 1, 1995).

Swampomyces Kohlm. & Volkm.-Kohlm. (1987), Hypocreomycetidae. 2, pantropical. See Hyde & Nakagiri (*Sydowia* 44: 122, 1992), Read *et al.* (*MR* 99: 1465, 1995; ultrastr.), Abdel-Wahab *et al.* (*Fungal Diversity* 8: 35, 2001; Egypt), Sakayaroj *et al.* (*Bot. Mar.* 48: 395, 2005; phylogeny), Schoch *et al.* (*MR* 111: 154, 2007; phylogeny).

swarm-cell (of *Mycetozoa* and some *Chytridiales*), a motile cell acting, before or after division, as an isogamete.

swarm-spore (swarmer), see zoospore.

Syamithabeeja Subram. & Natarajan (1976), anamorphic *Pezizomycotina*, Hso.0eH.18. 1, India. See Subramanian & Natarajan (*Mycol.* 67: 1213, 1975).

Sychnoblastia Vain. (1921) = *Thelopsis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Sychnogonia Körb. (1855) nom. rej. = *Muellerella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Sychnogonia Trevis. (1860) [non *Sychnogonia* Körb. 1855] = *Thelopsis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

sycosis, a fungus disease of the hair follicles; esp. of the face; ringworm of the beard.

Sydow (Hans; 1879-1946; Germany). Son of P. Sydow (q.v.); employed at the Dresden Bank, Berlin (1904-1937); collected in Costa Rica (1924-1925), Venezuela (1927-1928) and Ecuador (1937-1938). An amateur; founder and Editor *Annales Mycologici* (1903-1944); in addition to works produced with his father, contributed greatly to development of mycotas particularly in Central and South America. *Publs.* (with P. Sydow) *Mycotheca Germanica* (1903-1942) [exsiccati, nos 1-550 issued jointly with P. Sydow]; *Monographia Uredinearum* (1902-1924). *Biogs, obits etc.* Grummann (1974: 49); Petrak (*Sydowia* 2: 1, 1948 [portrait]); Stafleu & Cowan (*TL-2* 6: 129, 1986).

Sydow (Paul; 1851-1925; Germany). Schoolmaster, Berlin; father of H. Sydow (q.v.). Major contributions to information handling in mycology through indexes and catalogues; with his son, the author of many works describing new species of ascomycetes, rusts and smuts. *Publs.* *Die Flechten Deutschlands* (1887); Index vols (12-13) to Saccardo's *Sylloge*; (with Lindau) *Thesaurus Literaturae Mycologicae* (1908-1918); *Uredineen* (1888-1924) [exsiccati]; *Ustilagineen* (1894-1915) [exsiccati]; (with H. Sydow, q.v.) *Monographia Uredinearum* (1902-1924). *Biogs, obits etc.* Stafleu & Cowan (*TL-2* 6: 132, 1986).

Sydowia Bres. (1895), Dothioraceae. Anamorphs *Dothichiza*, *Sclerophoma*, *Hormonema*-like. 10, Europe; N. America. See Barr (*Contr. Univ. Mich. Herb.* 9: 523, 1972), Froidevaux (*Nova Hedwigia* 23: 679, 1973), Funk & Finck (*CJB* 66: 212, 1988), Yurlova *et al.* (*Stud. Mycol.* 43: 63, 1999; DNA), Barr (*Harvard Pap. Bot.* 6: 25, 2001), Goodwin *et al.* (*Phytopathology* 91: 648, 2001; phylogeny), Tsuneda *et al.* (*Mycol.* 96: 1128, 2004; phylogeny), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).

Sydowiella Petr. (1923), Sydowiellaceae. 3 (from bark), Europe; N. America. See Barr (*Mycotaxon* 41: 287, 1991), Rossman *et al.* (*Mycoscience* 48: 135,

- 2007; review).
- Sydowiellaceae** Lar.N. Vassiljeva (1987), Diaporthales. 7 gen., 17 spp. Further research is needed on the circumscription of this fam. fide Vasilyeva (*Mycoscience* 42: 401, 2001), Rossman *et al.* (*Mycoscience* 48: 135, 2007; phylogeny).
- Sydowiellina** Bat. & I.H. Lima (1959) = *Myriangiella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Sydowina** Petr. (1923) = *Lojkania* fide Barr (*Mycotaxon* 20, 1984).
- Sydowinula** Petr. (1923) = *Acanthonitschkea* fide Nannfeldt (*Svensk bot. Tidskr.* 69: 49, 1975).
- Sylviacollaea** Cif. (1963), anamorphic *Pezizomycotina*, St.0eH.15. 1 (on termites), Dominican Republic. See Ciferri (*Atti Ist. bot. Univ. Lab. crittog. Pavia* sér. 5 20: 246, 1963).
- sym-**, see **syn-**.
- Symbiosis**. Associations between unlike organisms, generally ones persisting for long periods (relative to the generation time of the interacting organisms); apparently first used by the lichenologist A.B. Frank in 1877 (often credited to de Bary, 1879) who later coined the word mycorrhiza (q.v.). At times equated with mutualism (q.v.), but correctly also covering parasitic (harmful) and commensalistic (unharmful) associations (Ahmadjian & Paracer, 1987).
- Symbioses involving fungi are frequent, abundant and widespread. Mutualistic symbioses include endophytes, lichens, mycorrhizas and rumen fungi, as well as cultivation of fungi by ambrosial insects, ants, humans and termites. Parasitic symbioses include fungal diseases of animals, other fungi and plants, but also parasitism of fungi by plants such as orchids, and consumption of fungi by various types of animal.
- In mutualistic lichen symbioses, there has been debate as to which partner might be regarded as host (e.g. de Bary regarded the algae in lichens as the host, and Douglas, 1994, the fungus as host to the algae); to circumvent this controversy, Law & Lewis (1983) used the neutral terms **exhabitant** (the organism forming the outer tissues) and **inhabitant** (the enclosed organism).
- In lichens, Poelt (*Abstr. IMC2*, 1977) recognized: **two-membered -**, one alga + one fungus, **three-membered -**, one alga + two fungi (lichenicolous fungi; q.v.), or two algae + one fungus (cephalodium; q.v.); and **four-membered -**, two algae + two fungi (lichenicolous lichens); Hawksworth (*Bot. J. Linn. Soc.* 96: 3, 1988) used '**-biont**' (q.v.) instead and discussed further fungal/algal interactions (see also Rambold & Triebel, *Bibl. Lich.* 48, 1992).
- Lit.*: Ahmadjian & Paracer (*Symbiosis, an introduction to biological associations*, 1986), Carroll (in Carroll & Wicklow, *The fungal community*, edn 2: 327, 1992; fungal mutualisms), Cook *et al.* (Eds) (*Symp. Soc. exp. Biol.* 29, 1975), Cooke (*The biology of symbiotic fungi*, 1977), Cook *et al.* (Eds) (*Cellular interactions in symbiosis and parasitism*, 1980), Douglas (*Symbiotic interactions*, 1994), Law & Lewis (*Biol. J. Linn. Soc.* 20: 249, 1983), Lewis (*Biol. Rev.* 48: 261, 1973; in Rayner *et al.* (Eds), *Evolutionary biology of the fungi*: 161, 1987), Margulis & Fester (Eds) (*Symbiosis as a source of evolutionary innovation*, 1991), Sapp (*Evolution by association: a history of symbiosis*, 1984). See Antagonism, Coevolution, Endophyte, Lichens, Mycorrhiza.
- Symbiotaphrina** Kühlw. & Jurzitza ex W. Gams & Arx (1980), anamorphic *Pezizomycotina*, Hso.0eH.?. 2 (beetle mycetomas), Germany. See Jones *et al.* (*MR* 103: 542, 1999; syst. posn), Schweigkofler *et al.* (*Organ. Divers. Evol.* 2: 1, 2002; phylogeny), Lopandic *et al.* (*Mycol. Progr.* 4: 205, 2005; phylogeny).
- sympatric**, occurring in the same geographical region. Cf. **allopatric**.
- Symperidium** Klotzsch (1843) = *Aecidium* fide Saccardo (*Syll. fung.* 18: 829, 1906).
- Symphaeophyma** Speg. (1912), Parmulariaceae. 1, S. America. See Inácio & Cannon (*MR* 107: 82, 2003).
- Symphaster** Theiss. & Syd. (1915), Asterinaceae. 2, S. America; S. Africa. See Hosagoudar *et al.* (*Journal of Mycopathological Research* 39: 61, 2001).
- symphogenous**, see **meristogenous**.
- Symphyosira** Preuss (1853), anamorphic *Symphyosirinia*, Hsy.≡ eH.39. 4, Europe.
- Symphyosirinia** E.A. Ellis (1956), Helotiaceae. Anamorph *Symphyosira*. 4, Europe; N. America. See Baral (*SA* 13: 113, 1994; posn), Baral (*Z. Mykol.* 60: 211, 1994; key).
- Symphysos** Bat. & Cavalc. (1967), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, Brazil. See Batista & Cavalcanti (*Atas Inst. Micol. Univ. Pernambuco* 5: 202, 1967).
- symplastic**, entering living cells; cf. **apoplastic**.
- Symplectromyces** Thaxt. (1908), Laboulbeniaceae. 1, widespread. See Benjamin (*Aliso* 10: 345, 1983), Tavares (*Mycol. Mem.* 9: 627 pp., 1985).
- symplesiomorphy (-ies)**, see **Cladistics**.
- Symplocia** A. Massal. (1854) nom. rej. ≡ *Crocynia*.
- Sympodia** (R. Heim) W.B. Cooke (1952) nom. inval. = *Marasmius* fide Kirk (*in litt.*).
- sympodial** (of conidiogenous cells), characterized by continued growth, after the main axis has produced a terminal spore, by the development of a succession of apices each of which originates below and to one side of the previous apex.
- Sympodiella** W.B. Kendr. (1958), anamorphic *Pezizomycotina*, Hso.0eH.39. 3, Europe; Cuba. See Kendrick (*TBMS* 41: 519, 1958).
- Sympodina** Subram. & Lodha (1964) = *Veronaea* fide von Arx (*Gen. Fungi Sporul. Cult.*, 1970).
- Sympodiocladium** Descals (1982), anamorphic *Pezizomycotina*, Hso.0eH.1. 1 (aquatic), British Isles. See Descals (*TBMS* 78: 427, 1982).
- Sympodioclathra** Voglmayr (1997), anamorphic *Pezizomycotina*, Hso.?.?. 1, USA. See Voglmayr & Krisai-Greilhuber (*Mycol.* 89: 945, 1997).
- sympodioconidium (sympodulospore)**, a spore produced on a sympodula.
- Sympodiomyces** Fell & Statzell (1971) = *Blastobotrys* fide Statzell-Tallman & Fell in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 603, 1998), Carreiro *et al.* (*Int. J. Syst. Evol. Microbiol.* 54: 1891, 2004), Kurtzman & Robnett (*FEMS Yeast Res.* 7: 141, 2007).
- Sympodiomycopsis** Sugiy., Tokuoka & Komag. (1991), anamorphic *Microstromataceae*. 1 (from nectar), Japan. See Begerow *et al.* (*MR* 104: 53, 2000; mol. phylogeny).
- Sympodiophora** G.R.W. Arnold (1970) = *Pseudohansfordia* G.R.W. Arnold fide de Hoog (*Persoonia* 10: 67, 1978), Arnold (*Abstracts, XI Congress of European Mycologists* Kew, England, 7-11 September 1992: 3, 1992).
- Sympodioplanus** R.C. Sinclair & Boshoff (1997), anamorphic *Pezizomycotina*, Hso.?.?. 1, S. Africa; S.

- America. See Sinclair *et al.* (*Mycotaxon* 64: 366, 1997).
- Sympodomyces** R.K. Benj. (1973), Laboulbeniaceae. 1, Papua New Guinea. See Benjamin (*Aliso* 8: 1, 1973), Tavares (*Mycol. Mem.* 9: 627 pp., 1985).
- sympodula**, a sympodial conidiogenous cell.
- Sympoventuria** Crous & Seifert (2007), ? Venturiaceae. Anamorph *Sympodiella*-like. 1, S. Africa. See Crous *et al.* (*Fungal Diversity* 25: 19, 2007), Crous *et al.* (*Stud. Mycol.* 58: 185, 2007; phylogeny).
- syn-** (sym-) (in compounds), growing together; adhesion; aggregation.
- Synalissa** Fr. (1825), Lichinaceae (L). 5, Europe; N. America. See Moreno & Egea (*Acta Bot. Barcinon.* 41: 1, 1992), Schultz & Büdel (*Mycotaxon* 84: 21, 2002), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key).
- Synalissina** Nyl. (1885) = Lempholemma fide Zahlbruckner (*Nat. Pflanzenfam.* 8: 167, 1926).
- Synallisopsis** Nyl. ex Stizenb. (1882) nom. inval. = *Pyrenopsis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- synanamorph**, see States of fungi.
- Synandromyces** Thaxt. (1912), Laboulbeniaceae. 10, widespread. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- Synaphia** Nees & T. Nees ex Rchb. (1841) nom. dub., Fungi.
- synapomorphy** (-ies), see Cladistics.
- Synaptomyces** Thaxt. (1912), Ceratomycetaceae. 1, S. America.
- synaptonemal complex**, proteinaceous, longitudinally aligned structure which usually unites homologous chromosomes during the prophase of meiosis.
- Synaptospora** Cain (1957), ? Coniochaetaceae. 4, Europe. See Barr (*Mycotaxon* 39: 43, 1990; posn), Matzer (*Cryptog. Mycol.* 14: 11, 1993), Huhndorf *et al.* (*Sydowia* 51: 176, 1999), Réblová (*Sydowia* 54: 248, 2002), García *et al.* (*MR* 110: 1271, 2006).
- Synarthonia** Müll. Arg. (1891), Arthoniales (L). 1, C. America.
- Synarthoniomyces** Cif. & Tomas. (1953) = *Synarthonia*.
- Synascomycetes**. Class (Gäumann, *Die Pilze*, 1949) for *Ascomycota* with spores formed in a spore sac ('synascus', q.v.), interpreted as a group of fused asci; included fungi now in *Ascosphaerales* and *Protomycetales* (here included in *Taphrinales*).
- synascus**, the gametangium of *Ascosphaera* (Varitchak, 1933).
- Syncarpella** Theiss. & Syd. (1915), Cucurbitariaceae. Anamorph *Syntholus*. 7, widespread. See Barr & Boise (*Mem. N. Y. bot. Gdn* 49: 298, 1989), Ramaley & Barr (*Mycotaxon* 65: 499, 1997).
- Syncephalastraceae** Naumov ex R.K. Benj. (1959), Mucorales. 8 gen. (+ 1 syn.), 22 spp.
Lit.: Benjamin (*Aliso* 4: 321, 1959), Zheng *et al.* (*Mycosystema* 1: 35, 1988).
- Syncephalastrum** J. Schröt. (1886), Syncephalastraceae. 2, widespread. See Benjamin (*Aliso* 4: 321, 1959), Misra (*Mycotaxon* 3: 51, 1975), Hobot & Gull (*Protoplasma* 107: 339, 1981; germination), Schipper & Stalpers (*Persoonia* 12: 81, 1983), Chen & Huang (*Mycosystema* 1: 53, 1988; electrophoresis), Zheng *et al.* (*Mycosystema* 1: 39, 1988; key), Benny *et al.* in McLaughlin *et al.* (Eds) (*The Mycota A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research* 7A: 113, 2001), O'Donnell *et al.* (*Mycol.* 93: 286, 2001; phylogeny), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny), Nyilasi *et al.* (*Clin. Microbiol. Infect.* 14: 393, 2008; molecular identification).
- Syncephalidium** Badura (1963) = *Syncephalis* fide Benjamin (*Mycol.* 48: 1, 1966).
- Syncephalis** Tiegh. & G. Le Monn. (1873), Piptocephalidaceae. c. 45 (mycoparasites of *Mucorales*), widespread. See Benjamin (*Aliso* 4: 321, 1959), Zycha *et al.* (*Mucorales*, 1969; key), Kuzuha (*TMSJ* 14: 237, 1973), Hunter & Butler (*Mycol.* 67: 863, 1975), Baker *et al.* (*Mycol.* 69: 1008, 1977; host range & culture), Kuzuha (*J. Jap. Bot.* 55: 343, 1980; zygosporangium formation), Bawcutt (*TBMS* 80: 219, 1983), Benjamin (*Aliso* 11: 1, 1985), Can *et al.* (*Nova Hedwigia* 49: 427, 1989), Ginman & Young (*Mycologist* 5: 19, 1991; ultrastr.), Gruhn & Petzold (*Can. J. Microbiol.* 37: 355, 1991), Patil & Patil (*Indian Phytopath.* 43: 217, 1994), Ho (*Taiwania* 48: 53, 2003; Taiwan), Tanabe *et al.* (*J. gen. appl. Microbiol.* Tokyo 51: 267, 2005; phylogeny), White *et al.* (*Mycol.* 98: 872, 2006; phylogeny), Ho & Benny (*Botanical Studies* 48: 319, 2007; n.sp., Taiwan), Ho & Benny (*Botanical Studies* 49: 45, 2008; n.sp., Taiwan).
- Syncephalopsis** Boedijn (1959) = *Syncephalis* fide Benjamin (*Mycol.* 48: 1, 1966).
- Syncesia** Taylor (1836), Roccellaceae (L). 17, widespread (esp. S. America). See Tehler (*Cryptog. Bot.* 3: 139, 1993), Tehler (*Fl. Neotrop.* 75, 1997), Myllys *et al.* (*Bryologist* 101: 70, 1998; morphology, phylogeny), Myllys *et al.* (*Lichenologist* 31: 461, 1999; phylogeny), Tehler & Irestedt (*Cladistics* 23: 432, 2007).
- Synchaetomella** Decock & Seifert (2005), anamorphic *Diaporthales*. 1, Singapore. See Decock *et al.* (*Antonie van Leeuwenhoek* 88: 234, 2005).
- synchronized culture**, a culture manipulated so that division of all the component cells is simultaneous; see Williamson & Scopes (*Symp. Soc. gen. Microbiol.* 11: 217, 1961; *Saccharomyces cerevisiae*).
- Synchronoblastia** Uecker & F.L. Caruso (1988), anamorphic *Pezizomycotina*, Cpd.0eH.6. 1, USA. See Uecker & Caruso (*Mycol.* 80: 345, 1988).
- synchronospore**, a spore produced simultaneously with other neighbouring spores.
- Synchytriaceae** J. Schröt. (1892), Chytridiales. 5 gen. (+ 5 syn.), 136 spp.
Lit.: Percival (*Zentbl. Bakt. ParasitKde* Abt. II 25: 440, 1910), Karling (*Synchytrium*: 470 pp., 1964), Barr (*Geobios* New Rep., 1980; emmend.), Raghavendra & Pavgi (*Indian Phytopath.* 46: 36, 1993), Hampson *et al.* (*Mycol.* 86: 733, 1994), Barr in McLaughlin *et al.* (Eds) (*The Mycota A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research* 7A: 93, 2001).
- Synchytrium** de Bary & Woronin (1863), Synchytriaceae. c. 120 (plant parasites), widespread. *S. aureum* reported from 198 host spp. (123 gen., 34 fam.); Karling experimentally infected 1465 spp. in more than 918 gen. of 176 fam. with *S. macrosporum*, *S. endobioticum* (potato wart disease). See Karling (*Synchytrium*, 1964; keys), Karling (*Adv. Frontier Pl. Sci.* 29: 1, 1972), Raghavendra & Pavgi (*Indian Phytopath.* 46: 36, 1993; on *Cucurbitaceae*), Hampson *et al.* (*Mycol.* 86: 733, 1994; Ultrastr. *S. endobioticum*), Niepold & Stachewicz (*Zeitschrift für Pflanzenkrankheiten und Pflanzenschutz* 111: 313, 2004; PCR-detection of *S. endobioticum*).

- Syncladium** Rabenh. (1859), anamorphic *Pezizomycotina*, Cpd.???. 1, widespread. See Hughes (*Mycol.* 68: 693, 1976).
- Syncleistostroma** Subram. (1972) nom. conf. = *Petromyces* fide Malloch & Cain (*CJB* 51: 1647, 1973).
- Syncoelium** Wallr. (1833), ? Algae. See Hughes (*CJB* 36: 747, 1958).
- Syncollesia** Nees (1823) ? = *Fumago* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Syncomista** Nieuwl. (1916) = *Toninia*.
- syncytium**, see coenocyte.
- Syndiplodia** Peyronel (1915) = *Microdiplodia* Allesch. fide Sutton (*Mycol. Pap.* 141, 1977).
- syndrome**, a complex of symptoms, especially that which constitutes the picture of a disease.
- Synechoblastus** Trevis. (1853) = *Collema* F.H. Wigg. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- synecology**, ecology of communities.
- synergism**, two organisms or environmental factors acting simultaneously to effect a change greater than either could alone; e.g. the increase of fungicidal value in certain mixtures of fungicides, fungicides and non-toxic materials, or of air pollutants. Cf. metabiosis.
- syngamy**, fertilization; the fusion of male and female cells to form a zygote.
- Syngenosorus** Trevis. (1860) = *Tomasellia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Syngliocladium** Petch (1932), anamorphic *Ophiocorydiceps*, Hsy.0eH.?. 5, widespread (north temperate). See Petch (*TBMS* 25: 262, 1942), Pendland & Boucias (*Mycopathologia* 99: 25, 1987), Hodge *et al.* (*Mycol.* 90: 743, 1998), Evans & Shah (*MR* 106: 737, 2002).
- Synglonium** Penz. & Sacc. (1897) ? = *Nymanomyces* fide Höhnelt (*Annls mycol.* 16: 154, 1918).
- synonym**, one of two or more names having the same basionym (Donk, *Persoonia* 1: 175, 1960).
- synkaryon**, a diploid zygote nucleus.
- synkaryotic** (of a nucleus), having $2n$ chromosomes.
- synnema** (pl. **synnemata**), a conidioma composed of a more or less compacted group of erect and sometimes fused conidiophores bearing conidia at the apex only or on both apex and sides. Seifert (*Stud. Mycol.* 27: 1, 1985) distinguished 3 types: **determinate** -, with a terminal, non-elongated conidiogenous zone, growth ceasing after sporulation has begun, e.g. *Stilbella*; **indeterminate** -, with an elongated fertile zone, sometimes covering the whole conidioma, growth continuing after sporulation, e.g. *Doratomyces*; **compound** -, branched in which determinate or indeterminate branches are formed on a branched or unbranched axis, e.g. *Tilachlidiopsis*. Anatomical stipe types found in the three groups include **parallel** -, of primarily parallel hyphae; **intricate** -, of primarily or entirely textura intricata; **basistromatic** -, with well-defined basal stromata; **amphistromatic** -, well-defined basal stroma, stipe of parallel hyphae and an apical dome of textura angularis to globulosa with conidiogenous cells; **cupulate** -, conidiogenous zone concave. See Fig. 38.
- synnema coremium**, sometimes used for synnemata with looser fascicles as in 'coremioid' spp. of *Penicillium* and *Aspergillus* (obsol.).
- Synnemadiplodia** Zambett. (1955) = *Botryodiplodia* fide Petrak (*Sydowia* 16: 353, 1963).
- Synnemapestaloides** T. Handa & Y. Harada (2004), anamorphic *Amphisphaeriaceae*. 1, Japan. See Handa *et al.* (*Mycoscience* 45: 138, 2004).
- Synnemaseimatoides** K. Matsush. & Matsush. (1996), anamorphic *Pezizomycotina*, Hso.???. 1, Japan. See Matsushima & Matsushima (*Matsush. Mycol. Mem.* 9: 38, 1996).
- Synnematium** Speare (1920) = *Hirsutella* fide Evans & Samson (*TBMS* 79: 431, 1982).
- Synnematomyces** Kobayasi (1981), anamorphic *Pezizomycotina*, Hsy.0eH.?. 1, Japan. See Kobayasi (*J. Jap. Bot.* 56: 287, 1981).
- Synnematomycetes**, anamorphic fungi having synnemata (Höhnelt, 1923); *Coremiales* (Potebnia, 1909), (obsol.).
- synnematous** (synnematogenous), having synnemata. See Seifert (*Stud. Mycol.* 27: 1, 1985, *Stilbella* and allies, *Mem. N.Y. bot. Gdn* 59: 109, 1990, keys).
- Synnemellisia** N.K. Rao, Manohar. & Goos (1989), anamorphic *Pezizomycotina*, Hsy.0eH.15. 1, India. See Rao *et al.* (*Mycol.* 80: 896, 1988).
- Synnemukerjiomyces** Aneja & R. Kumar (1999), anamorphic *Pezizomycotina*, H??.?. 1, India. See Aneja & Kumar (*Advances in Microbial Biotechnology*: 1, 1999).
- Synomyces** Arthur (1924) = *Coleosporium* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- synonym**, another name for a species or group, esp. a later or illegitimate name not currently employed for the taxon. If two or more names are based on the same type they are **homotypic** (**nomenclatural**, 'obligate', =) synonyms, if on different types they may be **heterotypic** (**taxonomic**, 'facultative', =) synonyms. See Nomenclature, and cf. basionym, homonym, orthographic synonym, variant.
- Synostomella** Syd. (1927) = *Cyclothea* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Synostomina** Petr. (1949), anamorphic *Pezizomycotina*, St.0eH.?. 1, S. America.
- Synpeltis** Syd. & P. Syd. (1917) = *Cyclothea* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Synpenicillium** Costantin (1888) = *Doratomyces* fide Morton & Smith (*Mycol. Pap.* 86, 1963).
- Synphragmidium** F. Strauss (1853) = *Speira* fide Saccardo (*Syll. fung.* 4: 514, 1886).
- Synsphaeria** Bonord. (1851), *Pezizomycotina*. 1, Europe.
- Synsphaeridium** G. Playford (1981), Fossil Fungi. 1, Western Australia.
- Synsporium** Preuss (1849) = *Stachybotrys* fide Hughes (*CJB* 36: 727, 1958).
- Synsterigmatocystis** Costantin (1888) nom. inval. = *Gibellula* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Syntexis** Theiss. (1916) ? = *Mollisia* fide Petrak (*Annls mycol.* 26: 399, 1928).
- Synthetospora** Morgan (1892) = *Stephanoma* fide Mattiolo (*Annals R. Accad. Agric. Torino* 79: 190, 1936).
- Syntholus** A.W. Ramaley & M.E. Barr (1997), anamorphic *Syncarpella*, Cpd.???. 1, USA. See Ramaley & Barr (*Mycotaxon* 65: 501, 1997).
- syntype**, see type.
- synzoospore**, multinucleate zoospore with many sets of flagella.
- Syphosphaera** Dumort. (1822), *Pezizomycotina*. 1, Europe.
- Syrigosis** Neck. ex Kremp. (1869) = *Sphaerophorus*

- fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Syringospora** Quinq. (1868) nom. rej. = *Candida* fide van der Walt (*Mycopathologia* 40: 231, 1970), von Arx *et al.* (*Stud. Mycol.* 14: 1, 1977).
- Syrropeltis** Bat., J.L. Bezerra & Matta (1964), ? Dothideales. 1 (on *Xylopia*), Brazil. See Batista *et al.* (*Portugaliae Acta Biologica Série B* 7: 376, 1964).
- syrrotium** (pl. -ia), term coined by Falk (1912) for the mycelial cord of *Merulius*. See Thompson (*in* Jennings & Rayner (Eds), *The ecology and physiology of the fungal mycelium*: 185, 1984).
- Syspastospora** P.F. Cannon & D. Hawksw. (1982), Ceratostomataceae. 2 (saprobic and/or fungicolous), widespread. See Horie *et al.* (*Mycotaxon* 25: 229, 1986), García *et al.* (*Mycol.* 94: 862, 2002).
- Systematics**. also **Biosystematics** (q.v.). The study of the relationships and classification of organisms and the processes by which they have evolved and are maintained (includes the subdisciplines of nomenclature and taxonomy), see Hawksworth (Ed.) (*Prospects in systematics*, 1988), Minelli (*Biological systematics: the state of the art*, 1993), Ross (*Biological systematics*, 1974), Stevens (*The development of biological systematics*, 1995). The word also has other uses outside biology. See also Classification, Nomenclature, Phylogenetic analysis.
- systemic** (1) (of a parasite), spreading throughout the host; (2) (of a fungicide), absorbed, esp. by the roots, and translocated to other parts of the plant.
- Systemostrema** E.I. Hazard & Oldacre (1975), Microsporidia. 3.
- Systemma** Theiss. & Syd. (1915), Dothideaceae. 1, widespread. See von Arx & Müller (*Stud. Mycol.* 9, 1975), Gams (*Taxon* 54: 520, 2005; nomencl.).
- Systemmopsis** Petr. (1923), anamorphic *Pezizomycotina*, St.0eH.?. 1, Europe. See Hoog & McGinnis (*Stud. Mycol.* 30: 187, 1987).
- Syzygites** Ehrenb. (1818), Mucoraceae. 1 (on decaying *Boletaceae* (esp. *Boletus*), widespread (north temperate). See Hesseltine (*Lloydia* 20: 228, 1957), Ekpo & Young (*Microbios* 10: 63, 1979; ultrastr.), Kaplan & Goos (*Mycol.* 74: 684, 1982; zygospore formation), Kovacs (*Syzygites megalocarpus* (*Mucoraceae*, *Mucorales*, *Zygomycetes*) and its host-parasite association in the contiguous United States, 1995), Weete *et al.* (*J. Am. Oil Chem. Soc.* 75: 1367, 1998; fatty acids), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny).
- Syzygospora** G.W. Martin (1937), Carcinomycetaceae. 16, widespread. If the type species is anamorphic, then the remaining species belong in *Carcinomyces* or *Christiansenia*. See Donk (*Taxon* 11: 101, 1962; ? nom. anam.), Ginns (*Mycol.* 78: 619, 1986; key), Diederich (*Bibliotheca Mycol.* 61: 29., 1996), Hauerslev (*Mycotaxon* 72: 465, 1999), Harmaja (*Memoranda Societatis pro Fauna et Flora Fennica* 79: 73, 2003; Finland), Kotiranta & Miettinen (*Acta Mycologica Warszawa* 41: 21, 2006; Finland n.sp.).
- Syzygosporaceae** Jülich (1982) = Carcinomycetaceae.
- Szczawinskia** A. Funk (1984), anamorphic *Pilocarpaceae*, St.0fH.15 (L). 1, N. America; Papua New Guinea. See Aptroot *et al.* (*Bibliotheca Lichenol.* 64, 1997), Holien & Tønsberg (*Lichenologist* 34: 369, 2002), Andersen & Ekman (*MR* 109: 21, 2005).
- T**, see RIEC.
- T-2 toxin**, a mycotoxin of the trichothecene group (q.v.) produced by some *Fusarium* spp., causing alimentary toxic aleukia.
- Tabanisporea** H.I. Bykova, Y.Y. Sokolova & I.V. Issi (1987), Microsporidia. 2.
- Tabanomyces** Couch, R.V. Andrejeva, Laird & Nolan (1979) = *Meristacrum* fide Tucker (*Mycotaxon* 13: 481, 1981).
- Tachaphantium** Bref. (1888) = *Platyglea* fide Bandoni (*Mycol.* 48: 821, 1956).
- Taeniola** Bonord. (1851) nom. illegit. = *Hormiscium* fide Saccardo (*Syll. fung.* 4: 263, 1886), Hughes (*CJB* 36: 727, 1958).
- Taeniolella** S. Hughes (1958), anamorphic *Glyphium*, Hso.≡ eP.3/4. c. 48, widespread. See Sutton (*TBMS* 54: 255, 1970; teleomorphs), Ellis (*More Dematiaceous Hyphomycetes*, 1976), Hawksworth (*Bull. Br. Mus. nat. hist. Bot.* 6: 183, 1979; on lichens), Zhurbenko (*Folia Cryptog. Estonica* 32: 153, 1998), Gulis & Marvanová (*Mycotaxon* 72: 237, 1999), Diederich & Zhurbenko (*Graphis Scripta* 12: 37, 2001; nomencl.), Jones & Eaton (*Mycoscience* 43: 201, 2002).
- Taeniolina** M.B. Ellis (1976), anamorphic *Pezizomycotina*, Hso.≡ eP.3. 1, Europe; Cuba. See Ellis (*More Dematiaceous Hyphomycetes*: 61, 1976).
- Taeniophora** P. Karst. (1886) = *Phragmotrichum* fide Sutton & Pirozynski (*TBMS* 48: 349, 1965).
- Taeniospora** Marvanová (1977), anamorphic *Fibulomyces*, Hso.1bH.1. 2 (with clamp connexions), Czech Republic. See Marvanová & Stalpers (*TBMS* 89: 489, 1987; key, teleomorphs).
- Tainosphaeria** F.A. Fernández & Huhndorf (2005), Chaetosphaeriaceae. 1, Puerto Rico. See Fernández & Huhndorf (*Fungal Diversity* 18: 44, 2005), Fernández *et al.* (*Mycol.* 98: 121, 2006; phylogeny).
- Taiwanascaceae** Sivan. & H.S. Chang (1997) = *Niessliaceae*.
- Taiwanascus** Sivan. & H.S. Chang (1997), *Niessliaceae*. 1 (from dead wood), Taiwan. See Samuels & Barr (*CJB* 75: 2165, 1997), Sivanesan & Chang (*MR* 101: 176, 1997).
- Taiwanoporia** T.T. Chang & W.N. Chou (2003), Agaricomycetidae. 1, Taiwan. See Chang & Chou (*Mycol.* 95: 1215, 2003).
- take-all**, a cereal disease (*Gaeumannomyces graminis*).
- Talaromyces** C.R. Benj. (1955), Trichocomaceae. Anamorphs *Penicillium*, *Geosmithia*-like, *Merimbla*. 42, widespread. See Pitt (*The genus Penicillium and its teleomorphic states Eupenicillium and Talaromyces*, 1979; keys), Frisvad *et al.* (*Antonie van Leeuwenhoek* 57: 179, 1990; chemotaxonomy), Prieto *et al.* (*MR* 99: 69, 1995; polysaccharides), Yaguchi *et al.* (*Mycoscience* 37: 55, 1996; ubiquinones), Ogawa *et al.* (*Mycol.* 89: 756, 1997; DNA), Ogawa & Sugiyama (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 149, 2000; phylogeny), Pitt *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 9, 2000; accepted names), Heredia *et al.* (*Mycol.* 93: 528, 2001; Mexico), Yaguchi *et al.* (*Cryptog. Mycol.* 26: 133, 2005), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny).
- Talbotiomyces** Vánky, R. Bauer & Begerow (2007), Entorrhizaceae. 1 (galls on roots of dicots), S. Africa. See Vánky *et al.* (*Mycol. Balcanica* 4: 11, 2007).
- Talekpea** Lunghini & Rambelli (1979), anamorphic *Pezizomycotina*, Hso.1eP.19. 1, Ivory Coast. See Lunghini & Rambelli (*Micol. Ital.* 8: 23, 1979).
- Talpapellis** Alstrup & M. Cole (1998), anamorphic

- Pezizomycotina*, Hso.???. 1, Canada. See Alstrup & Cole (*Bryologist* 10: 227, 1998).
- Tamnidium**, see *Thamnidium* Link.
- Tamsiniella** S.W. Wong, K.D. Hyde, W.H. Ho & S.J. Stanley (1998), Dothideomycetes. 1, Australia. See Wong *et al.* (*CJB* 76: 334, 1998).
- Tandonea**, see *Tandonia*.
- Tandonella** S.S. Prasad & R.A.B. Verma (1970) = *Passalora* fide Sutton & Pascoe (*Aust. J. Bot.* 35: 183, 1987; on *Olearia*), Crous *et al.* (*Mycol.* 93: 1081, 2001; phylogeny), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003).
- Tandonia** M.D. Mehrotra (1991), anamorphic *Pezizomycotina*, St.0eH.15. 1, India. See Mehrotra (*MR* 95: 1074, 1991).
- Tanglella** Höhn. (1918), ? Helotiales. 1, Europe.
- Tania** Egea, Torrente & Sipman (1995), Arthoniaceae (L). 1, Malaysia. See Egea *et al.* (*Lichenologist* 27: 352, 1995), Grube (*Bryologist* 101: 377, 1998), Harada & Yamamoto (*Lichenology* 5: 89, 2006).
- tao-cho** (tao-si), see hamanatto.
- tapé**, an Indonesian fermented food prepared by the action of *Rhizopus oryzae* and *Endomyces chodatii* on rice (Swan Djien Ko, *Appl. Microbiol.* 23: 976, 1972); - **ketala** (peuyeum), a Javanese food obtained by the fermentation of cassava tubers with *Mucor javanicus* (Hedger, *Bull. BMS* 12: 54, 1978). See also Fermented food and drinks.
- Tapeinosporium** Bonord. (1853) = *Septocylindrium* fide Saccardo (*Syll. fung.* 4: 226, 1886).
- Tapellaria** Müll. Arg. (1890), ? Ectolechiaceae (L). 12, widespread (tropical). See Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952), Lücking (*Phyton Horn* 39: 131, 1999; Costa Rica), Lücking (*Willdenowia* 29: 299, 1999; Ecuador).
- Tapellariopsis** Lücking (1999), Ectolechiaceae (L). 1, Costa Rica. See Lücking (*Phyton Horn* 104: 148, 1992).
- Tapesia** (Pers.) Fuckel (1870) nom. rej., Helotiales. c. 25, widespread. Species associated with cereal disease are now separated as *Oculimacula*. Often synonymized with *Mollisia*. See Baral & Krieglsteiner (*Beih. Z. Mykol.* 6, 1985; synonymy with *Mollisia*), Gamundí (*Fl. criptog. Tierra del Fuego* 10: 126 pp., 1986; Argentina), Gminder (*Z. Mykol.* 62: 181, 1996), Harrington & McNew (*Mycotaxon* 87: 141, 2003), Gminder (*Czech Mycol.* 58: 125, 2006).
- Tapesina** Lambotte (1887), Hyaloscyphaceae. Anamorph *Chalara*-like. 1, Europe. See Svrček (*Česká Mykol.* 41: 193, 1987), Baral (*Z. Mykol.* 68: 117, 2002).
- Taphria** Fr. (1821) = *Taphrina* fide Fries (*Syst. mycol.* 3: 520, 1832).
- Taphridium** Lagerh. & Juel (1902), Protomycetaceae. 2, widespread. See Reddy (*Mycotaxon* 3: 1, 1975; key).
- Taphrina** Fr. (1815), Taphrinaceae. Anamorph *Lalaria*. 95 (biotrophic on plants), widespread. *T. populina* (poplar leaf blister), *T. betulina* (witches' broom of birch), *T. bullata* (pear leaf blister), *T. cerasi* (witches' broom of cherry), *T. caerulascens* (oak leaf curl), *T. deformans* (peach leaf curl), *T. insititiae* (witches' broom of plum), *T. minor* (cherry leaf curl), *T. pruni* (pocket plums). See Mix (*Kansas Univ. Sci. Bull.* 33: 1, 1949), Kramer (*Mycol.* 52: 295, 1960; dev. and nuclear behaviour), Snider & Kramer (*Mycol.* 66: 743, 754, 1974; 754, 1974; numerical taxonomy), Bacigálová (*Czech Mycol.* 50: 107, 1997; spp. on *Betula*), Sjamsuridzal *et al.* (*Mycoscience* 38: 267, 1997; phylogeny), Sugiyama (*Mycoscience* 39: 487, 1998; phylogeny), Schweigkofler *et al.* (*Organ. Divers. Evol.* 2: 1, 2002; phylogeny), Bacigálová *et al.* (*Mycol. Progr.* 2: 179, 2003; on *Alnus*), Karatygin (*Mikol. Fitopatol.* 37: 26, 2003; key), Rodrigues & Fonseca (*Int. J. Syst. Evol. Microbiol.* 53: 607, 2003; phylogeny), Inácio *et al.* (*FEMS Yeast Res.* 4: 541, 2004; anamorphs, Portugal), Tavares *et al.* (*Eur. J. Pl. Path.* 110: 973, 2004; molecular detection), Sugiyama *et al.* (*Mycol.* 98: 996, 2006; phylogeny), Hansen *et al.* (*MR* 111: 592, 2007; on *Nothofagus*).
- Taphrinaceae** Gäum. (1928) nom. cons., Taphrinales. 2 gen. (+ 7 syn.), 118 spp.
Lit.: Kramer (*Stud. Mycol.* 30: 151, 1987), Nishida & Sugiyama (*Mol. Biol. Evol.* 10: 431, 1993), Bacigálová (*Czech Mycol.* 50: 107, 1997), Sjamsuridzal *et al.* (*Mycoscience* 38: 267, 1997), Moore in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 582, 1998), Sugiyama (*Mycoscience* 39: 487, 1998), Rodrigues & Fonseca (*Int. J. Syst. Evol. Microbiol.* 53: 607, 2003), Inácio *et al.* (*FEMS Yeast Res.* 4: 541, 2004), Sugiyama *et al.* (*Mycol.* 98: 996, 2006; phylogeny).
- Taphrinales** Gäum. & C.W. Dodge (1928). Taphrinomycetidae. 2 fam., 8 gen., 140 spp. Mycelium subcuticular or subepidermal, composed of dikaryotic ascogenous cells, sometimes forming thick-walled smooth or ornamented resting spores, vegetative tissue ± lacking; ascumata absent; interascal tissue absent; asci formed either directly from ascogenous cells or with a separating stalk cell, forming internally or in a palisade on the surface of the host tissue, ± cylindrical, the end often truncate, ± persistent, usually 8-spored, the ascospores discharged simultaneously; ascospores hyaline, aseptate, globose or ellipsoidal, sometimes discharged in a single mass. Anamorph yeast-like, monokaryotic, formed from budding ascospores. Biotrophic on plants, usually causing hyperplasia (galls, witches' brooms) or lesions. Fams:
- (1) **Protomycetaceae**
 - (2) **Taphrinaceae**
- Cell walls are two-layered and conidiogenesis (ascospore budding) is basidiomycete-like. Has similarities with the red yeasts, *Exobasidiales* and *Ustilaginales*, but are now accepted as an ancestral lineage of the *Ascomycota*.
- Lit.*: Kramer (*in* Ainsworth *et al.* (Eds), *The Fungi* 4A: 33, 1973; keys gen., *Stud. Mycol.* 30: 151, 1987), von Arx *et al.* (1982; relationships, ultrastr., wall chemistry), Sugiyama (*Mycoscience* 39: 487, 1998; phylogeny), Sugiyama *et al.* (*Mycol.* 98: 996, 2006; phylogeny), Sjamsuridzal *et al.* (*Mycoscience* 38: 267, 1997; phylogeny), Swann *et al.* (*Mycol.* 91: 51, 1999; contrast with *Basidiomycota*).
- Taphrinomycetes** O.E. Erikss. & Winka (1997). Taphrinomycotina. 1 ord., 2 fam., 8 gen., 140 spp. Subcl.: **Taphrinomycetidae**
 For *Lit.* see ord. and fam.
- Taphrinomycetidae**, see *Taphrinomycetes*.
- Taphrinomycotina** O.E. Erikss. & Winka (1997), Taphrinomycetes. Ord.: **Taphrinales**
 For *Lit.* see fam.
- Taphrophila** Scheuer (1988), Tubeufiaceae. Anamorph *Mirandina*. 2, Europe. See Scheuer (*MR* 95: 811, 1991; key), Crane *et al.* (*CJB* 76: 602, 1998), Ré-

- blová & Barr (*Sydowia* 52: 286, 2000), Réblová & Barr (*Sydowia* 52: 258, 2000), Kodsueb *et al.* (*Fungal Diversity* 21: 105, 2006).
- Tapinella** E.-J. Gilbert (1931), Tapinellaceae. 3. See Watling *et al.* (*British Fungus Flora. Agarics and Boleti* Rev. & Enl. Edn 1: 173 pp., 2005; UK).
- Tapinellaceae** C. Hahn (1999), Agaricales. 2 gen. (+ 1 syn.), 4 spp.
Lit.: Hahn (*Sendtnera* 6: 115, 1999).
- Tapinia** (Fr.) P. Karst. (1879) [non *Tapinia* Steud. 1841, *Anacardiaceae*] = *Tapinella*.
- tapuy**, a rice wine indigenous to the Philippines; similar to saki.
- Tarbertia** Dennis (1974), Arthoniales. 1, British Isles. See Dennis (*Kew Bull.* 29: 176, 1974).
- Tardivesicula** J.I.R. Larsson & E.K.C. Bylén (1992), Microsporidia. 1. See Larsson & Bylén (*Eur. J. Protist.* 28: 25, 1992).
- Tarichium** Cohn (1875), Entomophthoraceae. c. 30, widespread. See MacLeod & Müller-Kögler (*Mycol.* 62: 33, 1970; key), Humber (*Mycotaxon* 34: 441, 1989), Keller (*Sydowia* 58: 38, 2006; Switzerland).
- Tarsodisporus** Bat. & A.A. Silva (1965), anamorphic *Pezizomycotina*, Cpt.0eP.?. 1, Brazil. See Batista & Silva (*Atas Inst. Micol. Univ. Pernambuco* 2: 249, 1965).
- tartareous**, having a thick rough crumbling surface.
- Tartufa** (Gray) Kuntze (1891) = *Choiromyces*.
- Tarzetta** (Cooke) Lambotte (1888), Pyronemataceae. 9, widespread (north temperate). See Dumont & Korf (*Mycol.* 63: 165, 1971; nomencl.), Rogers *et al.* (*Mycol.* 63: 1084, 1971), Harmaja (*Karstenia* 14: 138, 1974; gen. concept), Lazzari (*Micol. ital.* 2: 20, 1984; nomencl.), Senn-Irlet (*Beitr. Kenntn. Pilze Mitteleur.* 5: 191, 1989; key 6 spp.), Landvik *et al.* (*Nordic JI Bot.* 17: 403, 1997; DNA), Medardi (*Boll. Gruppo Micol. 'G. Bresadola'* 42: 7, 1999; Italy), Wu & Kimbrough (*Int. J. Pl. Sci.* 162: 1075, 2001; ontogeny), Yao & Spooner (*MR* 106: 1243, 2002; UK (as *Tazzetta*)), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Liu & Zhuang (*Mycosystema* 25: 546, 2006; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Tasmidella** Kantvilas, Hafellner & Elix (1999), Megalariaceae (L). 1, Tasmania. See Kantvilas *et al.* (*Lichenologist* 31: 213, 1999).
- Tassia** Syd. & P. Syd. (1919), anamorphic *Pezizomycotina*, Cpt.0eH.?. 2, Brazil; Europe.
- Taste**. Five basic tastes are now generally recognized: bitter, salty, sour, sweet and savoury. Of these, savoury (also known by the Japanese word umami) is most important in mycology. This is the taste contributed by glutamates and characteristic of fermented foods, many of which are produced using fungi (see Fermented food and drinks). Tastes in fungi combine with smells (q.v.) to produce flavours which are significant in edible fungi, and as an aid to identification. Fresh basidiomata of some agarics have characteristic flavours (e.g. acrid, or apricot or garlic, peppery, etc.), often described as tastes, which are sometimes used to aid identification; see Gilbert (*Méthode de mycologie descriptive*, 1934), Josserand (1952: 68), Locquin (*Petite flore des champignons de France*, 1956: 100). Tasting unknown fungi should be practised with caution.
- Tatraea** Svrček (1993), Helotiaceae. 1, Europe. See Baral *et al.* (*Öst. Z. Pilzk.* 8: 71, 1999).
- Tauromyces** Cavalc. & A.A. Silva (1972) = *Gyalectidium* fide Lücking *et al.* (*Lichenologist* 30: 121, 1998).
- Tausonia** Babeva (1998), anamorphic *Cystofilobasidiaceae*. 1, Tadzhikistan. See Bab'eva (*Mikrobiologiya* 67: 231, 1998).
- Tavaresiella** T. Majewski (1980), ? Laboulbeniaceae. 4, widespread. See Benjamin (*Aliso* 13: 559, 1993).
- Tawdiella** K.B. Deshp. & K.S. Deshp. (1966), anamorphic *Pezizomycotina*, Hso.#eP.?. 1, India. See Deshpande & Deshpande (*Mycopathologia* 28: 207, 1966).
- tawny grisette**, basidioma of the edible *Amanita fulva*.
- taxis** (frequently a suffix), a movement of a plasmodium or zoospore as a reaction to a one-sided stimulus; + (positive) when the movement is in the direction of the stimulus, – (negative) when away from the stimulus. The following tactic movements of zoospores have been described; (1) **chemotaxis**, in response to root exudates (*Pythium* spp.) and amino acids (*Allomyces* spp.); (2) **gravitaxis** (*Phytophthora palmivora*); (3) **electrotaxis** (*Phytophthora palmivora*; Morris *et al.*, *Plant Cell & Environment* 15: 645, 1992).
- taxol**, an antitumor diterpenoid used in treatment of some cancers originally obtained from bark of Pacific yew (*Taxus brevifolia*), but also produced by the endophytic fungus *Taxomyces andreanae* (Stierle *et al.*, *Science* 260: 214, 1993).
- Taxomyces** Strobel, A. Stierle, D. Stierle & W.M. Hess (1993), anamorphic *Pezizomycotina*, Hso.1bH.1. 1 (endophytic), USA. See Strobel *et al.* (*Mycotaxon* 47: 73, 1993).
- taxon** (pl. **taxa**, **taxons**), a taxonomic group of any rank (Code, Art. 1). See Lam (*Taxon* 6: 213, 1957; history and usage). See Classification.
- taxonomy**, the science of classification, in biology the arrangement of organisms into a classification; **idio-**, of organisms; **syn-**, of communities. See Classification, Nomenclature, systematics.
- Tazzetta**, see *Tarzetta*.
- TDP**, thermal death point; generally used for a 10 min. application of heat.
- tea fungus**, a symbiotic association of yeasts (*Saccharomyces ludwigii*) and bacteria (esp. *Acetobacter xylinum*). See Stadelmann (*Sydowia* 11: 380, 1958; bibliogr., *Zbl. Bakt. Abt. I* 180: 401, 1961), Kappel & Anken (*The Mycologist* 7: 12, 1993; analysis); cf. teekwass, tibi, ginger beer plant.
- Teberdinia** Sogonov, W. Gams, Summerbell & Schroers (2005), anamorphic *Pseudeurotium*, H??.?. 1, Karacheyevo-Cherkessiya. See Sogonov *et al.* (*Mycol.* 97: 698, 2005).
- Tectacervulus** A.W. Ramaley (1992), anamorphic *Pezizomycotina*, Cac.0eH.15. 1, USA. See Ramaley (*Mycotaxon* 43: 438, 1992).
- Tectella** Earle (1909), ? Mycenaceae. 3, widespread (north temperate). See Cavet (*Bull. Trimestr. Féd. Mycol. Dauphiné-Savoie* 34: 32, 1994), Jin *et al.* (*Mycotaxon* 79: 7, 2001; phylogeny).
- Tectomyces** L.G. Valle & Santam. (2002), Legeriomycetaceae. 2 (in *Habroleptoides*), Spain. See Valle & Santamaria (*MR* 106: 842, 2002).
- teekwass**, a Russian drink obtained by fermenting tea with a symbiotic mixture of *Acetobacter xylinum* and *Schizosaccharomyces pombe*. Cf. ginger beer plant, tea fungus, tibi.
- Tegillum** Mains (1940) = *Olivea* fide Ono & Hennen (*TMSJ* 24: 369, 1978).

- Tegoa** Bat. & Fonseca (1961) nom. inval.; nom. dub., anamorphic *Pezizomycotina*. See Lücking *et al.* (*Lichenologist* 30: 121, 1998).
- Teichospora** Fuckel (1870), ? Dacampiaceae. c. 23 (on wood), widespread. See Yuan & Barr (*Mycotaxon* 54: 111, 1995), Barr (*Mycotaxon* 82: 373, 2002).
- Teichosporaceae** M.E. Barr (2002) ? = Dacampiaceae. Described to contain non-lichenicolous taxa of the *Dacampiaceae*, but is almost certainly polyphyletic in its original circumscription. Molecular data are lacking.
Lit.: Barr (*Mycotaxon* 82: 373, 2002).
- Teichosporella** (Sacc.) Sacc. (1895), Dothideomycetes. 1 or 2, widespread (temperate). See Kutorga & Hawksworth (*SA* 15: 1, 1997).
- Teichosporina** (G. Arnaud) Cif. & Bat. (1962) = *Limacinula* Höhn. fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Telamonia** (Fr.) Wünsche (1877) nom. cons. = *Cortinari* fide Kauffman (*N. Amer. Fl.* 10, 1932).
- teleblem** (**teleoblema**), see universal veil.
- Telebolus** Lindau (1905) = *Thelebolus* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Telemeniella** Bat. (1955) = *Phyllachora* Nitschke ex Fuckel (1870) fide Hyde & Cannon (*Mycol. Pap.* 175, 1999).
- teleomorph**, see States of fungi.
- teleutosorus**, see telium.
- Teleutospora** Arthur & Bisby (1921) = *Uromyces* fide Arthur (*Manual Rusts US & Canada*, 1934).
- teleutospore**, see teliospore.
- Teleutosporites** Mesch. (1902), Fossil Fungi ? Pucciniales. 4 (Carboniferous, Tertiary), France; Malaysia. But see Pirozynski (*Biol. Mem.* 1: 104, 1976).
- teleutosporodesm**, Donk's (*Proc. Kon. Nederl. Akad. Wetensch. C* 75: 385, 1972) term for teliospore (obso.).
- Telimena** Racib. (1900), Phyllachoraceae. 11 (from living leaves), widespread. See Müller (*Sydowia* 27: 74, 1975), Sivanesan (*TBMS* 88: 473, 1987).
- Telimenella** Petr. (1940), Phyllachoraceae. 2 (from living leaves), widespread (temperate). See Barr (*Mycol.* 69: 952, 1977), Sivanesan (*TBMS* 88: 473, 1987).
- Telimeniella**, see *Telemeniella*.
- Telimenochora** Sivan. (1987), Phyllachoraceae. 1 (from living leaves), Mexico; Puerto Rico. See Sivanesan (*TBMS* 88: 473, 1987).
- Telimenopsis** Petr. (1950) = *Telimena* fide Sivanesan (*TBMS* 88: 473, 1987).
- Telioclipeum** Viégas (1962), *Pezizomycotina*. 1 (on *Aspidiosperma*), Brazil. See Viégas (*Bragantia* 21: 260, 1962).
- Teliomycetes**, see *Pucciniomycetes*.
- teliospore** (teleutospore; teleutosporidesm, Donk (1973)), the spore (commonly a winter or resting spore) of the *Pucciniales* (or *Ustilaginales*) from which the basidium is produced (Fig. 8H).
- Teliosporeae**. A subclass (Bessey, 1935) for *Pucciniomycetes* and *Ustilaginomycetes*.
- telium**, a sorus producing teliospores.
- Telligia** Hendr. (1948), anamorphic *Pezizomycotina*, Hso.#eP.?. 1, Congo.
- Teloconia** Syd. (1921) = *Phragmidium* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- Teloggalla** Nik. Hoffm. & Hafellner (2000), Verrucariaceae. 1 (lichenicolous), Europe. See Hoffmann & Hafellner (*Bibliotheca Lichenol.* 77: 1, 2000).
- Telomapea** G.F. Laundon (1967) = *Maravalia* fide Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983).
- Telomyxa** L. Léger & E. Hesse (1910), Microsporidia. 1.
- Teloschistaceae** Zahlbr. (1898), Teloschistales (L). 12 gen. (+ 41 syn.), 644 spp.
Lit.: Filson (*Muelleria* 2: 65, 1969; Australia), Santesson (*Vortr. bot. Ges. n.f.* 4: 5, 1970; chemotaxonomy), Honegger (*Lichenologist* 10: 47, 1978; asci), Poelt & Hafellner (*Mitt. bot. StSamml., München* 16: 503, 1980; key gen.), Bellemère & Letrouit-Galinou (*Cryptog. Bryol.-Lichénol.* 3: 95, 1982; asci), Awasthi (*Proc. Indian Acad. Sci. Pl. Sci.* 96: 227, 1986), Bellemère *et al.* (*Cryptog. Bryol.-Lichénol.* 7: 189, 1986), Kärnefelt (*Monogr. Syst. Bot. Miss. Bot. Gdn* 25: 439, 1988), Almborn (*Nordic J Bot.* 8: 521, 1989), Kärnefelt (*Cryptog. bot.* 1: 147, 1989), Kärnefelt (*Lichenologist* 22: 307, 1990), Kärnefelt in Galloway (Ed.) (*Tropical lichens*: 105, 1991), Poelt & Hinteregger (*Bibliotheca Lichenol.* 50, 1993; Himalayas), Poelt & Hinteregger (*Bibliotheca Lichenol.* 50: 247 pp., 1993), Arup (*Bryologist* 98: 129, 1995), Castello (*Cryptog. Bryol.-Lichénol.* 16: 79, 1995), Kondratyuk & Kärnefelt (*Lichenologist* 29: 425, 1997), Lindblom (*J. Hattori bot. Lab.* 83: 75, 1997), Franc & Kärnefelt (*Graphis Scripta* 9: 49, 1998), Kärnefelt (*Cryptog. Bryol.-Lichénol.* 19: 93, 1998), Lumbsch (*Chemical Fungal Taxonomy*: 345, 1998), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998; phylogeny), Westberg & Kärnefelt (*Lichenologist* 30: 515, 1998), Wetmore & Kärnefelt (*Bryologist* 10: 230, 1998), Gaya *et al.* (*Am. J. Bot.* 90: 1095, 2003), Søchting & Lutzoni (*MR* 107: 1266, 2003), Honegger *et al.* (*MR* 108: 480, 2004), Lumbsch *et al.* (*Mol. Phylogen. Evol.* 31: 822, 2004), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Hofstetter *et al.* (*Mol. Phylogen. Evol.* 44: 412, 2007; phylogeny), Gaya *et al.* (*MR* 112: 528, 2008; phylogeny).
- Teloschistales** D. Hawksw. & O.E. Erikss. (1986), (L). Lecanoromycetidae. 5 fam., 66 gen., 1954 spp. Thallus varied, usually foliose or fruticose, often brightly coloured. Ascomata apothecial, usually strongly concave, usually orange or reddish, usually with a well-developed thalline margin, often with anthraquinone pigments (K+ crimson). Interascal tissue of usually unbranched paraphyses, the apices often capitate. Asci cylindrical, persistent, the apex strongly thickened, without separable wall layers, with a conspicuous outer J+ layer, sometimes also with an internal J+ structure, releasing ascospores through an apical split. Ascospores mostly hyaline, often with very thick septa, reduced lumina, and polarilocular. Anamorphs pycnidial. Lichenized with green algae, cosmop., esp. on nutrient-rich or basic substrata.
Pycnidia with numerous small locules lined by $\pm$ doliiform conidiogenous cells support the separation from *Lecanorales* as well as characters of the ascomata and chemistry. Fams:
(1) **Caliciaceae** (syn. *Buelliaceae*, *Pyxinaceae*)
(2) **Letrouitiaceae**
(3) **Megalosporaceae**
(4) **Physciaceae**
(5) **Teloschistaceae** (syn. *Caloplacaceae*)
Two suborders have been suggested, the *Teloschistineae* which corresponds to the traditionally circumscribed order, and the *Physciineae* which contains the *Caliciaceae* and *Physciaceae*. *Lit.*: Kärnefelt

- (*Crypt. Bot.* 1: 147, 1989; gen. names, phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006).
- Teloschistes** Norman (1853), Teloschistaceae (L). c. 33, widespread. See Thomson (*Am. midl. Nat.* 41: 706, 1949; N. Am.), Filson (*Muelleria* 2: 65, 1969; Australia), Almborn (*Nordic Jl Bot.* 8: 521, 1989; key 9 spp., C. & S. Afr.), Stenroos & DePriest (*Am. J. Bot.* 85: 1548, 1998; phylogeny), Martín *et al.* (*Fungal Genetics Biol.* 40: 252, 2003; introns), Søchting & Lutzoni (*MR* 107: 1266, 2003; phylogeny), Frödén & Lassen (*Lichenologist* 36: 289, 2004; generic limits), Frödén & Kärnefelt (*Bibliotheca Lichenol.* 95: 183, 2007; Africa), Gaya *et al.* (*MR* 112: 528, 2008; phylogeny).
- Teloschistomyces** Cif. & E.A. Thomas (1953) = *Teloschistes*.
- Telospora** Arthur (1906) = *Uromyces* fide Arthur (*Manual Rusts US & Canada*, 1934).
- TEM**, transmission electron microscope. See ultrastructure.
- Temerariomyces** B. Sutton (1993), anamorphic *Pezizomycotina*, Hso.0eP.73. 1, Malawi. See Sutton (*Mycol. Pap.* 167: 62, 1993).
- Temnospora** A. Massal. (1860) = *Chrysothrix* fide Laundon (*Lichenologist* 13: 101, 1981).
- tempeh** (tempé), an oriental food composed of *Rhizopus oligosporus* fermented soybeans (Hesseltine, *Mycol.* 57: 154, 1965).
- tempeh-bongrek**, an oriental food composed of *Rhizopus* and manioc prepared in Malaysia.
- tenacle**, see haerangium.
- Teng** (Shu-chun; 1902-1970; China). Student, Cornell University, New York, USA (1923-1928); Lecturer, Lingnan University (1928-1933); Lecturer, Jinling University and Nanking University (1930s); surveying to establish forest stations around the upper Yellow River to control erosion (early 1940s); member of staff, Research Institute of Biology, Academia Sinica (late 1940s). Member, Academia Sinica (1948); establishing Agricultural Colleges, northeast China (1950-1955); Member, Chinese Academy of Sciences (1955); Director, Mycology Section, Microbiology Institute (c. 1955 onwards); a victim of the 'cultural revolution', denounced as a 'counter-revolutionary academic authority', imprisoned and tortured (1966-1970). Produced the first major treatment of the fungi of China available in English; he studied Chinese native lore on fungi but his research, which pre-dated ethnomycology (q.v.) elsewhere, including the manuscript of a book of 400,000 words and 600 colour paintings was confiscated during the cultural revolution and, having not re-appeared when he was 'rehabilitated' (1978), must be presumed destroyed. *Publs. Chung-kuo Ti Chen-chun [Fungi of China]* (1963) [Chinese translation; original English version, Mycotaxon Ltd, 1996]. *Biogs, obits etc.* Zhuang Deng (Foreword, in *Fungi of China* ix-xiii, 1996) [biography written by Teng's daughter].
- Tengiomyces** Réblová (1999), Helminthosphaeriaceae. Anamorph *Spadicoides*. 1 (from wood), India; China. See Réblová (*Mycotaxon* 70: 387, 1999), Réblová (*Sydowia* 51: 223, 1999).
- Tenorea** Tornab. (1848) [non *Tenorea* Rafin. 1814, *Rutaceae*, etc.] = *Teloschistes* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- tentoxin**, a chlorosis-inducing cyclic tetrapeptide toxin from *Alternaria alternata* (Saad *et al.*, *Phytopath.* 60: 415, 1970).
- Tenuicutites** C.E. Bertrand (1898), Fossil Fungi ? Chytridiomycetes. 1 (Carboniferous), France.
- teonanácatl**, see hallucinogenic fungi.
- Tephrocybe** Donk (1962), Lyophyllaceae. c. 40, widespread (esp. temperate). See Orton (*Bull. BMS* 18: 114, 1984; key Brit. spp.), Grilli (*Docums Mycol.* 24 no. 95: 27, 1994; Italy), Basso & Candusso (*Bollettino dell'Associazione Micologica ed Ecologica Romana* 16: 45, 2000; pileipellis struct. *Tephrocybe rancida*).
- Tephromela** M. Choisy (1929), Tephromelataceae (L). c. 20, widespread. See Hertel & Rambold (*Bot. Jahrb. Syst.* 107: 469, 1985), Poelt & Grube (*Nova Hedwigia* 57: 1, 1993; key 5 spp. Himalaya), Rambold (*Sendtnera* 1: 281, 1993), Haugan & Timdal (*Graphis Scripta* 6: 17, 1994), Ekman & Wedin (*Pl. Biol.* 2: 350, 2000; phylogeny), Elix & Kalb (*Australasian Lichenology* 58: 27, 2006; Australia), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Arup *et al.* (*Mycol.* 99: 42, 2007; sister group relations with *Parmeliaceae*).
- Tephromelataceae** Hafellner (1984), Lecanorales. 3 gen., 26 spp. See Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Arup *et al.* (*Mycol.* 99: 42, 2007; sister group relations with *Parmeliaceae*).
- Tephrophana** Earle (1909) = *Marasmius* fide Singer (*Agaric. mod. Tax.*, 1951) but used by, Métrod (*BSMF* 75: 184, 1959).
- Tephrosticta** (Sacc., Syd. & P. Syd.) Syd. & P. Syd. (1913) = *Phaeosaccardinula* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- tequila**, see pulque.
- Teracosphaeria** Réblová & Seifert (2007), Sordariomycetidae. Anamorph *Phialophora*-like. 1, New Zealand. See Réblová & Seifert (*MR* 111: 287, 2007).
- Terana** Adans. (1763), Phanerochaetaceae. 1.
- teratogenic**, causing abnormalities in fetus growth.
- Teratomyces** Thaxt. (1893), Laboulbeniaceae. 9, widespread. See Benjamin (*Aliso* 10: 345, 1983), Tavares (*Mycol. Mem.* 9: 627 pp., 1985).
- Teratonema** Syd. & P. Syd. (1917) = *Nitschkia* fide Nannfeldt (*Svensk bot. Tidskr.* 66: 49, 1975).
- Teratoschaeta** Bat. & O.M. Fonseca (1967), ? Dothideomycetes. Anamorph ? *Ampullifera*. 1 (on lichens), Brazil. See Hawksworth (*Bull. Br. Mus. nat. hist. Bot.* 6: 183, 1979; anamorph), Matzer (*Mycol. Pap.* 171: 202 pp., 1996).
- Teratosperma** Syd. & P. Syd. (1909), anamorphic *Pezizomycotina*, Hso.≡ eP.1. 11, widespread. See Ellis (*Mycol. Pap.* 69, 1957; key), Hughes (*N.Z. Jl Bot.* 17: 139, 1979), Wu & Zhuang (*Fungal Diversity Res. Ser.* 15, 2005; China).
- Teratosphaeria** Syd. & P. Syd. (1912), Teratosphaeriaceae. Anamorph *Trimmatostroma*-like. 37, southern hemisphere. See Müller & Oehrens (*Sydowia* 35: 138, 1982), Taylor & Crous (*MR* 104: 618, 2000), Taylor *et al.* (*MR* 107: 653, 2003), Crous *et al.* (*Stud. Mycol.* 58: 1, 2007; phylogeny).
- Teratosphaeriaceae** Crous & U. Braun (2007), Capnodiales. 10 gen., 67 spp.
Lit.: Crous *et al.* (*Stud. Mycol.* 58: 1, 2007; phylogeny).
- teratum** (pl. -ta), an abnormal modification; for terata in lichens see Grummann (*Feddes Repert., Beih.* 122, 1941). See also gall.
- terebrate**, having scattered perforations.
- terebrator** (of lichens), a trichogyne (Lindau).
- Terenodon** Maas Geest. (1971), Gomphaceae. 1, Ja-

- pan. See Maas Geesteranus (*Verh. K. ned. Akad. Wet. tweede sect.* 60 no. 3: 45, 1971).
- terete**, cylindrical; frequently circular in section but narrowing to one end.
- Teretispora** E.G. Simmons (2007), Pleosporaceae. 1, Europe. See Simmons (*Alternaria: an Identification Manual*, 2007).
- terfas**, see *Terfezia*.
- Terfezia** (Tul. & C. Tul.) Tul. & C. Tul. (1851), Pezizaceae. 12 (hypogeous, esp. under *Helianthemum*, *Cistus*, etc.), widespread (arid regions). The ascoms (terfas, kamés) are edible. Nests within *Pezizaceae* in phylogenies, but more research is needed. See Janex-Favre & Parguey-Leduc (*Cryptog. Mycol.* 6: 87, 1985; asci, ascospores), Weete *et al.* (*Can. J. Microbiol.* 31: 1127, 1985; chemistry), Bokhary (*Arab Gulf Journal of Scientific Research B* (Agricultural and Biological Sciences) 5: 245, 1987; Saudi Arabia), Zhang (*Micologia e Vegetazione Mediterranea* 7: 39, 1992; China), Percudani *et al.* (*Mol. Phylogen. Evol.* 13: 169, 1999; phylogeny), Kovács *et al.* (*Folia Microbiol. Praha* 46: 423, 2001; molecular variation), Díez *et al.* (*Mycol.* 94: 247, 2002; phylogeny), Aviram *et al.* (*Antonie van Leeuwenhoek* 85: 169, 2004; multiple ITS sequences), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny).
- Terfeziaceae** E. Fisch. (1897) = *Pezizaceae*.
Lit.: Trappe (*Mycotaxon* 9: 247, 1979), Abdullah *et al.* (*Int. J. Mycol. Lichenol.* 4: 9, 1989), Trappe (*Mem. N. Y. bot. Gdn* 49: 336, 1989), Zhang (*SA* 11: 31, 1992), Alvarez *et al.* (*Mycol.* 84: 926, 1992), Khabar *et al.* (*Cryptog. Mycol.* 15: 187, 1994), Taylor *et al.* (*MR* 99: 874, 1995), Gutierrez *et al.* (*Cah. Opt. Méditerran.* 20: 139, 1996), O'Donnell *et al.* (*Mycol.* 89: 48, 1997; phylogeny), O'Donnell *et al.* (*Mycol.* 89: 48, 1997), Martin *et al.* (*Mycorrhiza Manual* Springer Lab Manual: 463, 1998), Norman & Eggers (*Mycol.* 91: 820, 1999; phylogeny), Percudani *et al.* (*Mol. Phylogen. Evol.* 13: 169, 1999; phylogeny), Kovács *et al.* (*Folia Microbiol. Praha* 46: 423, 2001), Díez *et al.* (*Mycol.* 94: 247, 2002), Ferdman *et al.* (*MR* 109: 237, 2005).
- Terfeziopsis** Harkn. (1899) = *Tuber* fide Fischer (*Nat. Pflanzenfam.* 5b: viii, 1938), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- terminus (phialo) spore**, a phialospore of a 1-spored phialide, i.e. one terminating the growth of the phialide (Mason, 1933).
- Termitaria** Thaxt. (1920), anamorphic *Kathistaceae*, St.0eH.15. 2 or 3, America; Sardinia. See Khan & Kimbrough (*Am. J. Bot.* 61: 395, 1974), Blackwell *et al.* (*Mycol.* 95: 987, 2003; phylogeny), Ensaf *et al.* (*Cryptog. Mycol.* 27: 219, 2006).
- Termitariaceae** Cif. (1963) = *Kathistaceae*.
- Termitariopsis** M. Blackw., Samson & Kimbr. (1980), anamorphic *Kathistaceae*, Hsp.≡ eH.?. 1 (on termites), USA. See Blackwell *et al.* (*Mycotaxon* 12: 98, 1980), Blackwell *et al.* (*Mycol.* 95: 987, 2003).
- Termite fungi**. Species of *Termitomyces* coexist in a mutualistic relationship with termite ants. Traditionally this has been described in terms of the termite cultivating fungi in their nests as food (Heim, *Termites et champignons*, 1977), but it may be more accurate to say that the fungus modifies cellulosic materials gathered by the ants making them more digestible for the ants; this has been described as an extracorporeal digestive system to which the ants have 'outsourced' cellulose digestion; the alternative view that the fungus is employing termites to provide it with a suitable environment and eliminate competitors has also been put forward (Turner, *Natural History* 111: 62, 2002). In Africa, fruitbodies of *Termitomyces* are prized as food (see Edible fungi). Termites are also attacked by fungi, see Blackwell & Kimbrough (*Mycol.* 70: 1279, 1979; key gen. termite-infesting fungi). See also: Ochiel *et al.* (*Mycologist* 11: 7, 1997; ecology, pathogens), Suh *et al.* (*Mycol.* 90: 611, 1998; pathogens, taxonomy), Thomas (*TBMS* 84: 519, 1985; isolation medium), Van der Westhuizen & Eicker (*MR* 94: 923, 1991; key S. Afr. spp.), Zobel & Grace (*Mycol.* 82: 289, 1990; on *Reticulitermes*).
- Termiticola** E. Horak (1979), Agaricaceae. 1 (on termite nests), Papua New Guinea. See Horak (*Beih. Sydowia* 8: 207, 1979), Vellinga (*MR* 108: 354, 2004; phylogeny; clades with *Leucocoprinus*).
- Termitomyces** R. Heim (1942), Lyophyllaceae. Anamorph *Termitosphaera*. c. 30 (in nests of *Macrotermittinae*), Africa; S.E. Asia. See Heim (*Termites et champignons*, 1977), Pegler (*Kew Bull. Addit. Ser.* 6, 1977; key), Jing & Ma (*Acta Mycol. Sin.* 4: 103, 1985; key Chinese spp.), Aanen *et al.* (*PNAS* 99: 1487, 2002; coevolution with termites), Rouland-Lefevre *et al.* (*Mol. Phylog. Evol.* 22: 423, 2002; phylogeny), Frøslev *et al.* (*MR* 107: 1277, 2003; phylogeny), Mossebo *et al.* (*Bull. Soc. Mycol. Fr.* 118: 195, 2003; Cameroon), Wei *et al.* (*MR* 108: 108, 2004; key), Tang *et al.* (*Mycotaxon* 94: 93, 2005; revision Indian spp.), Tang *et al.* (*Mycotaxon* 95: 285, 2006; revision Chinese spp.), Wei *et al.* (*Fungal Diversity* 21: 225, 2006).
- Termitosphaera** Cif. (1935), anamorphic *Termitomyces*. 1, widespread (tropical).
- Terramyces** Letcher (2006), *Terramycetaceae*. 1. See Letcher *et al.* (*MR* 110: 898, 2006).
- Terramycetaceae** Letcher (2006), *Rhizophydiales*. 2 gen., 2 spp.
- terrestrial**, growing on land as opposed to in water. Cf. *terricolous*.
- terricolous**, growing on the ground. Cf. *terrestrial*.
- Terriera** B. Erikss. (1970), *Rhytismataceae*. 16, Europe. See Eriksson (*Symb. bot. upsal.* 19: 58, 1970), Johnston (*Mycotaxon* 87: 1, 2003), Ortiz-García *et al.* (*Mycol.* 95: 846, 2003; phylogeny), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Terrostella** Long (1945) ≡ *Geasteroides*.
- terverticillate** (of a penicillus), having branching at three levels, i.e. having rami bearing metulae and phialides.
- tessellate**, marked with a mosaic design; chequered.
- Testicularia** Klotzsch (1832), *Anthracoideaceae*. 3 (on *Cyperaceae*), Africa; N. & S. America; West Indies. See Vánky & Piątek (*Mycol. Balcanica* 3: 163, 2006; monogr., key).
- Testudina** Bizz. (1885), *Testudinaceae*. 1, Europe. See Hawksworth (*CJB* 57: 91, 1979).
- Testudinaceae** Arx (1971), *Pleosporales*. 5 gen. (+ 3 syn.), 7 spp.
Lit.: Hawksworth (*CJB* 57: 91, 1979), Hawksworth (*SA* 6: 153, 1987), Sivanesan (*Mycopathologia* 114: 59, 1991), LoBuglio *et al.* (*Mol. Phylogen. Evol.* 6: 287, 1996), Padhye & McGinnis (*Manual of Clinical Microbiology*: 1318, 1999), Kruys *et al.* (*MR* 110: 527, 2006), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Testudomyces** Cano, M. Solé & Guarro (2002), Gym-

- noascaceae. 1, Spain. See Solé *et al.* (*Stud. Mycol.* 47: 150, 2002).
- Tetena** Raf. (1806) nom. dub., Fungi.
- Teterevnikova-Babayan** (Darya Nikolayevna; 1904-1988; Russia, later Armenia). Student, Leningrad Agricultural Institute (1921-1926); Researcher, Phytopathology Station, Tsarskoye Selo (1926-1929); Plant Pathologist (1929-1934) then Head of Department of Plant Pathology (1934-1938), Station of Plant Protection, People's Commissariat of Agriculture, Armenian SSR; Chair of Plant Protection, Armenian Agricultural Institute (1938-48); Head, Department of Plant Protection, Institute of Wine-Making and Viticulture, Armenian Academy of Sciences (1942-1946); Professor of Botany, Yerevan State University (1948-1964); Corresponding Member, Armenian Academy of Sciences (1960). Although starting as a plant pathologist, she was noted for early work on the mycota of Armenia; initiated and organized the multi-volume series *Mycoflora of Armenia*, writing two of the volumes, and editing four. *Publs. [Rust fungi of cultural and wild plants of Armenian SSR]* (1959) [in Russian]; [Rust Fungi]. *Mikoflora Armyansko? SSR* (1977) [in Russian]; [Sphaeropsidales]. *Mikoflora Armyansko? SSR* (1983) [in Russian]; [Fungi of the Genus *Septoria* in the USSR] (1987) [in Russian]. *Biogs, obits etc.* Anon. ([*Mikologiya i Fitopatologiya*] 10: 75, 1976 [in Russian]); Gorlenko, Melik-Khachatryan, Osipyan & Tomilin ([*Mikologiya i Fitopatologiya*] 23: 186, 1989) [portrait, in Russian]).
- tetra** (prefix), four; **-cytes**, the spores resulting from meiosis; **-d**, a group of four; **-polar** (of incompatibility systems), having 2 loci; bifactorial; cf. bipolar; **-spore**, see dispoire; **-tomic**, 4-times furcate at one node.
- Tetrabrachium** Nawawi & Kuthub. (1987), anamorphic *Pezizomycotina*, Hso.1bH.1. 1 (aquatic), Malaysia. See Nawawi & Kuthubutheen (*Mycotaxon* 29: 291, 1987).
- Tetrabrunneospora** Dyko (1978), anamorphic *Pezizomycotina*, Hso.0bP.1. 1 (aquatic), USA. See Dyko (*TBMS* 70: 414, 1978), Marvanová & Bärlocher (*Czech Mycol.* 53: 1, 2001).
- Tetrachaetum** Ingold (1942), anamorphic *Pezizomycotina*, Hso.1bH.1. 1 (aquatic), widespread. See Laitung *et al.* (*Mol. Ecol.* 13: 1679, 2004; genetic diversity).
- Tetrachia** Berk. & M.A. Curtis (1882) nom. nud. = *Spegazzinia* fide Saccardo (*Syll. fung.* 12: 775, 1897).
- Tetrachia** Sacc. (1921) = *Spegazzinia* fide Boedijn (*in litt.*).
- tetrachotomous**, with four branches arising from the same point.
- Tetrachytrium** Sorokīn (1874), ? Chytridiomycetes. 1, Europe.
- Tetracium**, see *Tetracrium*.
- Tetracladium** De Wild. (1893), anamorphic *Helotiales*, Hso.1bH.1. 7 (aquatic), widespread. See Petersen (*Mycol.* 54: 140, 1962; key), Roldán *et al.* (*MR* 93: 452, 1989; culture characters, key), Nikolcheva & Bärlocher (*Czech Mycol.* 53: 285, 2002; phylogeny), Baschien *et al.* (*Nova Hedwigia* 83: 311, 2006; phylogeny).
- Tetracoccusporium** Szabó (1905), anamorphic *Pezizomycotina*, Hso.#eP.1. 2, widespread.
- Tetracolum** Kunze ex Link (1824) nom. dub. = *Torula* fide Petch (*TBMS* 24: 56, 1940), Hughes (*CJB* 36, 1958).
- Tetracrium** Henn. (1902), anamorphic *Puttemansia*, Hsp.1bH.?. 3 (on insects), widespread (tropical). See Martin (*Pacific Sci.* 2: 71, 1948).
- Tetracytum** Vanderw. (1945) = *Cylindrocladium* fide Kendrick & Carmichae *in* Ainsworth *et al.* (Eds) (*The Fungi* 4A: 390, 1973).
- Tetradia** T. Johnson (1904) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Tetragoniomyces** Oberw. & Bandoni (1981), Tetragoniomycetaceae. 1, N. America; Europe. See Oberwinkler & Bandoni (*CJB* 59: 1034, 1981), Put *et al.* (*Sterbeekia* 19: 23, 2000).
- Tetragoniomycetaceae** Oberw. & Bandoni (1981), Tremellales. 1 gen., 1 spp.
Lit.: Oberwinkler & Bandoni (*CJB* 59: 1034, 1981), Bandoni (*Stud. Mycol.* 30: 87, 1987), Oberwinkler (*Stud. Mycol.* 30: 61, 1987), Cléménçon (*Mycol. helv.* 4: 53, 1990), Put *et al.* (*Sterbeekia* 19: 23, 2000).
- Tetramelaena** (Trevis.) C.W. Dodge (1971) = *Hyperphyscia* fide Hafellner *et al.* (*Herzogia* 5: 39, 1979).
- Tetramelas** Norman (1853), Caliciaceae (L.). 1, widespread. See Hawksworth *et al.* (*Lichenologist* 12: 85, 1980), Marbach (*Bibliotheca Lichenol.* 74, 2000), Nordin (*Lichenologist* 36: 355, 2004), Nordin & Tibell (*Lichenologist* 37: 491, 2005).
- Tetrameronycha** Speg. ex W. Rossi & M. Blackw. (1990), anamorphic *Pezizomycotina*, Hso.0eH.1. 1 (on *Forficulidae*), W. Africa. See Rossi & Blackwell (*Mycol.* 82: 138, 1990).
- Tetramicra** R.A. Matthews & A.B.F. Matthews (1980), Microsporidia. 1.
- Tetranacriella** Kohlm. & Volkm.-Kohlm. (2001), anamorphic *Pezizomycotina*, C??.?. 1, USA. See Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 44: 152, 2001).
- Tetranacrium** H.J. Huds. & B. Sutton (1964), anamorphic *Pezizomycotina*, St.1bH.1. 1, West Indies; India. See Hudson & Sutton (*TBMS* 47: 202, 1964), Punithalingam (*MR* 107: 917, 2003; cytology).
- Tetrandromyces** Thaxt. (1912), Laboulbeniaceae. 6, widespread. See Rossi & Santamaria (*Mycol.* 92: 786, 2000).
- Tetrapisispora** Ued.-Nishim. & Mikata (1999), Saccharomycetaceae. 6, widespread. See Ueda-Nishimura & Mikata (*Int. J. Syst. Bacteriol.* 49: 1915, 1999), Kurtzman *et al.* (*Stud. Mycol.* 50: 397, 2004), Sumpradit *et al.* (*Int. J. Syst. Evol. Microbiol.* 55: 1735, 2005), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Tetraploa** Berk. & Broome (1850), anamorphic *Massarina*, Hso.#eP.1. 9, widespread. See Ellis (*TBMS* 32: 246, 1949), Rifai *et al.* (*Reinwardtia* 10: 419, 1988; Javan spp.), Scheuer (*MR* 95: 126, 1991; teleomorph), Hatakeyama *et al.* (*Mycoscience* 46: 196, 2005; Japan).
- Tetraposporium** S. Hughes (1951), anamorphic *Pezizomycotina*, Hso.0bP.1. 2, Africa; USA. See Hughes (*Mycol. Pap.* 46: 25, 1951).
- Tetrapyrgos** E. Horak (1987), Marasmiaceae. 16, widespread (tropical). See Horak (*Sydowia* 39: 101, 1986), Bulakh (*Mikol. Fitopatol.* 37: 23, 2003; Russian Far East), Wilson & Desjardin (*Mycol.* 97: 667, 2005; phylogeny).
- Tettigomyces** Thaxt. (1915), Ceratomyetaceae. 16, widespread. See Ye & Shen (*Acta Mycol. Sin.* 11: 285, 1992; key 10 spp. China).

- Tettigorhyza** G. Bertol. (1875) ? = *Cordyceps* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- texospore**, ascospore coated with a layer of cells of paraphysal origin, as in *Texosporium* (Tibell & Hofsten, *Mycol.* 60: 557, 1968).
- Texosporium** Nádv. ex Tibell & Hofsten (1968), Caliciaceae (L). 1, USA. See Tibell & Hofsten (*Mycol.* 60: 557, 1968), Wedin *et al.* (*Taxon* 51: 655, 2002), Tibell (*J. Hattori bot. Lab.* 100: 809, 2006).
- Textotheca** Matsush. (1996), anamorphic *Pezizomycotina*, Cpd.?.?. 1, Cape Province. See Matsushima (*Matsush. Mycol. Mem.* 9: 28, 1996).
- textura**, see tissue types.
- Thaelaephora**, see *Thelephora*.
- Thailandia** Vardhan. (1959) = *Candida* fide Orr & Kuehn (*Mycol.* 63: 191, 1971).
- Thailandiomyces** Pinruan, Sakay., K.D. Hyde & E.B.G. Jones (2008), Diaporthales. Anamorph *Craspedodidymum*. 1, Thailand. See Pinruan *et al.* (*Fungal Diversity* 29: 89, 2008).
- thalamium**, asci + hamathecium (obsol.).
- thalassiomycetes**, fungi living in marine environments; see Marine fungi.
- Thalassoascus** Ollivier (1926), Dothideomycetes. 3 (on *Algae*), widespread. See Kohlmeyer (*Mycol.* 73: 833, 1981).
- Thalassochytrium** Nyvall, Pedersén & Longcore (1999), Chytridiomycota. 1 (on marine red alga), China. See Nyvall *et al.* (*Journal of Phycology* 35: 176, 1999).
- Thalassogena** Kohlm. & Volkm.-Kohlm. (1987), Halosphaeriaceae. 1 (marine), Belize. See Kohlmeyer & Volkmann-Kohlmeyer (*SA* 6: 223, 1987), Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 34: 1, 1991).
- Thalespora** Chatmala & E.B.G. Jones (2006), Halosphaeriaceae. 1, Thailand. See Chatmala & Jones (*Nova Hedwigia* 83: 228, 2006).
- thallic** (of conidiogenesis), one of the two basic sorts (cf. blastic) in which any enlargement of the recognizable conidial initial occurs *after* the initial has been delimited by one or more septa. The conidium is differentiated from a *whole* cell. **entero-**, thallic conidiogenesis in which the outer wall of the sporogenous cell is not involved in the formation of the spore wall (as for sporangiospores).
- thalline exciple (margin)** (margin), see excipulum thallinum.
- Thallinocarpon** Å.E. Dahl (1950) ? = *Lichinella* fide Henssen (*Ber. dt. bot. Ges.* 92: 483, 1980).
- Thallisphaera** Dumort. (1822) nom. dub., *Pezizomycotina*. Used for diverse perithecioid fungi.
- Thallochaete** Theiss. (1913) = *Aphanopeltis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- thalloconidium**, a propagule produced and seceded directly from the lower cortex and(or) rhizines of certain *Umbilicaria* spp.; similar structures arise from the prothallus in *Protoparmelia*, *Rhizoplaca* and *Sporastatia* (Poelt & Obermayer, *Herzogia* 8: 273, 1990); thalloconidia are dark brown, smooth to rugged, with 2-3 wall layers, and consist of one to 2500 cells. See Hestmark (*Nord. Jl Bot.* 9: 547, 1990; ultrastr., occurrence); see also thalyles.
- thallodic**, of, pertaining to, or belonging to a thallus (Weresub & LeClair, *CJB* 49: 2203, 1971).
- Thalloedematomyces** E.A. Thomas ex Cif. & Tomas. (1953) = *Thalloidima*.
- Thalloidima** A. Massal. (1852) nom. rej. = *Toninia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Thalloidimatomyces**, see *Thalloedematomyces*.
- Thalloloma** Trevis. (1853), Graphidaceae (L). 1, widespread. See Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Staiger (*Biblthca Lichenol.* 85, 2002), Kalb *et al.* (*Symb. bot. upsal.* 34 no. 1: 133, 2004), Archer (*Biblthca Lichenol.* 94, 2006; Australia), Archer (*Systematics & Biodiversity* 5: 9, 2007; Solomon Is).
- Thallomicrosporon** Benedek (1964) = *Microsporum* fide Ajello (*Sabouraudia* 6: 153, 1968).
- Thallomyces** H.J. Swart (1975), Parmulariaceae. 1, Australia. See Swart (*TBMS* 65: 84, 1975).
- Thallophyta**, see *Fungi*; **thallophyte**, one of the *Thallophyta*.
- Thallospora** L.S. Olive (1948), anamorphic *Pezizomycotina*, Hso.1bH.1. 1, USA.
- thallospore** (1) an asexual spore having neither conidiophore nor conidiogenous cell, or one which is not separated from the hypha or conidiogenous cell producing it; i.e. an arthrospore, blastospore, or chlamydospore (and aleuriospore) (after Vuillemin; see Mason, 1933); (2) a thalloconidium (q.v.).
- thallus**, the vegetative body of a thallophyte; for thallus types in lichens see Lichens; **heteromerous-**, a layered thallus; **homoiomerous-**, an unlayered thallus.
- thallyles**, minute thallus-like propagules produced on the underside of certain *Umbilicaria* thalli (Krog & Swinscow, *Nordic Jl Bot.* 6: 75, 1986); see also thalloconidia.
- Thamniaceae** Fitzp. (1930) = *Mucoraceae*.
Lit.: Kirk (*in litt.*).
- Thamnidium** Link (1809), *Mucoraceae*. 1, widespread. See Benny (*Mycol.* 84: 834, 1992), Roux & Botha (*Proc. Elect. Microsc. Soc. S. Afr.* 24: 64, 1994; ultrastr.), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny), Ho (*Fungal Science Taipei* 17: 87, 2002; Taiwan).
- Thamnidium** Tuck. ex Schwend. (1860) = *Lichina* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- thamniscophagous**, see *ptyophagous*.
- Thamnium** Vent. (1799) nom. rej. = *Roccella* fide Ahti (*Taxon* 33: 330, 1984).
- Thamnocephalis** Blakeslee (1905), Sismoideomycetaceae. 3, N. America; India. See Mehrotra (*Zbl. Bakt. Abt. II* 117: 425, 1964), Benny *et al.* (*Mycol.* 84: 635, 1992; key), Tanabe *et al.* (*Mol. Phylogen. Evol.* 16: 253, 2000; phylogeny).
- Thamnochrolechia** Aptroot & Sipman (1991), Agyriaceae (L). 1, Papua New Guinea. See Lumbsch *et al.* (*Biblthca Lichenol.* 57: 355, 1995), Schmitt *et al.* (*Biblthca Lichenol.* 86: 147, 2003; phylogeny).
- Thamnogalla** D. Hawksw. (1980), *Pezizomycotina*. 1 (on *Thamnotia*), widespread (northern hemisphere). See Hafellner & Sancho (*Herzogia* 8: 363, 1990; posn), Hoffmann & Hafellner (*Biblthca Lichenol.* 77: 1, 2000).
- Thamnolecania** (Vain.) Gyeln. (1933), Lecanorales (L). 5, widespread (sub-Antarctic). Perhaps allied to *Crocyniaceae*. See Ekman (*MR* 105: 783, 2001; phylogeny).
- Thamnotia** Ach. ex Schaer. (1850) nom. cons., Icmadophilaceae (L). 4, widespread (montane). Sterile. See Ihlen (*Graphis Scripta* 7: 17, 1995; Norway), Kärnefelt & Thell (*Biblthca Lichenol.* 58: 213, 1995;

- genetic variation), Ekman & Tønsberg (*MR* 106: 1262, 2002; phylogeny), Santesson (*Symb. bot. upsal.* 34: 393, 2004), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Thamnoliaceae** Zahlbr. (1898) = Icmadophilaceae.
- Thamnoma**, see *Thamnonoma*.
- Thamnomycetes** Ehrenb. (1820), Xylariaceae. Anamorph *Nodulisporium*. 4 or 5, widespread (esp. tropical). See Dennis (*Kew Bull.* 12: 297, 1957), Dennis (*Bull. Jard. bot. Brux.* 31: 150, 1961), Samuels & Müller (*Sydowia* 33: 274, 1980; relationships), San Martín & Rogers (*Mycotaxon* 53: 115, 1995; Mexico), Stadler *et al.* (*MR* 108: 239, 2004; chemistry), Stadler & Fournier (*Revta Iberoamer. Micol.* 23: 160, 2006).
- Thamnonoma** (Tuck.) Gyeln. (1933) = *Caloplaca* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Thamnostylum** Arx & H.P. Upadhyay (1970), Syncephalastraceae. 4, widespread (esp. warmer areas). See Benny & Benjamin (*Aliso* 8: 301, 1975; key), Botha *et al.* (*S. Afr. J. Bot.* 63: 104, 1997), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny), Ho (*Fungal Science Taipei* 17: 87, 2002; Taiwan).
- Thanatephorus** Donk (1956), Ceratobasidiaceae. Anamorph *Rhizoctonia*. 12, widespread. *T. cucumeris* (stat. mycel. *Rhizoctonia solani*) is now used to replace *Corticium solani*. See Talbot (*Persoonia* 3: 371, 1965), Currah & Zelmer (*Rep. Tottori mycol. Inst.* 40: 43, 1992; 4 spp. with orchids), Roberts (*Rhizoctonia-forming fungi*, 1999), Elbakali *et al.* (*Phytopath. Mediterr.* 42: 167, 2003; on potato), Toda *et al.* (*J. Gen. Pl. Path.* 70: 270, 2004; *Rhizoctonia solani* ITS), Ciampi *et al.* (*Eur. J. Pl. Path.* 113: 183, 2005; *Rhizoctonia solani* intraspecific evolution).
- Thanatophytum** Nees (1816), anamorphic *Helicobasidium*. 1, widespread. *T. crocorum* (a pathogen of *Crocus*; mort de saffran). See Lutz *et al.* (*MR* 108: 227, 2004).
- Thaptospora** B. Sutton & Pascoe (1987), anamorphic *Pezizomycotina*, Ccu.0eH.15. 1, Australia. See Sutton & Pascoe (*TBMS* 88: 174, 1987).
- Tharoopama** Subram. (1956), anamorphic *Pezizomycotina*, Hsy.0eP.10. 2, India; Panama. See Subramanian (*J. Indian bot. Soc.* 35: 84, 1956), Sureshkumar *et al.* (*Journal of Mycology and Plant Pathology* 36: 8, 2006).
- Thaumasiomyces** Thaxt. (1931), Ceratomycetaceae. 3, W. Africa; Borneo. See Zhou *et al.* (*MR* 105: 919, 2001; DNA).
- Thaxter** (Roland; 1858-1932; USA). Assistant Professor (1891) then Professor of Cryptogamic Botany (1901-1919), Harvard University; Honorary Curator of the Farlow Herbarium (1919 onwards). His great contribution was the detailed and meticulous study of the *Laboulbeniales* (q.v.), previously almost completely overlooked. *Publs.* Contribution towards a monograph of the *Laboulbeniaceae* I-V. *Memoirs of the American Academy of Arts and Sciences* (1896-1931). *Biogs, obits etc.* Grumann (1974: 197); Pfister (*Mycotaxon* 20: 225, 1984; index to non-*Laboulbeniales* names); Stafleu & Cowan (*TL-2* 6: 231, 1986); Weston (*Mycol.* 25: 69, 1933) [bibliography, portrait]; Weston (*Phytopathology* 23: 565, 1933).
- Thaxteria** Giard (1892) = *Laboulbenia* fide Thaxter (*Proc. Amer. Acad. Arts & Sci.* 30: 471, 1895).
- Thaxteria** Sacc. (1891), Nitschkiaceae. 2, widespread. See Booth & Müller (*TBMS* 58: 73, 1972), Nannfeldt (*Svensk bot. Tidskr.* 69: 204, 1975; posn), Huhndorf *et al.* (*Mycol.* 96: 368, 2004), Huhndorf *et al.* (*MR* 108: 1384, 2004).
- Thaxteriella** Petr. (1924), Tubeufiaceae. 11, widespread. See Rossman (*Mycol. Pap.* 157, 1987), Crane *et al.* (*CJB* 76: 602, 1998), Kodsueb *et al.* (*Fungal Diversity* 21: 105, 2006), Spatafora *et al.* (*Mycol.* 98: 1018, 2006; phylogeny), Tsui *et al.* (*Mycol.* 98: 94, 2006).
- Thaxteriellopsis** Sivan., Panwar & S.J. Kaur (1977) = *Chaetosphaerulina* fide Crane *et al.* (*CJB* 76: 602, 1998).
- Thaxterina** Sivan., R.C. Rajak & R.C. Gupta (1988), Tubeufiaceae. 1, India. See Sivanesan *et al.* (*TBMS* 90: 662, 1988), Crane *et al.* (*CJB* 76: 602, 1998), Kodsueb *et al.* (*Fungal Diversity* 21: 105, 2006).
- Thaxteriola** Speg. (1918), anamorphic *Pyxidiophora*. 1, widespread. See Blackwell *et al.* (*Mycol.* 78: 605, 1986), Blackwell *et al.* (*Science N.Y.* 232: 993, 1986), Simpson & Stone (*Mycotaxon* 30: 1, 1987), Blackwell & Malloch (*Mem. N. Y. bot. Gdn* 49: 23, 1989), Blackwell *et al.* (*MR* 92: 397, 1989), Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Thaxterogaster** Singer (1951) = *Cortinarius*. Formerly recognized as an independent sequestrate genus. fide Peintner *et al.* (*Mycotaxon* 81: 177, 2002).
- Thaxterogastraceae** Singer (1962) = *Cortinariaceae*.
- Thaxterosporium** Ben Ze'ev & R.G. Kenneth (1987), Neozygiteaceae. 1, widespread. See Ben-Ze'ev *et al.* (*Mycotaxon* 28: 323, 1987) = *Neozygites* (Entomophthor.) fide, Keller (*Sydowia* 43: 39, 1991).
- theca**, see *ascus* (obsol.).
- Thecamycetes**, see *Ascomycota* (Marchand, 1896).
- Thecaphora** Fingerh. (1836) nom. cons., Glomosporiaceae. Anamorphs *Thecaphorella*, *Rhombiella*. 57 (on *Leguminosae*, *Compositae*, *Convolvulaceae*, etc.), widespread. *T. solani*, potato (*Solanum*) smut; *T. frezzii*, peanut (*Arachis*) smut. Frequently has an anamorph. See Zambettakis & Joly (*BSMF* 91: 71, 1975; numerical taxonomy), Durán (*CJB* 60: 1512, 1982), Vánky (*Illustrated genera of smut fungi*, 1987), Vánky (*Cryptog. Stud.* 1: 159 pp., 1987), Mordue (*Mycopathologia* 103: 177, 1988), Vánky (*TBMS* 32: 148, 1991), Vánky (*Taxon* 47: 153, 1998), Vánky (*Fungal Diversity* 6: 131, 2001; as *Glomosporium*), Piątek (*Mycotaxon* 92: 33, 2005; as *Kochmania*), Vánky *et al.* (*Mycol. Progr.*: [in press], 2008).
- Thecaphorella** H. Scholz & I. Scholz (1988), anamorphic *Thecaphora*. 1. See Vánky (*Europ. Smut Fungi*: 228, 1994).
- Thecaria** Fée (1824), Graphidaceae (L.). 1, pantropical. See Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Staiger (*Biblthca Lichenol.* 85, 2002), Archer (*Biblthca Lichenol.* 94, 2006), Archer (*Systematics & Biodiversity* 5: 9, 2007; Solomon Is).
- thecaspore**, see *ascospore* (obsol.).
- Theciopeltis** F. Stevens & Manter (1925) = *Micropeltis* fide Clements & Shear (*Gen. Fung.*, 1931).
- thecium**, the part of an apothecium containing the asci between the epithecium and hypothecium; sometimes used for the whole sporocarp or as equivalent to hymenium.
- Theclospora** Harkn. (1884) = *Emericella* fide Peek & Solheim (*Mycol.* 50: 844, 1958).
- Thecographa** A. Massal. (1860), Graphidaceae. 1,

- paleotropical. See Lücking *et al.* (*Taxon* 56: 1296, 2007; nomencl.).
- Thecopsora**, see *Thekopsora*.
- Thecostroma** Clem. (1909) = *Bloxamia* fide Clements & Shear (*Gen. Fung.*, 1931).
- Thecotheus** Boud. (1869), ? *Ascobolaceae*. 17, widespread (esp. temperate). See Kimbrough (*Mycol.* 61: 107, 1969; key), Krug & Khan (*Mycol.* 79: 200, 1987; key 10 spp.), Aas (*A World-Monograph of the Genus Thecotheus*, 1992), Kimbrough in Hawksworth (Ed.) (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. 269 269: 398, 1994; posn), Prokhorov (*Mikol. Fitopatol.* 31: 27, 1997), Landvik *et al.* (*Mycoscience* 39: 49, 1998; phylogeny), Yao & Spooner (*Kew Bull.* 55: 451, 2000; UK), Nagao *et al.* (*Mycol.* 95: 688, 2003; Australia), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny).
- Thedongia** B. Sutton (1973), anamorphic *Helotiales*, Hsp.1 = eH.39. 3, widespread (north temperate). See Yoshikawa & Yokoyama (*TMSJ* 33: 177, 1992), Braun (*Monogr. Cercosporaella, Ramularia Allied Genera (Phytopath. Hyphom.)* 1: 211, 1995; key), Crous *et al.* (*Mycol.* 93: 1081, 2001; phylogeny), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003), Crous *et al.* (*Stud. Mycol.* 58: 33, 2007; phylogeny).
- Theissen** (Ferdinand; 1877-1919; Germany, later Brazil). Stationed in São Leopoldo, Brazil (1902-1908); studied theology and became priest, Valkenburg and Innsbruck (1909-1912); schoolmaster, Feldkirch (1914-1919); died as a result of a climbing accident in the Voralberg Alps while collecting. With Rick (q.v.) he made significant contributions to tropical mycology, particularly for ascomycetes of Brazil. *Publs. Die Gattung Asterina* (1913); (with H. Sydow, q.v.) *Die Dothideales. Annales Mycologici* (1915). *Biogs, obits etc.* Sydow (*Annales Mycologici* 17: 134, 1919, bibliography); Stafleu & Cowan (*TL-2* 6: 239, 1986).
- Theissenia** Maubl. (1914), *Xylariaceae*. Anamorph *Nodulisporium*. 4, pantropical. See Dennis (*Bull. Jard. bot. Brux.* 34: 231, 1961), Ju *et al.* (*Mycol.* 95: 109, 2003; monogr.), Ju *et al.* (*Mycol.* 99: 612, 2007; phylogeny).
- Theissenula** Syd. & P. Syd. (1914) nom. dub., *Fungi*. See Hansford (*Mycol. Pap.* 15, 1946).
- Thekopsora** Magnus (1875), *Pucciniastreaceae*. Anamorph *Pomatomyces*. c. 11 (on *Picea*, *Tsuga* (0, I) (*Pinaceae*; on dicots (II, III)), widespread (north temperate). See Hiratsuka (*Revision of taxonomy of the Pucciniastreaceae*, 1958), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983; as *Pucciniastrium*), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003; accepted).
- Thelactis** Mart. (1821) = *Mucor* Fresen. fide Fries (*Syst. mycol.* 3, 1832).
- Thelebolaceae** Eckblad (1968), *Thelebolales*. 9 gen. (+ 9 syn.), 46 spp.
Lit.: Kimbrough (*CJB* 44: 685, 1966), Kimbrough & Korf (*Am. J. Bot.* 54: 9, 1967), Moravec (*Česká Mykol.* 25: 150, 1971), Czymmek & Klomparens (*CJB* 70: 1669, 1992), Momol *et al.* (*SA* 14: 91, 1996), Brummelin (*Persoonia* 16: 425, 1998), Brummelin & Kristiansen (*Persoonia* 17: 119, 1998), Landvik *et al.* (*Mycoscience* 39: 49, 1998; phylogeny), Prokhorov (*Mikol. Fitopatol.* 32: 40, 1998), van Brummelen (*Persoonia* 16: 425, 1998; ultrastr.) and under *Thelebolus*, Wang (*Bull. natn. Mus. Nat. Sci. Taiwan* 12: 49, 1999), Stchigel *et al.* (*MR* 105: 377, 2001).
- Thelebolales** P.F. Cannon (2001), ? *Leotiomycetes*. 1 fam., 9 gen., 46 spp. Stromata absent. Ascomata minute, ± globose or pulvinate, at least initially cleistothecial, the excipulum hyaline, poorly developed, ± glabrous. Interascal tissue poorly developed, composed of simple paraphyses. Asci ± ellipsoidal, often multisporous, ± persistent, opening with a rather irregular vertical split. Ascospores usually small, hyaline, smooth or with ornamentation formed as an elaboration of an initially homogeneous secondary wall layer. Anamorphs unknown. Saprobiic, usually coprophilous, widespr. Fam.:
- Thelebolaceae**
 For *Lit.* see under fam.
- Thelebolus** Tode (1790), *Thelebolaceae*. 10 (psychrophilic, coprophilous), widespread (north temperate). See Cooke & Barr (*Mycol.* 56: 763, 1964; asci and *Erysiphaceae*), Wicklow & Malloch (*Mycol.* 63: 118, 1971), Kimbrough (*Mycol.* 73: 1, 1981; ascus structure), Czymmek & Klomparens (*CJB* 70: 1669, 1992; ascospores), Momol & Kimbrough (*SA* 13: 1, 1994; posn), Momol *et al.* (*SA* 14: 91, 1996; posn), Landvik *et al.* (*Mycoscience* 39: 49, 1998), Gernandt *et al.* (*Mycol.* 93: 915, 2001; phylogeny), Stchigel *et al.* (*MR* 105: 377, 2001; phylogeny), Hoog *et al.* (*Stud. Mycol.* 51: 33, 2005; phylogeny, ecology), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny).
- Thelenella** Nyl. (1855), *Thelenellaceae* (L.). 33, widespread. See Mayrhofer (*Biblhca Lichenol.* 26, 1987; key), Mayrhofer & McCarthy (*Muelleria* 7: 333, 1991; key 12 saxicolous spp.), Harris (*More Florida Lichens*, 1995), Aptroot (*Fungal Diversity* 2: 43, 1999), Fryday & Coppins (*Lichenologist* 36: 89, 2004), Lücking *et al.* (*Lichenologist* 39: 187, 2007).
- Thelenellaceae** O.E. Erikss. ex H. Mayrhofer (1987), *Pezizomycotina* (inc. sed.) (±L.). 2 gen. (+ 10 syn.), 51 spp.
Lit.: Mayrhofer & Poelt (*Herzogia* 7: 13, 1985), Barr (*Sydowia* 38: 11, 1985), Mayrhofer (*Biblhca Lichenol.* 26: 106 pp., 1987), Mayrhofer (*Biblhca Lichenol.* 26, 1987), Kalb (*Flechten Follmann Contributions to Lichenology in Honour of Gerhard Follmann*: 249, 1995), Harada (*J. Nat. Hist. Mus. Inst. Chiba* 5: 91, 1999), Hyde & Wong (*MR* 103: 347, 1999), Schmitt *et al.* (*Mycol.* 97: 362, 2005).
- Thelenidia** Nyl. (1886), ? *Dothideomycetes* (L.). 1, Greenland; Switzerland. See Topham & Swinscow (*Lichenologist* 4: 294, 1970).
- Thelenidiomyces** Cif. & Tomas. (1953) = *Thelenidia*.
- Thelephora** Ehrh. ex Willd. (1787), *Thelephoraceae*. c. 50, widespread. See Corner (*Beih. Nova Hedwigia* 27, 1968; monogr.), Stalpers (*Stud. Mycol.* 35: 168 pp., 1993; key), Zecchin (*Rivista di Micologia* 48: 243, 2005).
- Thelephoraceae** Chevall. (1826), *Thelephorales*. 12 gen. (+ 20 syn.), 171 spp.
Lit.: Svrček (*Sydowia* 14: 170, 1960; subfam. *Tomentelloideae*, keys), Cunningham (*The Thelephoraceae of Australia and New Zealand [Bull. DSIR N.Z.* 145], 1963; Cuba), Reid (*Beih. Nova Hedwigia* 18: 1090, 1965; stipitate steroid spp.), Corner (*Beih. Nova Hedwigia* 27, 1968), Jülich & Stalpers (*Verh. Kon. Ned. Akad. Wetensch. Afd. Natuurk. sect. 2* 74, 1980; N. Hemisph.), Stalpers (*Stud. Mycol.* 35: 168 pp., 1993), Kõljalg (*Syn. Fung.* 9: 213 pp., 1996).

Thelephorales Corner ex Oberw. (1976). Agaricomycetes. 2 fam., 18 gen., 269 spp. Fams:

(1) **Bankeraceae**

(2) **Thelephoraceae**

For *Lit.* see under fam.

Thelephorella P. Karst. (1889) nom. dub., Thelephorales. See Donk (*Taxon* 6: 17, 1957).

Theleporus Fr. (1847), Grammotheleaceae. 3, widespread (tropical). See Ryvarden (*TBMS* 73: 9, 1979), Roberts & Ryvarden (*Kew Bull.* 61: 55, 2006; Cameroon).

Thelidea Hue (1902) = *Knightiella* fide Rambold *et al.* (*Biblthca Lichenol.* 53: 217, 1993).

Thelidiaceae Walt. Watson (1929) = Verrucariaceae.

Thelidiella Fink (1933), Pezizomycotina. 1 (on lichens), N. America.

Thelidiola C.W. Dodge (1968) = *Muellerella* fide Castello & Nimis (*Biblthca Lichenol.* 57: 71, 1995).

Thelidiomyces Cif. & Tomas. (1953) = *Thelidium*.

Thelidiopsis Vain. (1921), Verrucariaceae (L.). 1, Europe; Asia.

Thelidium A. Massal. (1855), Verrucariaceae (L.). c. 111, widespread. See Servít (*Československé lišejníky čeledi Verrucariaceae*, 1954), Harada (*Hikobia* 12: 133, 1996; Japan), Harada (*Hikobia* 12: 289, 1998), Grube (*Nova Hedwigia* 68: 241, 1999; asci), Harada & Wang (*Lichenology* 3: 47, 2004), Harada & Wang (*Lichenology* 5: 23, 2006), Gueidan *et al.* (*MR* 114: 1145, 2007; phylogeny).

Thelignya A. Massal. (1855), Lichinaceae (L.). 1, Europe. See Henssen (*Symb. bot. upsal.* 18 no. 1, 1963), Jørgensen & Henssen (*Taxon* 39: 343, 1990), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key).

Thelis Clem. (1931) = *Hanseniaspora*.

Thelocarpaceae Zúkal (1893), Pezizomycotina (inc. sed.). 3 gen. (+ 12 syn.), 25 spp. See Salisbury (*Lichenologist* 3: 175, 1966), Reeb *et al.* (*Mol. Phylogen. Evol.* 32: 1036, 2004; phylogeny).

Thelocarpella Nav.-Ros. & Cl. Roux (1999), Acarosporaceae. 1, France. See Navarro-Rosinés *et al.* (*CJB* 77: 835, 1999), Lutzoni *et al.* (*Am. J. Bot.* 91: 1446, 2004; phylogeny), Reeb *et al.* (*Mol. Phylogen. Evol.* 32: 1036, 2004; phylogeny), Wedin *et al.* (*MR* 109: 159, 2005; phylogeny).

Thelocarpon Nyl. (1853), Thelocarpaceae ($\pm$ L.). 23, Europe; N. America. See Salisbury (*Lichenologist* 3: 175, 1966), Poelt & Hafellner (*Phyton Horn* 17: 67, 1975), Kocourková-Horáková (*Czech Mycol.* 50: 271, 1998), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Aptroot & Sparrius (*Lichenologist* 32: 513, 2000), Reeb *et al.* (*Mol. Phylogen. Evol.* 32: 1036, 2004; phylogeny).

Thelocarponomyces Cif. & Tomas. (1953) = *Thelocarpon*.

Thelocarpum Clem. (1909) = *Thelocarpon*.

Thelochroa A. Massal. (1855) = *Pyrenocarpon* fide Jørgensen & Henssen (*Taxon* 39: 343, 1990).

Thelococcum Nyl. ex Hue (1888) = *Thelocarpon* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Thelographis Nyl. (1857) nom. nud. = *Graphis* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Thelohania Henneguy (1892), Microsporidia. 23.

Thelomma A. Massal. (1860), Caliciaceae (L.). 7, widespread. See Tibell (*Bot. Notiser* 129: 221, 1976), Tibell (*Beih. Nova Hedwigia* 79: 597, 1984), Wedin & Tibell (*CJB* 75: 1236, 1997), Ekman & Wedin (*Pl.*

Biol. 2: 350, 2000; phylogeny), Andersen & Ekman (*Lichenologist* 36: 27, 2004; phylogeny).

Thelomphale Flot. (1863) = *Thelocarpon* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Thelophora Clem. (1902) = *Thelephora*.

Thelopsidomyces Cif. & Tomas. (1953) = *Thelopsis*.

Thelopsis Nyl. (1855) nom. cons., Ostropales (L.). 9, Europe; N. America. See Vězda (*Folia geobot. phytotax.* 4: 363, 1968), Sherwood (*Mycotaxon* 5: 1, 1977), McCarthy (*Muelleria* 7: 313, 1991; Australia), Renobales *et al.* (*Lichenologist* 28: 105, 1996; Spain), Breuss & Schultz (*Lichenologist* 39: 35, 2007; Socotra, key).

Theloschisma Trevis. (1860) = *Phaeographis* fide Staiger (*Biblthca Lichenol.* 85, 2002).

Theloschistes Th. Fr. (1861) = *Teloschistes*.

Theloschistomyces Cif. & Tomas. (1953) = *Theloschistes*.

Thelospora, see *Theclospora*.

Thelotrema Ach. (1803), Thelotremataceae (L.). c. 126, widespread (esp. tropical). See Salisbury (*Lichenologist* 5: 262, 1972; *lepadinum*-group), Hale (*Smithson. Contr. bot.* 16, 1974; Dominican Republic), Salisbury (*Lichenologist* 7: 59, 1975; gen. concept), Hale (*Smithson. Contr. bot.* 38, 1978; Panama), Hale (*Smithson. Contr. bot.* 40, 1980; limits), Hale (*Bull. Br. Mus. nat. hist. Bot.* 8: 227, 1981; Sri Lanka), Purvis *et al.* (*Biblthca Lichenol.* 58: 335, 1995; Eur.), Matsumoto & Deguchi (*Bryologist* 102: 86, 1999; anamorph), Matsumoto (*J. Hattori bot. Lab.* 88: 1, 2000; Japan), Galloway (*Australasian Lichenology* 49: 16, 2001), Homchantara & Coppins (*Lichenologist* 34: 113, 2002; SE Asia), Lücking *et al.* (*Mycol.* 96: 283, 2004; phylogeny), Frisch (*Biblthca Lichenol.* 92: 3, 2006; Africa), Frisch *et al.* (*Biblthca Lichenol.* 92: 517, 2006; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Mangold *et al.* (*Biblthca Lichenol.* 95: 459, 2007; Australia), Mangold *et al.* (*Lichenologist* 40: 39, 2008; phylogeny).

Thelotremataceae Stizenb. (1862), Ostropales (L.). 21 gen. (+ 37 syn.), 660 spp.

Lit.: Hale (*Mycotaxon* 11: 130, 1980), Hale (*Bull. Br. Mus. nat. Hist. Bot.* 8: 227, 1981; gen. concepts), Lumbsch (*Nova Hedwigia* 56: 227, 1993), Lumbsch & Tehler (*Bryologist* 101: 398, 1998), Matsumoto & Deguchi (*Bryologist* 102: 86, 1999; anams), Kantvilas & Vězda (*Lichenologist* 32: 325, 2000; Tasmania), Kantvilas & Vězda (*Lichenologist* 32: 343, 2000), Matsumoto (*J. Hattori bot. Lab.* 88: 1, 2000), Kauff & Lutzoni (*Mol. Phylogen. Evol.* 25: 138, 2002), Martín *et al.* (*Lichenologist* 35: 27, 2003), Kalb *et al.* (*Symb. bot. upsal.* 34 no. 1: 133, 2004), Lumbsch *et al.* (*Mol. Phylogen. Evol.* 31: 822, 2004), Lumbsch *et al.* (*Symb. bot. upsal.* 34 no. 1: 9, 2004), Frisch *et al.* (*Biblthca Lichenol.* 92: 556 pp., 2006), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Staiger *et al.* (*MR* 110: 765, 2006), Rivas Platas *et al.* (*Biodiversity & Conservation* 17: in press, 2008; indicator of undisturbed tropical forests).

Thelotrematomyces E.A. Thomas ex Cif. & Tomas. (1953) = *Thelotrema*.

Themisia Velen. (1939), ? Helotiales. 1, former Czechoslovakia.

Thermoactinomyces Tsikl. (1899), Bacteria. q.v.

Thermoascaceae Apinis (1967), Eurotiales. 2 gen., 8 spp. See Hambleton *et al.* (*Stud. Mycol.* 53: 29, 2005; phylogeny).

- Thermoascus** Miehe (1907), Thermoascaceae. Anamorph *Polypaecilum*. 5, widespread. See also *Coonemeria*. See Apinis (*TBMS* 50: 573, 1967), Ellis (*TBMS* 76: 457, 1981; ultrastr.), Ellis (*TBMS* 76: 467, 1981; ultrastr.), Malloch in Samson & Pitt (Eds) (*Advances in Penicillium and Aspergillus systematics* 102: 365, 1985), Landvik *et al.* (*Mycoscience* 37: 237, 1997; DNA), Mouchacca (*Cryptog. Mycol.* 18: 19, 1997; review), Luangsa-ard *et al.* (*Mycol.* 96: 773, 2004; phylogeny), Hambleton *et al.* (*Stud. Mycol.* 53: 29, 2005; phylogeny).
- thermodury**, withstanding high temperature, esp. when in a dormant state, e.g. as spores. Cf. thermophily.
- Thermoidium** Miehe (1907) = *Malbranchea* fide Sigler & Carmichael (*Mycotaxon* 4: 441, 1976).
- Thermomonospora** Henssen (1957), Actinobacteria. q.v.
- Thermomucor** Subrahman., B.S. Mehrotra & Thirum. (1977), Mucoraceae. 1, India. See Subrahmanyam *et al.* (*Georgia J. Sci.* 35: 1, 1977), Schipper (*Antonie van Leeuwenhoek* 45: 275, 1979), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny).
- Thermomyces** Tsikl. (1899), anamorphic *Eurotiales*, Hso.0eP.1. 4 (from soil), widespread. See Pugh *et al.* (*TBMS* 47: 115, 1964), Jensen *et al.* (*MR* 97: 665, 1993; growth kinetics), Mouchacca (*Cryptog. Mycol.* 18: 19, 1997; review), Hambleton *et al.* (*Stud. Mycol.* 53: 29, 2005; phylogeny).
- thermophily**, making active growth at high temperature. Cf. thermodury. Fungi may be classified as **thermophiles** (adj. **-ilic**), growth at 20-50+°C (opt. 40-50+°C). See Cooney & Emerson (*Thermophilic fungi*, 1964; descriptions), Emerson (in Ainsworth & Sussman (Eds), *The Fungi* 3: 105, 1968), Crisan (*Mycol.* 65: 1170, 1973; concepts), Bilař & Zakharchenko (*Opredelitel' Termofil'nykh Gribov*, 1987; keys, illustr. 38 spp.); **thermotolerant fungi**, e.g. *Aspergillus fumigatus*, *Absidia ramosa*, max. c. 50°C, min. well below 20°C; **mesophiles** (adj. **-ilic**), growth 10-40°C (opt. 20-35°C); **psychrophiles** (adj. **-ilic**), growth below 10°C (opt. below 20°C).
- Thermophymatospora** Udagawa, Awao & Abdullah (1986), anamorphic *Ganoderma*. 1 (with clamp connexions, from soil), Iraq. See Udagawa *et al.* (*Mycotaxon* 27: 100, 1986).
- Thermutis** Fr. (1825), Lichinaceae (L.). 1, Europe. See Henssen (*Symb. bot. upsal.* 18 no. 1, 1963), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key).
- Thermutomyces** Cif. & Tomas. (1953) = *Thermutis*.
- Thermutopsis** Henssen (1990), Lichinaceae (L.). 1, Antigua. See Henssen (*Lichenologist* 22: 254, 1990), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key).
- Therrya** Sacc. (1882), Rhytismataceae. 7, widespread. See Reid & Cain (*CJB* 39: 1117, 1961), Yuan & Mohammed (*Mycotaxon* 64: 173, 1997), Johnston (*Aust. Syst. Bot.* 14: 377, 2001).
- Thielavia** Zopf (1876), Chaetomiaceae. 31, widespread. See Malloch & Cain (*Mycol.* 65: 1055, 1973), von Arx (*Stud. Mycol.* 8, 1975), von Arx *et al.* (*Bibliotheca Mycol.* 94, 1988), Mouchacca (*Cryptog. Mycol.* 18: 19, 1997; thermophilic spp.), Lee & Hanlin (*Mycol.* 91: 434, 1999; DNA), Stchigel *et al.* (*MR* 106: 975, 2002; phylogeny), Stchigel *et al.* (*Mycol.* 95: 1218, 2003; Antarctica), Sun *et al.* (*Mycosystema* 24: 318, 2005; China), Cai *et al.* (*MR* 110: 137, 2006; phylogeny).
- Thielaviella** Arx & T. Mahmood (1968) = *Boothiella* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Thielaviopsis** Went (1893), anamorphic *Ceratocystis*, Hso.0eP.38. 12, widespread. *T. basicola* (root rot of tobacco and other plants). See Johnson (*J. agric. Res.* 7: 289, 1916; hosts), Rawlings (*Ann. Mo. bot. Gdn* 27: 561, 1940; culture), Punja & Sun (*CJB* 77: 1801, 1999), Paulin & Harrington (*Stud. Mycol.* 45: 209, 2000; phylogeny), Paulin-Mahady *et al.* (*Mycol.* 94: 62, 2002; phylogeny), Geldenhuis *et al.* (*MR* 110: 306, 2006; phylogeography).
- Thind** (Kartar Singh; 1917-1991; India). PhD, University of Wisconsin, Madison, USA (1948); Senior Lecturer (1949-1957) then Reader (1957-1962) then Professor (1962-1967) then Senior Professor (1967-1977) in Botany (Mycology and Plant Pathology) and Head of the Botany Department (1976-1977) then Professor (1977-1980) then Emeritus Professor (1980 onwards), Panjab University, Chandigarh. Explored the mycota of the northwest Himalaya over many years, leading a team of younger mycologists, organizing broad coverage of all taxonomic groups and ensuring a continuous output of papers reporting discoveries. *Publs. Clavariaceae of India* (1961); *Myxomycetes of India* (1977). *Biogs, obits etc.* Subramanian (*Current Science* 63: 151, 1992).
- Thindia** Korf & Waraitch (1971), Sarcoscyphaceae. 1 (on *Cupressus*), India. See Cabello (*Boln Soc. argent. Bot.* 25: 395, 1988; numerical taxonomy).
- Thindiomyces** Arendh. & R. Sharma (1983), Helotiaceae. 1, Bhutan. See Arambarri & Sharma (*Mycotaxon* 17: 486, 1983).
- Thirumalacharia** Rathaiah (1981), anamorphic *Pezizomycotina*, Hso.1eP.10. 1, India. See Rathaiah (*Mycol.* 72: 1210, 1980).
- Thirumalachariella** Sathe (1975) = *Phragmidiella* fide Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983).
- Tholomyces** Matsush. (2003), anamorphic *Pezizomycotina*, Cpd.???. 1, Honshu. See Matsushima (*Matsush. Mycol. Mem.* 10: 94, 2001).
- Tholurna** Norman (1861) nom. cons., Caliciaceae (L.). 1, Europe; N. America. See Tibell (*MR* 107: 1403, 2003; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Tholurnaceae** Elenkin (1929) = Caliciaceae.
- Tholurnomyces** Cif. & Tomas. (1953) = *Tholurna*.
- tholus**, see ascus.
- Thom** (Charles; 1872-1956; USA). PhD, University of Missouri (1899); Mycologist at the Storrs (Connecticut) Experiment Station (1904-1913); Mycologist in Charge, Microbiological Laboratory (1913-1927) then Head, Division of Soil Microbiology (1927-1934), Bureau of Chemistry, then Head, Bureau of Plant Industry (1934-1942), US Department of Agriculture, Washington. Noted for his studies on fungi in dairy products and the soil, particularly *Penicillium* and *Aspergillus* (q.v.); his work influenced the establishment of standards for food handling and processing in the USA; he played an important role in development of penicillin during World War II. *Publs. The Penicillia* (1930); (with M.B. Church) *The Aspergilli* (1926); (with K.B. Raper) *A Manual of the Aspergilli* (1945); (with K.B. Raper) *A Manual of the Penicillia* (1949). *Biogs, obits etc.* Raper (*Mycol.* 49: 134, 1957) [bibliography, portrait]; Stafleu & Cowan (*TL-2* 6: 268, 1986).
- Thomiella** C.W. Dodge (1935) = *Gonatobotryum* fide Kendrick & Carmichael in Ainsworth *et al.* (Eds)

- (*The Fungi* 4A: 390, 1973).
- Thoracella** Oudem. (1900), anamorphic *Pezizomycotina*, St.0eH.10. 1, Europe.
- Thozetella** Kuntze (1891), anamorphic *Chaetosphaeriaceae*, Hsp.0eH.15. 12, widespread. See Pirozynski & Hodges (*CJB* 51: 157, 1973), Sutton & Cole (*TBMS* 81: 97, 1983), Waipara *et al.* (*N.Z. J. Bot.* 34: 517, 1996), Markovskaja & Treigienė (*Botanica Lithuanica* 7: 93, 2001; Lithuania), Allegrucci *et al.* (*Mycotaxon* 90: 275, 2004; Argentina), Paulus *et al.* (*Mycol.* 96: 1074, 2004; Australia, phylogeny, key).
- Thozetellopsis** Agnihothr. (1958) = *Thozetella* fide Pirozynski & Hodges (*CJB* 51: 157, 1973).
- Thozetia** Berk. & F. Muell. (1881) [non *Thozetia* F. Muell. ex Benth. 1868, *Asclepiadaceae*] = *Thozetella*.
- Thrauste** Theiss. (1916), *Englerulaceae*. 1 or 2, Java; Philippines.
- thread blight** (1) a disease caused by species of *Corticium* and *Marasmius* having mycelium running as well-marked threads over the leaves and stems of tropical plants; (2) a fungus causing - -; see Petch (*Ann. R. bot. Gdns Peradeniya* 9: 1-43, 1924). Cf. horse-hair blight fungi.
- Thrinacospora** Petr. (1948), anamorphic *Pezizomycotina*, St. = eH.1. 1, Ecuador.
- Thripomyces** Speg. (1915), *Ceratomycetaceae*. 1, Italy. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- Thrombiaceae** Poelt & Vězda ex J.C. David & D. Hawksw. (1991), *Pezizomycotina* (inc. sed.) (L). 1 gen. (+ 4 syn.), 1 spp.
Lit.: Schmitt *et al.* (*Mycol.* 97: 362, 2005).
- Thrombium** Wallr. (1831), *Thrombiaceae* (L). 1, Europe; N. America. See Swinscow (*Lichenologist* 2: 276, 1964), Schmitt *et al.* (*Mycol.* 97: 362, 2005; phylogeny).
- Thrombocytozoons** Tchacarof (1963) = *Candida* fide Desser & Barta (*Can. J. Microbiol.* 34: 1096, 1988).
- thrush**, a throat and genital disease of humans caused by *Candida albicans*.
- thryptogen** (thryptophyte), an organism increasing the sensitivity of a suscept to outside factors, e.g. to cold (Langer, 1936).
- Thryptospora** Petr. (1947), *Dothideomycetes*. 1, Syria.
- Thuchomyces** Hallbauer & Jahns (1977), Fossil Fungi ? Fungi (L). 1 (Precambrian), S. Africa. Formed abiotically fide Cloud (*Palaeobiology* 2: 351, 1976). See also Klappa (*Sediment. Petrol.* 49: 387, 1979).
- Thuemenella** Penz. & Sacc. (1898), *Xylariaceae*. Anamorph *Nodulisporium*. 1, widespread. See Corlett (*Mycol.* 77: 272, 1985), Samuels & Rossman (*Mycol.* 84: 26, 1992), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Thuemenia** Rehm (1878) = *Botryosphaeria* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Thuemenidium** Kuntze (1891) = *Geoglossum* fide Eckblad (*Nytt Mag. Bot.* 10: 137, 1963), Gamundí (*Kew Bull.* 31: 731, 1976), Benkert (*Delitschia* 10: 141, 1983; key), Nitare (*Windahlia* 14: 37, 1984), Spooner (*Biblotheca Mycol.* 116: 1, 1987).
- Thujacorticium** Ginns (1988), *Cyphellaceae*. 1, Canada. See Ginns (*Mycol.* 80: 69, 1988).
- Thwaitesiella** Massee (1892) = *Lopharia* fide Donk (*Taxon* 6: 17, 1957).
- Thyrea** A. Massal. (1856), *Lichinaceae* (L). c. 23, widespread. See Henssen (*Ber. dt. bot. Ges.* 81: 176, 1968), Yoshimura (*J. Jap. Bot.* 43: 354, 1968), Yoshimura (*J. Jap. Bot.* 43: 500, 1968), Asahina (*J. Jap. Bot.* 45: 65, 1970), Moreno & Egea (*Lichenologist* 24: 215, 1992), Moreno & Egea (*Acta Bot. Barcinon.* 41: 1, 1992; Eur. N. Afr.), Schultz *et al.* (*Lichenologist* 33: 211, 2001; S America), Schultz *et al.* (*Pl. Biol.* 3: 116, 2001; phylogeny), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key), Schultz & Büdel (*Lichenologist* 35: 151, 2003).
- Thyriascus** Schulzer (1877) nom. dub., Fungi.
- Thyridaria** Sacc. (1875), *Dothideomycetes*. Anamorph *Cyclothyrium*. 23, widespread. See Wehmeyer (*Lloydia* 4: 241, 1941), Barr (*Mycotaxon* 88: 271, 2003; placement in *Didymosphaeriaceae*).
- Thyridella** (Sacc.) Sacc. (1895), *Pezizomycotina*. 3, widespread.
- Thyridiaceae** J.Z. Yue & O.E. Erikss. (1987), *Sordariomycetidae* (inc. sed.). 5 gen. (+ 5 syn.), 22 spp.
Lit.: Leuchtmann & Müller (*Bot. Helv.* 96: 283, 1986), Eriksson & Yue (*SA* 8: 9, 1989), Samuels & Rogerson (*Stud. Mycol.* 31: 145, 1989), Eriksson & Yue (*SA* 10: 57, 1990), Taylor *et al.* (*Sydowia* 49: 94, 1997), Miller & Huhndorf (*Mol. Phylogen. Evol.* 35: 60, 2005).
- Thyridium** Fuckel (1870) [non *Thyridium* Mitt. 1868, *Musci*] = *Mycothyridium* E. Müll.
- Thyridium** Nitschke (1867), *Thyridiaceae*. Anamorph *Pleurocytospora*. 17, widespread. See Esfandiari & Petrak (*Sydowia* 4: 11, 1950), Leuchtmann & Müller (*Bot. Helv.* 96: 283, 1986), Eriksson & Yue (*SA* 8: 9, 1989).
- Thyrinula** Petr. & Syd. (1924), anamorphic *Aulographina*, Cpt.0fH.15. 1, S. Africa; Australia. See Swart (*TBMS* 90: 286, 1988).
- Thyriochaetum** Frolov (1968) ? = *Amerosporium* fide Sutton & Sarbhoy (*TBMS* 66: 297, 1976).
- Thyridictyella** Cif. (1962), *Micropeltidaceae*. 1, Dominican Republic. See Ciferri (*Atti Ist. bot. Univ. Lab. crittog. Pavia sér. 5* 19: 129, 1962).
- Thyriopsis** Theiss. & Syd. (1915), *Asterinaceae*. 1, widespread. See Câmara & Dianese (*Fitopatol. Brasil* 18 (Supl.): 346, 1993).
- Thyriostroma** Died. (1913) = *Leptostroma* fide Höhnelt (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt. 1* 124: 49, 1915).
- Thyriostromella** Bat. & C.A.A. Costa (1959), anamorphic *Pezizomycotina*, Cpt.1eH.?. 1, Malaysia. See Batista & Costa (*Mycopath. Mycol. appl.* 11: 15, 1959).
- thyriothecium**, an inverted flattened ascoma, having the wall ('scutellum', 'placodium') more or less radial in structure, and lacking a basal plate, e.g. *Microthyrium*; cf. catathecium.
- Thyrococcum** (Sacc.) Sacc. (1913) nom. dub., anamorphic *Pezizomycotina*. See von Höhnelt (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt. 1* 124: 49, 1915).
- Thyrodochium** Werderm. (1924) = *Stemphylium* fide Wiltshire (*TBMS* 21: 211, 1938).
- Thyronectria** Sacc. (1875) nom. dub., ? *Sordariomycetes*. 1, Italy. See Rossman (*Mem. N. Y. bot. Gdn* 49: 253, 1989).
- Thyronectroidea** Seaver (1909), *Thyridiaceae*. 1 (from bark), USA. See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Thyrosoma** Syd. (1921) = *Cyclotheca* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Thyrospora** Kirschst. (1938), *Dothideales*. 1, Germany.

Thyrospora Tehon & E.Y. Daniels (1925) = *Stemphylium* fide Wiltshire (*TBMS* 21: 211, 1938), Simmons (*Mycotaxon* 88: 163, 2003).

Thyrostroma Höhn. (1911), anamorphic *Dothidotthia*, Hsp.≡ -#eP.19. 19, widespread. See Sutton & Pascoe (*MR* 92: 210, 1989; relationship with *Stigmina*),

Yuan & Old (*MR* 94: 573, 1990; *T. eucalypti* on *Eucalyptus*), Sutton (*Arnoldia* 14: 33, 1997), Ramaley (*Mycotaxon* 94: 127, 2005; teleomorph).

Thyrostromella Höhn. (1919), anamorphic *Pezizomycotina*, Hsp.#eP.10. 2, Australia; Europe.

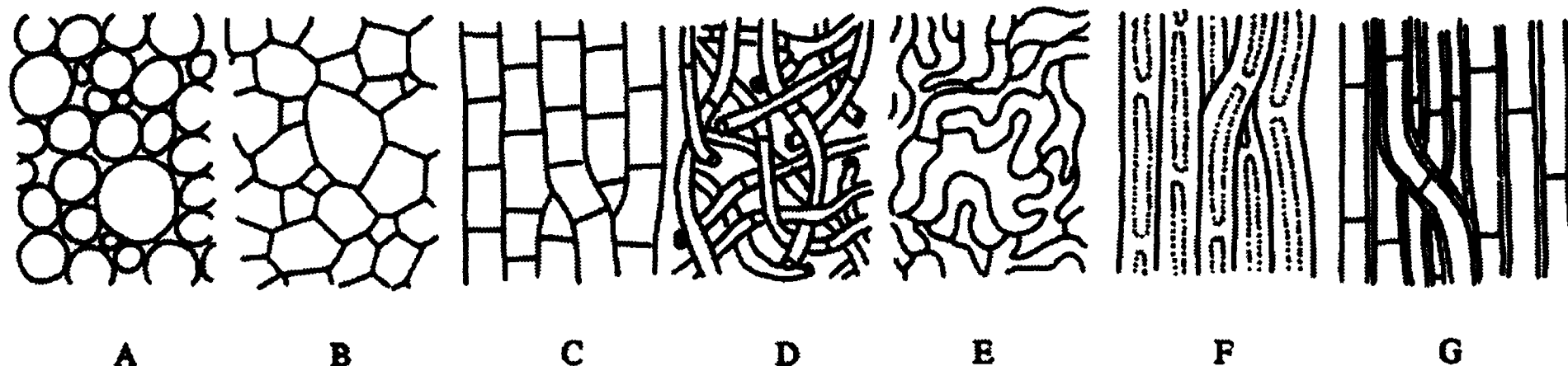


Fig. 24. Hyphal tissue (textura) types (Korf, 1958). A, textura globulosa; B, textura angularis; C, textura prismatica; D, textura intricata; E, textura epidermoidea; F, textura oblita; G, textura porrecta.

Thyrostromella Syd. (1924) [non *Thyrostromella* Höhn. 1919] = *Thyrostroma* fide Ellis (*Dematiaceae* *Hyphomycetes*, 1971), Sutton & Pascoe (*MR* 92: 212, 1989).

Thyrotheca Kirschst. (1944), *Pezizomycotina*. 1, N. America.

Thyrsidiella Höhn. ex Höhn. (1909), anamorphic *Pezizomycotina*. 2, Europe.

Thyrsidina Höhn. (1905), anamorphic *Pezizomycotina*, Cac.#eH.1. 1, Europe.

Thyrsidium Mont. (1849) ≡ *Myriocephalum*.

thyrsus (pl. **thyrsi**), (1) a type of inflorescence (Bot.); (2) the densely branched apices of some lichens, e.g. *Cladonia stellaris*.

thysanoblastic (of conidiogenesis), when 'the whole of the upper surface of the conidiogenous cell takes part in the process of conidium formation and secession, and both schizolysis and rhexolysis occur alternately in successively seceding conidia' (Roux & van Warmelo, *MR* 92: 225, 1989).

Thysanophora W.B. Kendr. (1961), anamorphic *Trichocomaceae*, Hso.0eP.15. 9, Europe; N. America. See Stolk & Hennebert (*Persoonia* 5: 189, 1968), Iwamoto *et al.* (*Mycoscience* 43: 169, 2002; phylogeny), Peterson & Sigler (*MR* 106: 1109, 2002), Iwamoto *et al.* (*Mycol.* 97: 1238, 2005; evolution).

Thysanophoron Stirt. (1883) = *Sphaerophorus* fide Wedin (*Pl. Syst. Evol.* 187: 213, 1993).

Thysanopyxis Rabenh. ex Bonord. (1864) = *Volutella* fide Saccardo (*Syll. fung.* 4: 684, 1886).

Thysanorea Arzanlou, W. Gams & Crous (2007), anamorphic *Herpotrichiellaceae*. 1, Papua New Guinea. See Arzanlou *et al.* (*Stud. Mycol.* 58: 57, 2007).

Thysanothecium Mont. & Berk. (1846), *Cladoniaceae* (L.). 2, Australasia; Asia. See Galloway (*Nova Hedwigia* 28: 499, 1977), Stenroos (*Ann. bot. fenn.* 25: 207, 1988; Melanesia), Ahti (*Regnum veg.* 128: 58, 1993), Wei *et al.* (*Mycosystema* 7: 23, 1994; China), Hammer (*Biblthca Lichenol.* 78: 75, 2001; ontogeny).

Tiarospora Sacc. & Marchal (1885), anamorphic *Phaeosphaeriaceae*, Cpd.1eH.1. 3, Europe.

Tiarosporella Höhn. (1924), anamorphic *Darkera*,

Cpd.0eH.1. 10, Europe; N. America. See Sutton (*The Coelomycetes*, 1980), Roux *et al.* (*MR* 94: 254, 1990; conidiomatal and conidial ontogeny), Hyde (*Aust. Syst. Bot.* 6: 169, 1993), Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993), Kohlmeyer & Volkmann-Kohlmeyer (*Mycotaxon* 59: 79, 1996), Karadžic (*Eur. J. For. Path.* 28: 145, 1998), Müller & Hantula (*MR* 102: 1163, 1998; diversity).

Tiarosporellivora Punith. (1981), anamorphic *Pezizomycotina*, Cpd.0eH.15. 1 (in *Tiarosporella*), Germany. See Punithalingam (*Nova Hedwigia* 35: 26, 1981).

Tibellia Vězda & Hafellner (1992), *Ramalinaceae* (L.). 1, Australia. See Hafellner & Vezda (*Nova Hedwigia* 55: 186, 1992), Ekman (*Op. bot.* 127: 148 pp., 1996).

tibi, Swiss drink derived from a 15% sucrose sol. (+ other ingredients) by fermentation with 'Tibi grains', a symbiotic association of *Betabacterium vermiforme* and *Saccharomyces intermedius*. Cf. gingerbeer plant, tea fungus, teekwass.

Tichodea Körb. (1848) = *Collema* F.H. Wigg. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Tichospora A. Massal. ex Horw. (1912) nom. inval. ? = *Psorotichia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Tichothecium Flot. (1850) = *Verrucaria* Schrad. fide Hawksworth (*Bot. Notiser* 132: 283, 1979).

tichus, peripheral layer of cells of perithecial walls forming a dark protective layer as in *Pleospora herbarum* (Groenhart, *Persoonia* 4: 11, 1965).

Ticogloea G. Weber, Spaaij & W. Gams (1994), anamorphic *Pezizomycotina*, Hso.0eP.10. 1, widespread. See Weber *et al.* (*MR* 98: 663, 1994), Halmschlager & Kowalski (*Öst. Z. Pilzk.* 9: 67, 2000).

Ticomycetes Toro (1952), *Meliolaceae*. 1 (from leaves), C. America. See Toro (*J. Agric. Univ. Puerto Rico* 36: 48, 1952).

Ticonectria Döbbeler (1998), ? *Nectriaceae*. 1 (liverworts), Costa Rica. See Döbbeler (*Nova Hedwigia* 66: 325, 1998).

Tieghemella Berl. & De Toni (1888) = *Absidia* fide Hesseltine (*Mycol.* 47: 344, 1955).

- Tieghemiomyces** R.K. Benj. (1959), Dimargaritaceae. 2 (mycoparasites of *Mucorales*), India; Poland; USA. See Benjamin (*Aliso* 5: 11, 1961; key), Misra & Gupta (*Mycotaxon* 7: 204, 1978; India), Beblowska (*Acta Mycologica Warszawa* 27: 271, 1991; Poland).
- tiger's milk**, *Polyporus sacer*; used as a medicine in Malaysia.
- Tigria** Trevis. (1853) = *Erysiphe* fide Braun (*SA* 7: 57, 1988).
- Tilachlidiopsis** Keissl. (1924), anamorphic *Dendrocollybia*, Hsy.0eH.41. 1 (with clamp connexions), widespread (north temperate). See Mains (*Bull. Torrey bot. Club* 78: 122, 1951), Stalpers *et al.* (*CJB* 69: 6, 1991; gen. revision).
- Tilachlidium** Preuss (1851), anamorphic *Hypocreales*, Hsp.0eH.15. 1, widespread. See Gams (*Cephalosporium-artige Schimmelpilze*, 1971).
- Tilakidium** Vaidya, C.D. Naik & Rathod (1986), ? *Hypocreaceae*. 1, India. Affinities uncertain, the description is inadequate for proper characterization.
- Tilakiella** Srinivas. (1973), *Dothideomycetes*. 1, India. See Srinivasalu (*Indian Phytopath.* 25: 292, 1972).
- Tilakiopsis** V.G. Rao (1994), anamorphic *Pezizomycotina*, Hso.???. 1, India. See Rao (*Advances in Mycology and Aerobiology* (Dr S.T. Tilak Commemoration Volume). *Current Trends in Life Sciences* 20: 132, 1994).
- Tilakomyces** Sathe & Vaidya (1979) = *Eutypella* fide Rappaz (*Mycol. Helv.* 3: 281, 1989).
- Tilletia** Tul. & C. Tul. (1847), *Tilletiaceae*. Anamorph *Tilletiella*. c. 175 (on *Poaceae*), widespread. Basidiospores produced at the apex of an aseptate basidium; few to many in number, when 1-nucleate, often conjugating with one another, giving rise to ballistosporic 'secondary conidia', but in some spp. basidiospores are multinucleate and do not conjugate. Species delimited on morphological characters do not always fit with those based on molecular data, which are also not unanimous. *T. caries* (syn. *T. tritici*) and *T. laevis* (syn. *T. foetida*) (wheat bunt); *T. controversa* (dwarf bunt of wheat, barley, rye and several grasses); *T. horrida* (syn. *Neovossia horrida*) (rice smut); *T. indica* (syn. *N. indica*) (kernal bunt of wheat). See Buller & Vanterpool Buller (*Researches on Fungi* 5, 1933), Holton & Heald (*Bunt or stinking smut of wheat*, 1941), Durán & Fischer (*The genus Tilletia*, 1961; keys, species delimited on morphological characters), Kollmorgen *et al.* (*TBMS* 75: 461, 1980), Durán (*Ustilaginales of Mexico*: 331 pp., 1987; basidiospores), Ingold (*TBMS* 88: 75, 1987), Russell & Mills (*Phytopath.* 84: 576, 1994), Shi *et al.* (*Phytopath.* 86: 311, 1996), Pimentel *et al.* (*Mycol.* 90: 1017, 1998), Pimentel *et al.* (*Phytopath.* 90: 376, 1998), Pimentel *et al.* (*Mycol.* 92: 411, 2000).
- Tilletiaceae** J. Schröt. (1887), *Tilletiales*. 6 gen. (+ 1 syn.), 186 spp.
Lit.: Kollmagen *et al.* (*TBMS* 75: 461, 1980), Durán (*Ustilaginales of Mexico. Taxonomy, Symptomatology, Spore Germination and Basidial Cytology*: 331 pp., 1987), Ingold (*TBMS* 88: 75, 1987), Buller & Vanterpool in Buller (*Mycol.* 82: 276, 1990), Begerow *et al.* (*CJB* 75: 2045, 1998), Palm (*Mycol.* 91: 1, 1999), McDonald *et al.* (*Pl. Dis.* 84: 1121, 2000), Pimentel *et al.* (*Phytopathology* 90: 376, 2000), Pimentel *et al.* (*Mycol.* 92: 411, 2000), Levy *et al.* (*Phytopathology* 91: 935, 2001), Josefsen & Christiansen (*MR* 106: 1287, 2002), Vánky & McKenzie (*Fungal Diversity Res. Ser.* 8: 259 pp., 2002), Chesmore *et al.* (*Bulletin OEPP EPPO Bulletin* 33: 495, 2003), Anon. (*Bulletin OEPP EPPO Bulletin* 34: 219, 2004), Cunnington & Shivas (*Australas. Mycol.* 22: 53, 2004), Vánky (*Mycol. Balcanica* 1: 175, 2004), Castlebury *et al.* (*Mycol.* 97: 888, 2005), Tan & Murray (*MR* 110: 203, 2006).
- Tilletiales** Kreisel ex R. Bauer & Oberw. (1997). Exobasidiomycetes. 1 fam., 6 gen., 186 spp. Fam.: **Tilletiaceae**
 For *Lit.* see under fam.
- Tilletiaria** Bandoni & B.N. Johri (1972), *Tilletiariaceae*. 1 (saprobic), Canada. See Begerow *et al.* (*MR* 104: 53, 2000; mol. phylogeny).
- Tilletiariaceae** R.T. Moore (1980), *Georgefischeriales*. 3 gen., 7 spp.
Lit.: Vánky (*Cryptog. Stud.* 1: 159 pp., 1987), Ingold (*MR* 96: 987, 1992), Takashima & Nakase (*J. gen. appl. Microbiol.* Tokyo 42: 421, 1996), Bauer *et al.* (*CJB* 75: 1273, 1997), Begerow *et al.* (*CJB* 75: 2045, 1998), Boekhout in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 703, 1998), Begerow *et al.* (*MR* 104: 53, 2000; mol. phylogeny), Bauer *et al.* (*MR* 105: 423, 2001).
- Tilletiella** Zambett. (1970) nom. inval. = *Tilletia*.
- Tilletiopsis** Derx (1948), anamorphic *Entyloma*, *Melanotaenium*. 7, widespread. See Boekhout (*Stud. Mycol.* 33:1, 1991; species revision).
- Tilotus** Kalchbr. (1881) nom. dub. ? = *Phyllotopsis* fide Singer (*Agaric. mod. Tax.* edn 3, 1975).
- Timdalia** Hafellner (2001), *Lecanoromycetes* (L). 1. See Hafellner & Türk (*Stapfia* 76: 158, 2001), Reeb *et al.* (*Mol. Phylogen. Evol.* 32: 1036, 2004; phylogeny), Crewe *et al.* (*MR* 110: 521, 2006; phylogeny).
- Timgrovea** Bougher & Castellano (1993), *Agaricomycetes*. 5, Australasia; China. See Bougher & Castellano (*Mycol.* 85: 288, 1993), Francis & Bougher (*Australasian Mycologist* 21: 81, 2002).
- Tinctoporellus** Ryvarden (1979), *Polyporaceae*. 2, widespread (pantropical). See Ryvarden (*TBMS* 73: 18, 1979), Ryvarden & Iturriaga (*Mycol.* 95: 1066, 2003; Venezuela).
- Tinctoporia** Murrill (1907) = *Porogramme* fide Ryvarden (*TBMS* 73: 1, 1979).
- tinder fungus**, *Fomes fomentarius*; **false -**, *Phellinus igniarius*. Cf. amadou.
- tinea**, ringworm or other skin diseases in humans or animals caused by various parasitic fungi (esp. dermatophytes). - **barbae** (- sycosis), beard ringworm; - **capitis** (- tonsurans), head ringworm; - **corporis** (- **circinata**), body ringworm; - **cruris**, groin ringworm; - **favosa** = favus (q.v.); - **imbricata** (Tokelau) (*Trichophyton concentricum*); - **nigra**, pigmented cutaneous infection caused by a dematiaceous fungus; - **nodosa** = piedra (q.v.); - **pedis**, 'athlete's foot', foot ringworm; - **unguium**, ringworm of the nails; - **versicolor** = pityriasis versicolor (q.v.).
- Tingiopsidium** Werner (1939) = *Koerberia* fide Henssen (*Symb. bot. upsal.* 18 no. 1, 1963).
- tinophyses** (Groenhart, *Persoonia* 4: 11, 1965), paraphysoids; see hamathecium.
- Tirisporella** E.B.G. Jones & Vrijmoed (1994), *Halosphaeriaceae*. 2 (marine), Hong Kong; India. See Jones *et al.* (*CJB* 72: 1373, 1994), Sarma & Hyde (*Australas. Mycol.* 19: 52, 2000; India), Pang *et al.* (*Nova Hedwigia* 77: 1, 2003; phylogeny).
- Tirisporella** E.B.G. Jones, K.D. Hyde & Alias (1996), *Dothideomycetes*. Anamorph *Phialophora*-like. 1, widespread. See Jones *et al.* (*CJB* 74: 1489, 1996).

- Tirmania** Chatin (1892), Pezizaceae. 3 (hypogeous, mycorrhizal), widespread. See Trappe (*TBMS* 57: 185, 1971), Malençon (*Persoonia* 7: 261, 1973), Alsheikh & Trappe (*TBMS* 81: 83, 1983), Moreno *et al.* (*MR* 104: 378, 2000), Díez *et al.* (*Mycol.* 94: 247, 2002; phylogeny), Hansen *et al.* (*Mol. Phylogen. Evol.* 36: 1, 2005; phylogeny), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- tissue types**, Korf distinguished the types of hyphal tissues in discomycetes as different *textura*'s and this is now applied to all ascomycetes and coelomycetes. Tissue (*textura*) types (from Korf, *Sci. Rep. Yokohama nat. Univ.* II 7: 13, 1958; which is derived from Starbäck, 1895). See also Dargan (*Nova Hedw.* 44: 489, 1987; *Xylariaceae*), plectenchyma. See Fig. 24.
- Titaea** Sacc. (1876), anamorphic *Paranectriella*, Hso.1bH.10. 9 (on fungi), widespread. See Sutton (*TBMS* 83: 399, 1984; key), Pelaez *et al.* (*Mycotaxon* 70: 55, 1999; Spain), Kirschner & Piepenbring (*Fungal Diversity* 21: 93, 2006).
- Titaeella** G. Arnaud ex K. Ando & Tubaki (1985), anamorphic *Agaricomycetes*, Hso.1bH.1. 1 (with clamp connexions, aquatic), Europe; Japan. See Ando & Tubaki (*TMSJ* 26: 151, 1985).
- Titaeopsis** B. Sutton & Deighton (1984), anamorphic *Pezizomycotina*, Hso.1bH.10. 1 (on leaf ascomycetes), Uganda. See Sutton & Deighton (*TBMS* 83: 409, 1984).
- Titaeospora** Bubák (1916), anamorphic *Pezizomycotina*, Cac.1eH.15. 2, widespread (temperate).
- Titaeosporina** Luijk (1920) = *Asteroma* fide Sutton (*Mycol. Pap.* 141, 1977).
- Titarella** Syd. & P. Syd. (1919) = *Pyrenula* Ach. (1809) fide Barr (*Mycotaxon* 9: 17, 1979), Harris (*Mem. N. Y. bot. Gdn* 49, 1989), Checa & Blanco (*Mycotaxon* 91: 353, 2005).
- Titania** Berl. (1891) [non *Titania* Endl. 1833, *Orchidaceae*] = *Fremineavia*.
- Tjibodasia** Holterm. (1898) = *Platyglea* fide Martin (*Lloydia* 11: 119, 1948).
- toadstool**, a basidioma, esp. an inedible one, of an agaric or a bolete; there is no unequivocal definition and the term is best avoided; in 1959 there was a controversial court case as to whether soup made from *Boletus edulis* should be referred to as 'toadstool soup' (Small, *Pl. Sci. Bull.* 21(3): 34, 1975). Cf. mushroom.
- Tode** (Heinrich Julius; 1733-1797; Germany). President of the Synod of Wittenburg. An early mycologist who gave names to such common ascomycete genera as *Acrospermum*, *Hysterium*, *Myrothecium*, *Stilbum*, *Sphaerobolus*, and *Volutella* and gave accounts of 54 species. of *Sphaeria*. *Publs. Fungi Mecklenburgenses Selecti* (1790-1791). *Biogs, obits etc.* Grumann (1974: 50); Stafleu & Cowan (*TL-2* 6: 382, 1986).
- Tofispora** G. Langer (1994) = *Thanatephorus* fide Roberts (*Rhizoctonia-forming fungi*, 1999).
- tofu**, see *sufu*.
- Togaria** W.G. Sm. (1908) = *Agrocybe* fide Singer (*Agaric. mod. Tax.* edn 3, 1975).
- Togninia** Berl. (1900), Togniniaceae. Anamorph *Phaeoacremonium*. 11, widespread. See Barr *et al.* (*Mycotaxon* 48: 529, 1993), Mostert *et al.* (*Mycol.* 95: 646, 2003; anamorph), Pascoe *et al.* (*Phytopath. Mediterr.* 43: 51, 2004; Australia), Réblová *et al.* (*Stud. Mycol.* 50: 533, 2004), Rooney-Latham *et al.* (*Pl. Dis.* 89: 177, 2005; USA), Mostert *et al.* (*Stud. Mycol.* 54: 115 pp., 2006; revision), Mostert *et al.* (*Phytopath. Mediterr.* 45 Suppl.: S12, 2006), Réblová & Mostert (*MR* 111: 299, 2007; phylogeny).
- Togniniaceae** Réblová, L. Mostert, W. Gams & Crous (2004), ? Diaporthales. 2 gen. (+ 2 syn.), 25 spp.
Lit.: Barr (*Mycol.* 77: 549, 1985), Mostert *et al.* (*Mycol.* 95: 646, 2003), Pascoe *et al.* (*Phytopath. Mediterr.* 43: 51, 2004), Réblová *et al.* (*Stud. Mycol.* 50: 533, 2004), Vijaykrishna *et al.* (*Stud. Mycol.* 50: 387, 2004), Fischer *et al.* (*Mycotaxon* 92: 85, 2005), Mostert *et al.* (*Stud. Mycol.* 54: 115 pp., 2006), Rossman *et al.* (*Mycoscience* 48: 135, 2007; phylogeny).
- Togniniella** Réblová, L. Mostert, W. Gams & Crous (2004), Calosphaeriaceae. Anamorph *Phaeocrella*. 1, New Zealand. See Réblová *et al.* (*Stud. Mycol.* 50: 543, 2004), Mostert *et al.* (*Stud. Mycol.* 54: 115 pp., 2006).
- Tolediella** Viégas (1943) = *Phyllachora* Nitschke ex Fuckel (1870) fide Petrak (*Sydowia* 5: 340, 1951).
- tolerant** (of an organism), giving little reaction to infection by a pathogen or to the effect of other factors (e.g. tolerant of heat, of a virus).
- Tolypocladium** W. Gams (1971), anamorphic *Elaphocordyceps*, Hso.0eH.15. 11, widespread. See also cyclosporin. See Riba *et al.* (*J. Invert. Path.* 48: 362, 1986; isozyme analysis), von Arx (*Mycotaxon* 25: 153, 1986), Holubová-Jechová (*Mykol. Listy* 31: 8, 1988; key), von Arx (*Persoonia* 13: 467, 1988), Aarnio & Agathos (*Appl. Microbiol. Biotechn.* 33: 435, 1990; pigmented variants in *T. inflatum*), Rakotonirainy (*J. Invert. Path.* 57: 17, 1991; rRNA sequence comparison with *Beauveria*), Stimberg *et al.* (*Appl. Microbiol. Biotechn.* 37: 485, 1992; electrophoretic karyotyping), Dreyfuss & Gams (*Taxon* 43: 660, 1994; nomencl.), Doggett & Porter (*Mycol.* 88: 720, 1996; teleomorph), Fang *et al.* (*Mycosystema* 17: 40, 1998), Stensrud *et al.* (*MR* 109: 41, 2005; phylogeny), Sung *et al.* (*Stud. Mycol.* 57, 2007).
- Tolypoderma** Thirum. & M.J. O'Brien (1978) nom. inval. = *Moesziomyces* fide Vánky (*Europ. Smut Fungi*: 163, 1994).
- Tolypomyria** Preuss (1852) = *Trichoderma* Pers. (1794) fide Hughes (*Friesia* 9: 64, 1969).
- tolypophagous**, see *ptyophagous*.
- Tolyposporella** G.F. Atk. (1897), Tilletiariaceae. 5 (on *Poaceae*), N. & S. America; Africa; Asia. See Thirumalachar *et al.* (*Mycol.* 59: 389, 1967).
- Tolyposporidium** Thirum. & Neerg. (1978) = *Moesziomyces* fide Vánky (*Carpathian Ustilaginales*, 1985).
- Tolyposporium** Woronin ex J. Schröt. (1887), Anthracoideaceae. 2 (on *Cyperaceae*, *Juncaceae*), Europe; New Zealand; N. America. See Vánky (*Bot. Notiser* 130: 131, 1977), Vánky (*Mycotaxon* 74: 344, 2000).
- Tomasellia** A. Massal. (1856), ? Naetrocymbaceae ($\pm$ L). c. 50, widespread (esp. tropical). See Keissler (*Rabenh. Krypt.-Fl.* 9, 1937), Harris (*More Florida Lichens*, 1995; delimitation).
- Tomaselliella** Cif. (1952) = *Arthonia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Tomaselliellomyces** Cif. (1953) = *Tomaselliella*.
- Tomaselliomyces** Cif. & Tomas. (1953) = *Tomasellia*.
- Tomelin** (Boris Anatol'evich; 1928-2008; Russia). Graduate, Kharkiv State University, Ukraine (1953); student, then laborant, then mycologist, then Head of the Laboratory of Applied Mycology, then Head of

- the Department of Ecology of Fungi, then Professor of Mycology, V.I. Komarov Botanical Institute (1954-2005), St Petersburg. Carried out pioneering mycological exploration of boreal and oriental Russia (the Amur valley, Komi, the Taimyr peninsula, the northern Urals, Yakutia and the Russian Far East) described in a series of papers in various Russian language journals; known for work on *Mycosphaerella*; also studied diseases of cotton in Kazakhstan (1960s). *Publs.* [*Identification Book of the Genus Mycosphaerella Johans.*] (1979) [in Russian]. *Biogs, obits etc.* Karatygin, Dudka, Andrianova & Lebedeva ([*Mikologiya i Fitopatologiya*] 32: 89, 1998) [portrait, in Russian].
- Tomentella** Johan-Olsen (1888) [non *Tomentella* Pat. 1887, nom. cons.] = *Tomentella* Pat. fide Donk (*Taxon* 6: 119, 1957).
- Tomentella** P. Karst. (1889) [non *Tomentella* Pat. 1887, nom. cons.] = *Trechispora* fide Stalpers (*in litt.*; or = *Phlebiella*).
- Tomentella** Pers. ex Pat. (1887) nom. cons., Thelephoraceae. 80 (ectomycorrhizal), widespread. See Wakefield (*TBMS* 53: 161, 1969; key 40 Br. spp.), Larsen (*Mycol. Mem.* 4, 1974; key 72 spp.), Stalpers (*Stud. Mycol.* 35: 168 pp., 1993; key), Kõljalg (*Syn. Fung.* 9: 213 pp., 1996; key), Jakucs *et al.* (*Mycorrhiza Mycorrhiza*: 247, 2005).
- Tomentellaceae** Warm. (1890) = Thelephoraceae.
- Tomentellago** Hjortstam & Ryvarden (1988) = *Amaurodon* fide Kõljalg (*Syn. Fung.* 9, 1996).
- Tomentellastrum** Svrček (1958) = *Tomentella* Pat. fide Donk (*Taxon* 12: 113, 1963).
- Tomentelleopsis** Orlova (1959) ? = *Chromelosporium* fide Sutton (*in litt.*).
- Tomentellina** Höhn. & Litsch. (1906) = *Tomentella* Pat. fide Kõljalg (*Syn. Fung.* 9, 1996).
- Tomentellopsis** Hjortstam (1970), Thelephoraceae. 7, widespread. See Hjortstam (*Svensk bot. Tidskr.* 68: 51, 1974), Kõljalg (*Syn. Fung.* 9, 1996; key), Kõljalg *et al.* (*Mycol. Progr.* 1: 81, 2002; phylogeny).
- Tomenticola** Deighton (1969), anamorphic *Pezizomycotina*, Hso.≡ eP.10. 1, Africa (tropical). See Deighton (*Mycol. Pap.* 117: 20, 1969).
- Tomentifolium** Murrill (1903) ≡ *Phyllotopsis*.
- Tomentoporus** Ryvarden (1973) = *Microporus* fide Reid (*Microscopy* 32: 448, 1975).
- tomentose**, having a covering of soft, matted hairs (a **tomentum**; downy).
- Tomeoa** I. Hino (1954), Dothideomycetes. 1, Japan. See Hino (*Bulletin of the Faculty of Agriculture, Yamaguchi University* 5: 241, 1954).
- Tomophagus** Murrill (1905) = *Ganoderma* fide Furtado (*Mycol.* 57: 599, 1965).
- Tompetchia** Subram. (1985), anamorphic *Pezizomycotina*, Hso.#eP.1. 1 (on scale insects), widespread. See Subramanian (*Kavaka* 12: 66, 1984).
- Tonduzia** F. Stevens (1927) [non *Tonduzia* Pittier 1908, *Apocynaceae*] ≡ *Dontuzia*.
- Toninia** A. Massal. (1852) nom. cons., Catillariaceae (±L). 82 (a few on lichens), widespread. Perhaps better subsumed within the *Ramalinaceae*. See Timdal (*Op. Bot.* 110, 1991; key), Lumbsch *et al.* (*Mol. Phylogen. Evol.* 31: 822, 2004; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Toniniopsis** Frey (1926), Ramalinaceae (L). 1, Europe.
- tonophily** (adj. -ilic, -ilous), the ability to grow under conditions of high osmotic pressure.
- Topelia** P.M. Jørg. & Vězda (1984), ? Stictidaceae (L). 6, Europe; N. America. See Jørgensen & Vězda (*Nova Hedwigia* Beih. 79: 502, 1984), Tretiach & Vězda (*Lichenologist* 24: 107, 1992; Italy).
- Topeliopsis** Kantvilas & Vězda (2000), Thelotremaaceae (L). 8, widespread. See Kantvilas & Vězda (*Lichenologist* 32: 347, 2000), Kalb (*Mycotaxon* 79: 319, 2001; Australia), Frisch (*Bibliotheca Lichenol.* 92: 3, 2006; Africa), Frisch & Kalb (*Lichenologist* 38: 37, 2006), Frisch *et al.* (*Bibliotheca Lichenol.* 92: 517, 2006; phylogeny), Mangold *et al.* (*Lichenologist* 40: 39, 2008; phylogeny).
- Tophora** Fr. (1825) ≡ *Byssus*.
- Topospora** Fr. (1836), anamorphic *Godronia*, St.≡ eH.15. 6, widespread. See Verkley (*Nova Hedwigia* 75: 433, 2002; phylogeny).
- Tormentella** H.D. Pflug (1966), Fossil Fungi. 1, USA.
- Tornabea** Østh. (1980), Physciaceae (L). 2, widespread. See Kurokawa (*J. Jap. Bot.* 37: 289, 1962), Nimis & Tretiach (*Bryologist* 100: 217, 1997; revision), Nordin & Mattsson (*Lichenologist* 33: 3, 2001; phylogeny), Scheidegger *et al.* (*Lichenologist* 33: 25, 2001; evolution), Helms *et al.* (*Mycol.* 95: 1078, 2003; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Tornabenia** A. Massal. (1853) [non *Tornabeneia* Parl. 1850, *Umbelliferae*] = *Anaptychia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Tornabenia** Trevis. (1853) [non *Tornabeneia* Parl. 1850, *Umbelliferae*] ≡ *Tornabea*.
- Tornabeniopsis** Follmann (1980) nom. inval. ≡ *Tornabea*.
- Torora** Syd. (1926), Pseudoperisporiaceae. 2, widespread (tropical). See Hansford (*Mycol. Pap.* 15, 1946).
- Torpedospora** Meyers (1957), Hypocreomycetidae. 2 (marine), widespread. See Meyers (*Mycol.* 49: 496, 1957), Sakayaroj *et al.* (*Bot. Mar.* 48: 395, 2005; revision, phylogeny), Schoch *et al.* (*MR* 111: 154, 2007; phylogeny).
- Torrendia** Bres. (1902) = *Amanita* Pers. fide Kuyper (*in litt.*); basidioma gasteroid.
- Torrendiaceae** Jülich (1982) = *Amanitaceae*.
- Torrendiella** Boud. & Torrend (1911), Sclerotiniaceae. 12, widespread. See Spooner (*Bibliotheca Mycol.* 116, 1987), Galán *et al.* (*Mycotaxon* 48: 229, 1993; posn), Zhuang (*Mycotaxon* 72: 325, 1999), Johnston & Gamundí (*N.Z. J. Bot.* 38: 493, 2000; 6 spp. on *Notofagus*), Malaval (*Bulletin Semestriel de la Fédération des Associations Mycologiques Méditerranéennes* 28: 41, 2005; France).
- Torrentispora** K.D. Hyde, W.H. Ho, E.B.G. Jones, K.M. Tsui & S.W. Wong (2000), Annulatascaceae. 3 (from wood, aquatic), Hong Kong. See Hyde *et al.* (*MR* 104: 1399, 2000), Lee *et al.* (*Fungal Diversity* 16: 87, 2004; ultrastr.).
- Torrubia** Lév. (1863) ≡ *Cordyceps*.
- Torrubiella** Boud. (1885), Cordycipitaceae. Anamorphs *Akanthomyces*, *Gibellula*, *Lecanicillium*, *Simplicillium*. 70 (on *Arachnida* and *Coccida*), widespread (tropical). See Petch (*TBMS* 27: 81, 1944), Samson *et al.* (*Atlas of Entomopathogenic Fungi*, 1988), Hywel-Jones (*MR* 99: 330, 1995; Thailand), Hywel-Jones (*MR* 101: 143, 1997; Thailand), Hywel-Jones *et al.* (*MR* 101: 1242, 1997; anamorphs), Tzean *et al.* (*MR* 102: 1350, 1998; Taiwan), Zare & Gams (*Nova Hedwigia* 73: 1, 2001; anamorph), Bischoff & White (*Stud. Mycol.* 50: 89, 2004), Sung *et al.* (*Stud. Mycol.* 57, 2007).

Torsellia Fr. (1849) = *Cytospora* fide Défago (*Phytopath. Z.* 14: 103, 1944).

torsive, spirally twisted.

Torula Pers. (1794), anamorphic *Pezizomycotina*, Hso.0eP.3. 7, widespread. *T. ligniperda* causes stain in hardwoods. See Rao & de Hoog (*Persoonia* 8: 201, 1975; key), Crane & Schoknecht (*Mycol.* 78: 86, 1986), Casares-Porcel *et al.* (*Lichenologist* 28: 37, 1996; spp. on gypsum), Crane (*Mycotaxon* 80: 109, 2001; nomenclator), Hughes & Crane (*Mycol.* 98: 141, 2006).

Torulaspora Lindner (1904), *Saccharomycetaceae*. 3, widespread. See van der Walt & Johansen (*CSIR Res. Rept.* 325, 1975), Kreger-van Rij (Ed.) (*Yeasts, a taxonomic study* 3rd edn, 1984), Yamada *et al.* (*J. gen. appl. Microbiol.* Tokyo 37: 503, 1991; molec. relations), Oda & Tonomura (*Lett. Appl. Microbiol.* 21: 190, 1995; karyotypes), James *et al.* (*Int. J. Syst. Bacteriol.* 46: 189, 1996; ITS), Smole Možina *et al.* (*Lett. Appl. Microbiol.* 24: 311, 1997; PCR), Kurtzman in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 404, 1998), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).

Torulella Gyeln. (1939) nom. dub., anamorphic *Pezizomycotina*. See Hawksworth (*Bull. Br. Mus. nat. hist. Bot.* 6: 181, 1979).

Torulina Sacc. & D. Sacc. (1906) = *Gliomastix* fide Dickinson (*Mycol. Pap.* 115, 1968).

Torulites Grüss (1927), Fossil Fungi. 1 (Tertiary), Europe.

Torulites Pia (1927), Fossil Fungi. 1 (Oligocene), Europe.

Toruloidea Sumst. (1913) = *Oospora* fide Clements & Shear (*Gen. Fung.*, 1931).

Torulomyces Delitsch (1943), anamorphic *Trichomaceae*, Hso.0eH.15. 6, Europe; N. America. See Barron (*Mycol.* 59: 716, 1967), Ando *et al.* (*Mycoscience* 39: 313, 1998; key).

Torulopsidosira Geitler (1955), ? *Algae*. See Batra in Subramanian (Ed.) (*Taxonomy of fungi* 1: 187, 1978; an achlorotic alga).

Torulopsiella Bender (1932), anamorphic *Pezizomycotina*, Hso.0eP.38. 2, S. America. See Hughes (*N.Z. J. Bot.* 10: 232, 1972).

Torulopsis Berl. (1894) = *Candida* fide van der Walt & Johannsen (*Antonie van Leeuwenhoek* 40: 281, 1974), Yarrow & Meyer (*Int. J. Syst. Bacteriol.* 28: 611, 1978), Odds *et al.* (*J. gen. Microbiol.* 136: 761, 1990; synonymy with *Candida*).

Torulopsis Oudem. (1903) = *Gliomastix* fide Sutton (*in litt.*).

Torulopsis Speg. (1918) ≡ *Torulopsiella*.

torulose (torulous), cylindrical but having swellings at intervals; moniliform.

torulosis, see cryptococcosis.

Tothia Bat. (1960), ? *Microthyriaceae*. 1, Hungary. See Batista (*Annl. hist.-nat. Mus. natn. hung.* 52: 105, 1960).

Tothiella Vánky (1999) = *Thecaphora* fide Vánky (*Mycotaxon* 89: 55, 2004).

totipotent, bisexual.

touchwood (1) wood rotted by fungi (esp. *Polyporus squamosus*); (2) *Fomes fomentarius* or *Phellinus igniarius* basidiomata or the tinder ('amadou', q.v.) made from them.

Tovariella Syd. (1930), *Helotiales*. 1, S. America.

toxic, of, caused by, or acting as, poison; **-ity**, the power of acting as a poison.

Toxicocladosporium Crous & U. Braun (2007), anamorphic *Capnodiales*. 1, Surinam. See Crous *et al.* (*Stud. Mycol.* 58: 33, 2007).

toxigenic, toxin producing.

toxin, a non-enzymic metabolite of one organism which is injurious to another (cf. antibiotic); **myco-**, a toxin produced by a fungus, esp. one affecting humans or animals (see Mycetisms, Mycotoxicoses, Phytotoxic mycotoxins); **patho-** (Wheeler & Luke, *Ann. Rev. Phytopath.* 17: 223, 1963), see vivotoxin; **phyto-**, (1) a toxin produced by a plant (cf. phytoalexins); (2) (frequently, but better avoided), a toxin injurious to plants (see Phytotoxic mycotoxins); **vivo-**, a toxin 'produced in the infected host by the pathogen and/or its host, which functions in the production of disease, but is not itself the initial inciting agent' (Dimond & Waggoner, *Phytopath.* 43: 229, 1953); pathotoxin.

toxiphilous, favouring a polluted habitat (e.g. *Lecanora conizaeoides* in area of high sulphur dioxide pollution), cf. poleophilous; **toxiphobous**, not tolerating such a habitat, e.g. *Usnea* spp.); **toxitolerant**, tolerant of toxins. See Air pollution.

Toxoglugea L. Léger & E. Hesse (1924), *Microsporidia*. 3.

Toxonema Léger & Hesse (1922), *Microsporidia*. 1.

Toxospora Kudo (1925), *Microsporidia*. 1.

Toxospora Voronin (1993), *Microsporidia*. 1.

Toxosporiella B. Sutton (1986), anamorphic *Pezizomycotina*, Cpd.≡ eP.1. 1, Australia. See Sutton (*TBMS* 86: 16, 1986).

Toxosporiopsis B. Sutton & Sellar (1966), anamorphic *Pezizomycotina*, St.≡ eP.1. 3, widespread. See Sutton & Dyko (*MR* 93: 476, 1989), Wu (*Acta Mycol. Sin.* 12: 205, 1993; n.sp.).

Toxosporium Vuill. (1896), anamorphic *Pezizomycotina*, Hsp.≡ eP.1. 2, widespread. See Sutton (*Mycol. Pap.* 138, 1975).

Toxotrichum G.F. Orr & Kuehn (1964) = *Myxotrichum* fide Apinis (*Mycol. Pap.* 96, 1964).

trabecula (pl. **-ae**; adj. **-ate**), (1) a lamella primordium; (2) (of *Gymnoglossum* and other gasteromycetes), plates of undifferentiated primordial tissue in the developing gleba forming a branch of a dendroid columella; (3) (of pseudoparaphyses), paraphysoids, tinophyses, see hamathecium.

Trabecularia Bonord. (1857) = *Merulius* Fr. fide Donk (*Reinwardtia* 1: 199, 1951).

Trabutia Sacc. & Roum. (1881), ? *Phyllachoraceae*. Anamorph *Baeumleria*. 1, widespread. See Barr (*Mycol.* 79: 188, 1987; key 3 N. Am. spp.), von Arx (*SA* 6: 213, 1987), Cannon (*Mycopathologia* 135: 37, 1996).

Trabutiella F. Stevens (1920) ≡ *Diatractium*.

Trabutiella Theiss. & Syd. (1914) = *Phyllachora* Nitschke ex Fuckel (1870) fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).

trace elements, see nutrition of fungi.

tracheomycosis, see hadromycosis.

Trachipleistophora W.S. Hollister, E.U. Canning, E. Weidner, A.S. Field, J. Kench & D.J. Marriott (1996), *Microsporidia*. 2.

Trachyderma (Imazeki) Imazeki (1952) = *Ganoderma* fide Donk (*Persoonia* 1: 173, 1960).

Trachyderma Norman (1853) = *Pannaria* fide Jørgensen (*Op. Bot.* 45, 1978).

Trachylia Fr. (1817) = *Arthonia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

- Trachylia** Tuck. (1848) = *Cyphelium* Ach. fide Tibell (*Symb. bot. upsal.* 27 no. 1: 279 pp., 1987), Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Trachypus** Bataille (1908) [non *Trachypus* Reinw. & Hornsch. 1826, *Musci*] = *Leccinum*.
- Trachyspora** Fuckel (1861), Phragmidiaceae. 6 (on *Alchemilla* (*Rosaceae*)), widespread (esp. north temperate; Africa; Java). See Gäumann (*Boissiera* 7: 105, 1943), Gjaerum & Cummins (*Mycotaxon* 15: 420, 1982), Helfer (*Nova Hedwigia* 81: 325, 2005; Europ. spp.).
- Trachysporella** Syd. (1921) = *Trachyspora* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- trachytectum**, see *exosporium*; Spore wall.
- Trachythyrilium** Speg. (1919) nom. conf., anamorphic *Pezizomycotina*. See Petrak & Sydow (*Annl. mycol.* 33: 157, 1935).
- Trachyxylaria** Möller (1901) = *Xylobotryum* fide Clements & Shear (*Gen. Fung.*, 1931).
- Tracya** Syd. & P. Syd. (1901), Doassansiaceae. Anamorph *Tracyella*. 2 (on aquatic plants), widespread (northern hemisphere). See Spooner & Legon (*Mycologist* 20: 90, 2006; British sp.).
- Tracyella** Zambett. (1970) nom. inval. = *Tracya* fide Vánky (*in litt.*).
- Tracylla** (Sacc.) Tassi (1904), anamorphic *Pezizomycotina*, Cpt.0eH.15/16. 2, widespread. See Petrak (*Sydowia* 1: 202, 1947), Sutton (*Sydowia* 43: 264, 1991), Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993).
- Trailia** G.K. Sutherl. (1915), ? Halosphaeriaceae. 1 (on marine *Ascomyllum*), British Isles. See Christensen (*Mycol.* 74: 226, 1982; synoptic keys *A. ochraceus* and *A. nidulans* groups).
- Trailia** Syd. (1922) [non *Trailia* G.K. Sutherl. 1915] = *Puccinia* fide Dietel (*Nat. Pflanzenfam.* 6, 1928).
- trama**, the layer of hyphae in the central part of a lamella of an agaric, a spine of *Hydnaceae*, or the dissepiment between pores in a polypore. Cf. *context*.
- Trametaceae** Boidin, Mugnier & Canales (1998) = *Polyporaceae*.
- Trametella** Pinto-Lopes (1952) = *Coriolopsis* fide Ryvarden (*Syn. Fung.* 5, 1991).
- Trametes** Fr. (1836), *Polyporaceae*. c. 50 (on wood), widespread. Living trees attacked by *T. pini* and others. See Haddow (*TBMS* 22: 182, 1938; *T. pini*), Ryvarden (*Polyp. N. Eur.* 2: 421, 1978; key 8 Eur. spp.), Ryvarden & Johansen (*Prelim. Polyp. Fl. E. Afr.*: 555, 1980; key 20 Afr. spp. s.lat.), Tomšovský & Homolka (*Nova Hedwigia* 79: 425, 2004; Mating tests in *Trametes versicolor*), Tomšovský *et al.* (*Nova Hedwigia* 82: 269, 2006; Molecular phylogeny European spp.), Zhang *et al.* (*Mycosystema* 25: 23, 2006; molecular taxonomy based on ITS sequences).
- Trametites** Mesch. (1892), Fossil Fungi. 3 (Cretaceous, Pliocene), Europe.
- Transeptaesporites** V.S. Ediger (1981), Fossil Fungi. 5 (upper Oligocene), Turkey; USA.
- transformations**, in fungi; see *Biotechnology*, *Genetic engineering*.
- trans-septum**, see *septum*.
- Tranzschel** (Woldemar Andrejevich; 1868-1942; Russia). Assistant, Forestry Institute, St Petersburg; Assistant for Systematic Botany, University of Warsaw (1898); Curator, Department of Cryptogams, St Petersburg Botanical Museum (1900); Professor, Institute for Applied Zoology and Plant Pathology, Leningrad. Noted for his work on rusts of Russia and adjacent countries [formerly the Soviet Union]. *Publs. Conspectus Uredinalium URSS* (1939). *Biogs, obits etc.* Azbukina ([*Mikologiya i Fitopatologiya*] 27: 91, 1993) [in Russian]; Stafleu & Cowan (*TL-2* 6: 433, 1986).
- Tranzschelia** Arthur (1906), Uropyxidaceae. 12 (heteroecious on *Ranunculaceae* (0, I); on *Prunus* (II, III) (*Rosaceae*), or autoecious on *Ranunculaceae*), widespread (esp. north temperate). *T. discolor*, *T. prunispinosae* (esp. on cultivated *Prunus*). See Blumer (*Phytopath. Z.* 38: 355, 1960), Bennell & Henderson (*TBMS* 71: 271, 1978; spore devel.), López-Franco & Hennen (*System. Bot.* 15: 560, 1990; American spp.), Helfer (*Nova Hedwigia* 81: 325, 2005; Europ. spp.).
- Tranzscheliella** Lavrov (1936), ? Ustilaginaceae. 16 (on *Poaceae* (esp. *Stipa*)), widespread. See Gutner (*Golovnevye griby*, 1941; ? = *Ustilago*), Vánky (*Mycotaxon* 89: 55, 2004).
- Tranzschel's Law**. This states in essence that the telia of microcyclic rust species adopt the habit of the parent macrocyclic species and occur on the aecial host plants of the latter. There are no proven exceptions, the only one firmly suspected (*Chrysomyxa arctostaphyli*) having been disproved (Peterson, *Science*, N.Y. 134: 468, 1961). The significance of haustorial type in relation to this law has been investigated (Quilliam & Shattock, *Plant pathology* 52: 104, 2003).
- Trapelia** M. Choisy (1929) nom. cons., *Trapeliaceae* (L). 12, widespread (temperate). See Hertel (*Herzogia* 1: 111, 1968), Hertel (*Vortr. bot. Ges. n.f.* 4: 171, 1970), Honegger (*Lichenologist* 14: 205, 1982; asci), Coppins & James (*Lichenologist* 16: 241, 1984), Lumbsch (*J. Hattori bot. Lab.* 83: 1, 1997), Lumbsch *et al.* (*MR* 105: 16, 2001; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Lumbsch *et al.* (*MR* 111: 1133, 2007).
- Trapeliaceae** M. Choisy ex Hertel (1970), *Baeomycetales*. 9 gen. (+ 13 syn.), 103 spp. Contains most lichenized species formerly placed in the *Agyriaceae*. *Lit.*: Lumbsch *et al.* (*MR* 105: 265, 2001), Lumbsch *et al.* (*MR* 111: 1133, 2007).
- Trapelina** Motyka (1996) nom. inval. = *Trapelia*.
- Trapeliopsis** Hertel & Gotth. Schneid. (1980), *Agyriaceae* (L). 17, widespread (esp. temperate). See Coppins & James (*Lichenologist* 16: 241, 1984), Coppins (*SA* 7: 93, 1988), Lumbsch (*J. Hattori bot. Lab.* 83: 1, 1997), Lumbsch *et al.* (*MR* 105: 16, 2001; phylogeny), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Traponora** Aptroot (1997), *Lecanoraceae* (L). 1, Papua New Guinea. See Aptroot *et al.* (*Bibliotheca Lichenol* 64: 199, 1997).
- Trappea** Castellano (1990), *Trappeaceae*. 3, China; Europe; N. America. See Xu & Luo (*Mycosystema* 22: 191, 2003; China).
- Trappeaceae** P.M. Kirk (2008), *Hysterangiales*. 2 gen., 4 spp.
- Traquairia** Carruth. (1873), Fossil Fungi, *Ascomycota*. 2, USA. See Smith (*Am. J. Bot.* 70: 387, 1983).
- Traversoa** Sacc. & Syd. (1913) = *Lasiodiplodia* fide Sutton (*Mycol. Pap.* 141, 1977).
- Trechinothus** E.C. Martini & Trichies (2004), *Agaricomycetes*. 1, Europe. See Martini & Trichiès (*Mycotaxon* 90: 262, 2004).
- Trechispora** P. Karst. (1890), *Hydnodontaceae*. 46, widespread. See Liberta (*CJB* 51: 1871, 1973), Larson (*The Genus Trechispora* (*Corticaceae*, *Basidio-*

mycetes) Dissertation. Universität Göteborg, 1992).

Trechisporales K.H. Larss. (2007). Agaricomycetes. 1 fam., 15 gen., 105 spp. Fam.:

Hydnodontaceae

For *Lit.* see under fam.

tree hair (1) lichens, esp. fruticose spp. (*Bryoria*, *Usnea*), etc. growing on tree trunks (obsol.); (2) the lichen *Pseudevernia furfuracea* (mousse d'arbre); a source of perfume. Cf. oak-moss.

trehalose, a reserve disaccharide (α -D-glucopyranosyl- α -D-glucopyranoside) of fungi (esp. yeasts) and lichens which is hydrolyzed by the enzyme **trehalase**; mycose.

Treleasia Speg. (1896) = Pyxidiophora fide Petch (*Annl's mycol.* 34: 74, 1936), Sutton (*Mycol. Pap.* 141, 1977), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).

Trelesiella Speg. (1896) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).

trellis rust, on pear (*Gymnosporangium fuscum*); on juniper (*G. sabinae*).

Tremateia Kohlm., Volkm.-Kohlm. & O.E. Erikss. (1995), ? Pleosporaceae. Anamorph *Phoma*-like. 1 (on *Juncus*), USA. See Koblmeier *et al.* (*Bot. Mar.* 38: 165, 1995).

Trematomyces Schrantz (1961) = Requienella fide Boise (*Mycol.* 78, 1986).

Trematophlyctis Pat. (1918), ? Chytridiales. 1 (on *Leptodesmia* (legume)), Madagascar.

Trematophoma Petr. (1924), anamorphic *Pezizomycotina*, Cpd.0eH.19. 1, Austria.

Trematophora Eisenack (1965), Fossil Fungi ? Fungi. 1, Sweden.

Trematosphaerella Kirschst. (1906) ? = Phaeosphaeria fide Holm (*Symb. bot. upsal.* 14 no. 3: 1, 1957), Hara (*Monogr. Rice Diseases*, 1959), Shoemaker & Babcock (*CJB* 67: 1500, 1989).

Trematosphaeria Fuckel (1870), ? Pleomassariaceae. Anamorph *Zalerion*-like. 15, widespread. See Boise (*Mycol.* 77: 230, 1985; key), Fisher & Webster (*Nova Hedwigia* 54: 77, 1992; anamorph), Lumbsch & Lindemuth (*MR* 105: 901, 2001; phylogeny), McKeown *et al.* (*MR* 105: 615, 2001; ultrastr.), Tanaka *et al.* (*Fungal Diversity* 19: 145, 2005; revision, Japan), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny, polyphyly).

Trematosphaeriopsis Elenkin (1901), Pleosporales. 1 (lichenicolous). See Theissen & Sydow (*Annl's mycol.* 13: 603, 1915), Hafellner (*Mycotaxon* 80: 381, 2001).

Trematosphaeris Clem. & Shear (1931) $\equiv$ Trematosphaeriopsis.

Trematosphaerites Grüss (1924), Fossil Fungi ? Fungi. 1 (Devonian), Spitzbergen.

Trematosphaerites Mesch. (1892), Fossil Fungi. 1 (Tertiary), Europe. See Bužek & Holy (*Sbor. geol. ved.* 4: 108, 1964).

Trematostoma (Sacc.) Shear (1942) = Exarmidium fide Barr & Boise (*Mycotaxon* 23, 1985), Aptroot (*Nova Hedwigia* 66: 89, 1998).

Trematovalsa Jacobesco (1906), ? Diaporthales. 1, France.

trembling fungi, the *Tremellales*.

Tremella Dill. ex L. (1753) nom. inval., Cyanophyta.

Tremella Pers. (1794) nom. cons., Tremellaceae. c. 90 (parasites on other fungi), widespread. The edible *T. fuciformis* ('Silver ear') is cultivated in China. See Donk (*Persoonia* 4: 179, 1966; regional lists), Bandoni & Bisalputra (*CJB* 49: 27, 1971; ultrastr. of hap-

lonts), Barnett *et al.* (*Yeasts: Characteristics and Identification* 2nd edn, 1990; yeast states 10 spp.), Diederich & Christiansen (*Lichenologist* 26: 47, 1994; on lichens), Roberts (*Mycologist* 15: 146, 2001; British spp.), Roberts (*Kew Bulletin* 58: 763, 2003; Cameroon), Diederich (*Opuscula Philo-lichenum* 4: 11, 2007; on lichens).

Tremellacantha Jülich (1980) = Protohydnum fide Hjortstam *et al.* (*Kew Bull.* 45: 319, 1990).

Tremellaceae Fr. (1821), Tremellales. 17 gen. (+ 14 syn.), 238 spp.

Lit.: Bandoni (*Stud. Mycol.* 30: 87, 1987), Barnett *et al.* (*Yeasts: Characteristics and Identification* 2nd edn, 1990; yeast states), Zugmaier *et al.* (*Mycol.* 86: 49, 1994), Bandoni & Boekhout in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 705, 1998), Banno & Yamada in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 768, 1998), Boekhout & Nakase in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 731, 1998), Chen (*Bibliotheca Mycol.* 174: 225 pp., 1998), Bandoni & Ginns (*CJB* 76: 1544, 1998), Chen *et al.* (*Mycoscience* 40: 137, 1999), Chen *et al.* (*Mycotaxon* 77: 215, 2001), Weiss & Oberwinkler (*MR* 105: 403, 2001), Sampaio *et al.* (*Mycol.* 94: 874, 2002), Scorzetti *et al.* (*FEMS Yeast Res.* 2: 495, 2002), Yan *et al.* (*Mycosystema* 21: 47, 2002).

Tremellales Fr. (1821). Tremellomycetes. 9 fam., 38 gen., 341 spp. Mycoparasites. Fams:

(1) **Carcinomycetaceae**

(2) **Cuniculitremaeae**

(3) **Hyaloriaceae**

(4) **Phragmoxenidiaceae**

(5) **Rhynchogastremataceae**

(6) **Sirobasidiaceae**

(7) **Tetragoniomycetaceae**

(8) **Tremellaceae**

(9) **Trichosporonaceae**

Lit.: Martin (1952), Donk (1951-1963; VIII, 1966: 218), Lowy (*Fl. Neotrop.* 6, 1971; *Nova Hedw.* 19: 407, 1971; key neotrop. spp.), Raitviir (*in* Parmasto, *Zhivaya priroda Dal'nego Vostoka*: 84, 1971; E. former USSR), McNabb (*in* Ainsworth *et al.* (Eds), *The Fungi* 4B, 1973), Bandoni (*Trans. Mycol. Soc. Japan* 25: 489, 1984; review, classific.; *Stud. Mycol.* 30: 87, 1987; review), Wells (*Mycol.* 86: 18, 1994; review, classific.), Wells & Bandoni (*Mycota VIIb*: 85, 2000; taxonomy), and under fams.

Tremellastrum Clem. (1909) $\equiv$ Crepidotus.

Tremellidium Petr. (1927), anamorphic *Pezizomycotina*, St.0eH.?. 1, Europe.

Tremellina Bandoni (1986), anamorphic *Tremellales*. 1, USA. See Bandoni (*Windahlia* 16: 53, 1986).

Tremellochaete Raitv. (1964) = Exidia fide Donk (*Persoonia* 4: 166, 1966).

Tremellodendron G.F. Atk. (1902), Sebacinaceae. c. 10, N. America; S. America; Europe. See Bodman (*Am. midl. Nat.* 27: 203, 1942), Walker & Parrent (*Memoirs of the New York Botanical Garden* 89: 291, 2004; mycorrhizal).

Tremellodendropsidaceae Jülich (1982) = Auriculariales.

Tremellodendropsis (Corner) D.A. Crawford (1954), Auriculariales. 7, widespread. See Petersen (*Mycotaxon* 29: 45, 1987), Wendland (*Boletus* 18: 102, 1994), Weiss & Oberwinkler (*MR* 105: 403, 2001).

Tremellodiscus Lloyd (1925) nom. nud. $\equiv$ Ruhlandiella fide Dissing & Korf (*Mycotaxon* 12: 290, 1980).

- Tremellodon** (Pers.) Fr. (1874) = *Pseudohydnum* P. Karst.
- Tremellogaster** E. Fisch. (1924), Diplocystidiaceae. 1, Surinam; Guyana. See Linder (*Mycol.* 22: 265, 1930).
- Tremellogastraceae** Zeller (1948) = Diplocystidiaceae.
- tremelloid** (1) like jelly or wet gelatin; gelatinous; (2) *Tremella*-like.
- Tremellomycetes** Hibbett, Matheny & Manfr. Binder (2007), Agaricomycotina. 3 ord., 11 fam., 50 gen., 377 spp. Ords:
- (1) **Cystofilobasidiales**
 - (2) **Filobasidiales**
 - (3) **Tremellales**
- Lit.*: Hibbett *et al.* (*MR* 111: 509, 2007).
- Tremellomycetidae**, see *Tremellomycetes*.
- Tremellopsis** Pat. (1903) = *Crepidotus* fide Singer (*Lilloa* 13: 59, 1947).
- Tremelloscypha** D.A. Reid (1979), Sebacinaceae. 2, Australia; Jamaica; USA. See Reid (*Beih. Sydowia* 8: 332, 1979), Weiss & Oberwinkler (*Mycol.* 74: 325, 1982), Weiss & Oberwinkler (*MR* 105: 403, 2001; posn, phylogeny).
- Tremellostereum** Ryvarden (1986), Sebacinaceae. 1, Caribbean. See Ryvarden (*Mycotaxon* 27: 321, 1986).
- Tremiscus** (Pers.) Lév. (1846) = *Guepinia* Fr. fide Legon *et al.* (*Checklist of the British & Irish Basidiomycota*, 2005).
- Tremolecia** M. Choisy (1953), Lecanorales (L). 5, widespread. See Hertel (*Ergebn. Forsch. Unternehm. Nepal Himalaya* 6: 150, 1977), Makarova (*Nov. sist. Niz. Rast.* 27: 107, 1990; Russia), Buschbom & Mueller (*Mol. Phylogen. Evol.* 32: 66, 2004; phylogeny), Türk & Uhl (*Bibliotheca Lichenol.* 88: 691, 2004; Austria), Wedin *et al.* (*MR* 109: 159, 2005; phylogeny).
- tremorgen**, a mycotoxin inducing a neurotoxicosis (tremor) in humans and higher animals, e.g. fumitremorgin, verruculotoxin.
- Tremotylomyces** Cif. & Tomas. (1953) = *Thelotrema*.
- Tremotylum** Nyl. (1865), Thelotremataceae (L). 6, widespread. See Redinger (*Ark. Bot.* 28A no. 8: 1, 1936).
- Trenomycetes** Chatton & F. Picard (1908), Laboulbeniaceae. 11, widespread. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- Trentepohlia** Mart. (1817), Algae. Algae.
- Tretendophragmia** Subram. (1994) = *Diplococcium* fide Sutton (*in litt.*).
- tretic** (of conidiogenesis), the sort of conidiogenesis in which each conidium (**tretoconidium**, tretic conidium, poroconidium, porospore) is delimited by an extension of the inner wall of the conidiogenous cell. Tretoconidia are solitary or in acropetal chains (cf. phialidic). **mono-**, **poly-**, (of conidiogenous cells), producing tretroconidia by the extrusion of the inner wall through one or several channels, respectively.
- Tretocephala** Subram. (1995), anamorphic *Pezizomycotina*, Hso.0eP.24. 1, Singapore. See Subramanian (*Cryptog. Mycol.* 13: 65, 1992), Subramanian (*Kavaka* 20/21: 57, 1992/1993).
- Tretophragmia** Subram. & Natarajan (1974), anamorphic *Pezizomycotina*, Hsy.≡ eP.24. 2, India. See Subramanian & Natarajan (*Proc. Natl. Inst. Sci. India B, Biol. Sci.* 39: 550, 1973), Holubová-Jechová & Mercado Sierra (*Česká Mykol.* 40: 142, 1986).
- Tretopileus** B.O. Dodge (1946), anamorphic *Corticaceae*, Hsy.≡ eP.42. 3, USA; Africa. See Deighton (*Mycol. Pap.* 78, 1960), Okada *et al.* (*Asian Network on Microbial Researches. Proceedings of International Conference on Asian Network on Microbial Researches* NATO ASI Series vol. 269: 537, 1998), Okada *et al.* (*Mycoscience* 39: 21, 1998; phylogeny), Lawrey *et al.* (*Amer. J. Bot.* 95: 816, 2008).
- Tretospeira** Piroz. (1972), anamorphic *Pezizomycotina*, Hso.≡ eP.24. 1, Uganda. See Pirozynski (*Mycol. Pap.* 129: 58, 1972).
- Tretospora** M.B. Ellis (1976), anamorphic *Balladynopsis*, Hso.≡ eP.24. 7, widespread. See Khan *et al.* (*Mycotaxon* 49: 477, 1993; key), Chaudhary *et al.* (*Mycotaxon* 57: 201, 1996), Hosagoudar *et al.* (*Zoos' Print Journal* 18: 967, 2003).
- Tretovularia** Deighton (1984), anamorphic *Pezizomycotina*, Hso.0eH.15. 1, widespread (northern Europe). See Braun (*Monogr. Cercospora, Ramularia Allied Genera (Phytopath. Hyphom.)* 2, 1998).
- Treubiomyces** Höhn. (1909), Chaetothyriaceae. 2, widespread. See Pohlád & Reynolds (*Mycol.* 66: 521, 1974), Pohlád (*CJB* 67: 40, 1989), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Trevisan** (Vittore, Earl of San Leon; 1818-1897; Italy). Born of a wealthy family in Padova; Professor of Natural History and Popular Physics in Padova (1851-1853); from 1853 onwards worked from his estate in Mason, then moved to Monza and Milan where he died. Trevisan devoted much of his time to advancing study of a wide range of cryptogams, including plant pathogens and lichen-forming fungi; he was especially concerned in using new microscopic features, introducing 75 generic names for lichen-forming taxa and making numerous critical and nomenclatural remarks on the works of Körber (q.v.) and especially Massalongo (q.v.). His collections were transferred to the University of Genoa, but all destroyed in World War II. *Biogs, obits etc.* Lazzarin [ed.] (*L' Opera Lichenologica di Vittore Trevisan*, 1994) [reprint collected works, including biography]; Grummann (1974: 524); Stafleu & Cowan (*TL-2* 6: 480, 1986).
- tri-** (in combination), three, triple.
- Triactella** Syd. (1921) = *Hapalophragmium* fide Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983) See, Lohsomboon *et al.* (*MR* 96: 461, 1992), Hennen *et al.* (*Mycol.* 92: 312, 2000).
- Triacutus** G.L. Barron & Tzean (1981), anamorphic *Pezizomycotina*, Hso.1bH.1. 1 (on bdelloid rotifer), Canada. See Barron & Tzean (*CJB* 59: 1207, 1981).
- Triadelphia** Shearer & J.L. Crane (1971), anamorphic *Pezizomycotina*, Hso.≡ eP.1. 13 (aquatic and terrestrial), widespread. See Constantinescu & Samson (*Mycotaxon* 15: 472, 1982; key), von Arx (*TBMS* 85: 566, 1985; related genera), Révay (*Acta Bot. Hung.* 33: 67, 1987), Tzean & Chen (*Mycol.* 81: 626, 1989; synoptic key).
- Triainomyces** W. Rossi & A. Weir (1998), Laboulbeniaceae. 1 (on pill-millipedes), New Zealand. See Rossi & Weir (*Mycol.* 90: 282, 1998).
- Triandromyces** Thaxt. (1931) = *Tetrandromyces* fide Tavares (*Mycol. Mem.* 9, 1985).
- Triangularia** Boedijn (1934), Lasiosphaeriaceae. 6, widespread. See Cain & Farrow (*CJB* 34: 689, 1956; key), von Arx & Hennebert (*BSMF* 84: 423, 1969), Guarro & Cano (*TBMS* 91: 587, 1988; key 5 spp.), Guarro *et al.* (*SA Reprint of Volumes 1-4* (1982-1985) 10: 79, 1991), Huhndorf *et al.* (*Mycol.* 96: 368,

- 2004; phylogeny), Miller & Huhndorf (*Mol. Phylogen. Evol.* **35**: 60, 2005; phylogeny), Cai *et al.* (*MR* **110**: 359, 2006; phylogeny).
- Triblidiaceae** Rehm (1888), Triblidiales. 3 gen. (+ 5 syn.), 11 spp.
- Lit.*: Eriksson (*SA* **11**: 1, 1992), Magnes (*Biblthca Mycol.* **165**: 177 pp., 1997).
- Triblidiales** O.E. Erikss. (1992). *Pezizomycotina*. 1 fam., 3 gen., 11 spp. Fam.:
- Triblidiaceae**
- Lit.*: Eriksson (*SA* **11**: 1, 1992), Magnes (*Bibl. Mycol.* **165**, 1997).
- Triblidium** Rebm. (1804), Triblidiaceae. 1 or 6, Europe. See Eriksson (*Op. Bot.* **60**, 1981), Magnes (*Biblthca Mycol.* **165**, 1997).
- Tribolites** W.H. Bradley ex Janson. & Hills (1976), Fossil Fungi, anamorphic *Pezizomycotina*. 1 (Eocene), USA.
- Tribolospora** D.A. Reid (1966), anamorphic *Pezizomycotina*, St.0eH.15. 1, Australia. See Reid (*Aust. J. Bot.* **14**: 31, 1966).
- Tribulatia** Joanne E. Taylor, K.D. Hyde, E.B.G. Jones (2003), Sordariomycetes. 1, Queensland. See Taylor & Hyde (*Fungal Diversity Res. Ser.* **12**: 189, 2003).
- Tricella** Long (1912) = *Phragmopyxis* fide Dietel (*Nat. Pflanzenfam.* **6**, 1928).
- Tricellaesporonites** Sheffy & Dilcher (1971), Fossil Fungi. 2 (Eocene), USA.
- Tricellula** Beverw. (1954), anamorphic *Pezizomycotina*, Hsy.≡ eH.10. 4, Europe; USA. See Haskins (*Can. J. Microbiol.* **4**: 279, 1958), Petersen (*Bull. Torrey bot. Club* **89**: 287, 1962).
- Tricellulortus** Matsush. (1995) = *Minimedusa* fide Diederich & Lawrey (*Mycol. Progr.* **6**: 61, 2007).
- Triceromyces** T. Majewski (1980), Laboulbeniaceae. 5, widespread. See Tavares (*Mycol. Mem.* **9**: 627 pp., 1985), Benjamin (*Aliso* **11**: 245, 1986; key 6 spp.), Benjamin (*Aliso* **17**: 1, 1998).
- Trichaegum** Corda (1837), anamorphic *Pezizomycotina*, Hso.#eP.?. 3, Europe; N. America.
- Trichaleurina** Rehm (1903) = *Scutellinia* fide Eckblad (*Nytt Mag. Bot.* **15**: 1, 1968).
- Trichaleuris** Clem. (1909) = *Scutellinia* fide Eckblad (*Nytt Mag. Bot.* **15**: 1, 1968).
- Trichamelia** Bat. (1960), Asterinaceae. 1, Brazil. See Batista (*Publções Inst. Micol. Recife* **295**: 9, 1960), Hosagoudar *et al.* (*Journal of Mycopathological Research* **39**: 61, 2001).
- Trichangium** Kirschst. (1935), Helotiales. 1, Europe.
- Trichaptum** Murrill (1904), Polyporaceae. 20, widespread (pantropical). See Macrae (*CJB* **45**: 1371, 1966), Corner (*Beih. Nova Hedwigia* **86**: 197, 1987; key), Hattori (*Mycoscience* **46**: 303, 2005; type studies Corner species).
- Tricharia** Boud. (1885) ≡ *Tricharina*.
- Tricharia** Fée (1825), Gomphillaceae (L.). 69, widespread (tropical). See Sérusiaux (*Mycol.* **76**: 108, 1984; key), Vězda & Poelt (*Folia geobot. phytotax.* **22**: 179, 1987), Lücking (*Biblthca Lichenol.* **65**: 1, 1997), Ferraro (*Fungal Diversity* **15**: 153, 2004; hypophores), Lücking *et al.* (*Mycol.* **96**: 283, 2004; phylogeny), Lücking *et al.* (*Lichenologist* **37**: 123, 2005; phylogeny).
- Tricharina** Eckblad (1968), Pyronemataceae. Anamorph *Ascorhizoctonia*. 13, widespread (temperate). See Yang & Korf (*Mycotaxon* **24**: 467, 1985; key), Yang & Kristiansen (*Mycotaxon* **35**: 313, 1989; anamorph), Egger (*CJB* **74**: 773, 1996; DNA), Barrera & Romero (*Mycotaxon* **77**: 31, 2001; Argentina), Hansen & Pfister (*Mycol.* **98**: 1029, 2006; phylogeny), Liu & Zhuang (*Mycosystema* **25**: 546, 2006; phylogeny), Tedersoo *et al.* (*New Phytol.* **170**: 581, 2006; mycorrhiza), Perry *et al.* (*MR* **111**: 549, 2007; phylogeny).
- Trichaster** Czern. (1845) = *Geastrum* fide Staněk in Pilát (Ed.) (*Fl. ČSR B*, **1**: 480, 1958).
- Trichasterina** G. Arnaud (1918), Asterinaceae. 9, widespread (tropical). See Song *et al.* (*Mycosystema* **21**: 309, 2002; China).
- trichidium**, see *sterigma*.
- Trichobacidia** Vain. (1921) nom. dub., Fungi. See Santesson (*Symb. bot. upsal.* **12** no. 1: 1, 1952).
- Trichobasis** Lév. (1849) = *Uredo* fide Saccardo (*Syll. fung.* **7**: 838, 1887) See, Laundon (*Mycotaxon* **3**: 133, 1975).
- Trichobelonium** (Sacc.) Rehm (1896) = *Belonopsis* fide Aebi (*Nova Hedwigia* **23**: 49, 1972), Nannfeldt (*Sydowia* **38**: 194, 1985).
- Trichobolbus** Bat. (1964), anamorphic *Pezizomycotina*, Cpd.0eP.?. 1, Brazil. See Batista (*Riv. Patol. veg., Pavia sér.* **3** **4**: 559, 1964).
- Trichobolus** (Sacc.) Kimbr. & Cain (1967), *Pezizales*. 4, Europe; N. America. Perhaps close to *Lasiobolus*. See Krug (*CJB* **51**: 1497, 1973), Samuelson & Kimbrough (*Mycol.* **70**: 1191, 1978), Olsen (*Blyttia* **45**: 117, 1987; Norway), Brummelin (*Persoonia* **16**: 425, 1998), Prokhorov (*Mikol. Fitopatol.* **32**: 40, 1998; Russia).
- Trichobotrys** Penz. & Sacc. (1901), anamorphic *Pezizomycotina*, Hso.0eP.3. 3, Asia (tropical). See Morgan-Jones *et al.* (*Mycotaxon* **30**: 345, 1987), D'Souza & Bhat (*Mycotaxon* **80**: 105, 2001).
- Trichocarpus** P. Karst. (1889) [non *Trichocarpus* Schreb. 1789, *Tiliaceae*] = *Amylostereum* fide Donk (*Persoonia* **3**: 199, 1964).
- Trichocephalum** Costantin (1888) = *Periconia* fide Mason & Ellis (*Mycol. Pap.* **56**, 1953).
- Trichoceridium** R.A. Poiss. (1932) ? = *Smittium* fide Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986).
- Trichochora** Theiss. & Syd. (1915) nom. dub., Fungi. See Petrak (*Annlis mycol.* **27**: 324, 1929).
- Trichocicinnus** (Sacc.) Höhn. (1926) = *Chaetosticta* fide Sutton (*Mycol. Pap.* **141**, 1977).
- Trichocintractia** M. Piepenbr. (1995), *Anthra-coideaceae*. 1 (on *Rhynchospora* (*Cyperaceae*)), widespread (tropical). See Piepenbring (*CJB* **73**: 1089, 1995), Piepenbring (*Revta Biol. trop.* **49**: 411, 2001; Panama), Pérez & Minter (*IMI Descr. Fungi Bact.* **164**, 2005).
- Trichocladia** (de Bary) Neger (1901) = *Erysiphe* fide Braun & Takamatsu (*Schlechtendalia* **4**: 3, 2000).
- Trichocladia** Stirt. (1882) [non *Trichocladia* Harv. 1836, *Algae*] = *Heterodea* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Trichocladium** Harz (1871), anamorphic *Chaetomiaceae*, Hso.≡ eP.1. 24, widespread. The genus is highly polyphyletic. See Hughes (*TBMS* **35**: 152, 1952), Hughes (*N.Z. Jl Bot.* **7**: 153, 1969), Pidoplichko & Kirilenko (*Mikol. Fitopatol.* **6**: 510, 1972; key), Kohlmeyer & Volkmann-Kohlmeyer (*Mycotaxon* **53**: 349, 1995; key 7 aquatic spp.), Goh & Hyde (*Fungal Diversity* **2**: 101, 1999; synopsis), Chang (*Fungal Science Taipei* **16**: 35, 2001; teleomorph), Jones *et al.* (*Fungal Diversity* **7**: 49, 2001), Chatmala *et al.* (*Fungal Diversity Res. Ser.* **7**: 59,

- 2002), Mantle *et al.* (MR 110: 1371, 2006; phylogeny).
- Trichocollonema** Höhn. (1902) = *Zignoëlla* fide von Höhnel (*Annls mycol.* 15, 1917).
- Trichocoma** Jungh. (1838), Trichocomaceae. Anamorph *Penicillium*. 1, widespread (subtropical). See Martin (*Mycol.* 29: 620, 1937), Kuraishi *et al.* (MR 95: 705, 1991; ubiquinones), Ogawa & Sugiyama (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 149, 2000; phylogeny), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny).
- Trichocomaceae** E. Fisch. (1897), Eurotiales. 39 gen. (+ 45 syn.), 881 spp.
- Lit.*: Raper & Fennell (*The genus Aspergillus*, 1965), Malloch & Cain (*CJB* 50: 2613, 1972), Malloch & Cain (*CJB* 51: 1647, 1973; gen. names), Weijman (*Antonie van Leeuwenhoek* 42: 315, 1976), Pitt (*The genus Penicillium and its teleomorphic states Eupenicillium and Talaromyces*, 1979), Malloch in Arai (Ed.) (*Filamentous micro-organisms*: 37, 1985; key gen.), Malloch in Samson & Pitt (Eds) (*Advances in Penicillium and Aspergillus Systematics* 102: 365, 1985), Malloch (*Advances in Penicillium and Aspergillus Systematics* 102: 365, 1985), Pitt & Samson (*Regnum veg.* 128: 13, 1993; names in use), Pitt (*CJB* 73 Suppl. 1: S768, 1995), Horie *et al.* (*Mycoscience* 37: 323, 1996), Landvik *et al.* (*Mycoscience* 37: 237, 1996), Ogawa *et al.* (*Mycol.* 89: 756, 1997), Frisvad *et al.* (*Chemical Fungal Taxonomy*: 289, 1998), Geiser *et al.* (*Mycol.* 90: 831, 1998), Domenech *et al.* (*Microbiology Reading* 145: 2789, 1999), Skouboe *et al.* (MR 103: 873, 1999), Frisvad & Samson (*Stud. Mycol.* 45: 201, 2000), Frisvad *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 265, 2000), Kuraishi *et al.* (*Antonie van Leeuwenhoek* 77: 179, 2000), Ogawa & Sugiyama (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 149, 2000), Peterson (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 163, 2000), Peterson (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 323, 2000), Pitt *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 9, 2000), Tamura *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 357, 2000), Klich (*Identification of Common Aspergillus Species*: 116 pp., 2002), Klich *et al.* (*Mycol.* 95: 1252, 2003), Samson *et al.* (*Stud. Mycol.* 49: 175, 2004), Scott *et al.* (*Mycol.* 96: 1095, 2004), Hong *et al.* (*Mycol.* 97: 1316, 2005), Peterson (*Mycol.* 100: 205, 2008; 4-locus phylogeny).
- Trichoconiella** B.L. Jain (1976) = *Alternaria* fide Sutton (*in litt.*).
- Trichoconis** Clem. (1909), anamorphic *Pezizomycotina*, Hso.≡ eH.1. 15 (on fungi), widespread. See Deighton & Pirozynski (*Mycol. Pap.* 128, 1972; keys), Baker *et al.* (*Mycotaxon* 79: 361, 2001).
- Trichoconium** Corda (1837) = *Melanconium* fide Saccardo (*Syll. fung.* 3: 1, 1884).
- Trichocrea** Marchal (1891) nom. dub., anamorphic *Pezizomycotina*. See Minter & Caine (*TBMS* 74: 434, 1980).
- Trichoctosporea** J.I.R. Larsson (1994), Microsporidia. 1. See Larsson (*Arch. Protistenk.* 144: 147, 1994).
- trichocyst**, a subpellicular organelle of many ciliates and dinoflagellates; sometimes an offensive weapon able to disable prey, sometimes an anchoring device.
- Trichodelitschia** Munk (1953), Phaeotrichaceae. 4, widespread. See Lundqvist (*Svensk bot. Tidskr.* 58: 267, 1964), Barr (*Prodr. Cl. Loculoasc.*, 1987; posn), Eriksson (*SA* 7: 93, 1988), Ebersohn & Eicker (*S. Afr. J. Bot.* 58: 145, 1992), Kruys *et al.* (MR 110: 527, 2006; phylogeny).
- trichoderm** (of basidiomata), an outer layer composed of hair-like elements projecting from the surface (Furtado, *Mycol.* 57: 599, 1965). See *derm*.
- Trichoderma** Pers. (1794), anamorphic *Hypocrea*, Hso.0eH.15. 102 (esp. in soil), widespread. See Rifai (*Mycol. Pap.* 116, 1969; key), Doi *et al.* (*Bull. natn. Sci. Mus. Tokyo*, B 10: 73, 1984), Barak *et al.* (*Can. J. Microbiol.* 31: 810, 1985; antigens), Eveleigh (*Biology of Industrial Microorganisms*: 487, 1985; review), Min *et al.* (*Korean J. Mycol.* 13: 221, 1985; chromosomes), Doi & Doi (*Bull. natn. Sci. Mus. Tokyo*, B 12: 1, 1986; nomenclator), Doi *et al.* (*Bull. natn. Sci. Mus. Tokyo*, B 13: 1, 1987), Elad *et al.* (*TBMS* 88: 259, 1987; ultrastr.), Doi *et al.* (*Bull. natn. Sci. Mus. Tokyo*, B 15: 27, 1989; conidium ornamentation), Meyer & Plaskowitz (*Mycol.* 81: 312, 1989; SEM), Stasz *et al.* (*Mycol.* 81: 391, 1989; cladistics), Toyama & Toyama (*Agric. Biol. Chem.* 54: 2331, 1990; genetics), Meyer (*Phytopathology* 81: 1240, 1991), Meyer (*Appl. Environm. Microbiol.* 57: 2269, 1991; DNA), Nevalainen *et al.* (*Molecular Industrial Mycology: Systems and Applications for Filamentous Fungi* Mycology Series 8: 129, 1991; gene expression), Samuels *et al.* (*Petria* 1: 121, 1991; teleomorph), Bissett (*CJB* 69: 2357, 1991), Bissett (*CJB* 69: 2418, 1991), Bissett (*CJB* 70: 639, 1992), Bissett (*CJB* 69: 2373, 1991), Zimand *et al.* (*Phytoparasitica* 21: 166, 1993; RAPDs), García *et al.* (*Revta Iberoamer. Micol.* 11: S48, 1994; numerical taxonomy), Mills & Muthumeenakshi (*Ecology of Plant Pathogens*: 135, 1994; from mushroom compost), Samuels *et al.* (*Mycol.* 86: 421, 1994), Tschen & Li (*Mycoscience* 35: 257, 1994; protoplast generation), Zimand *et al.* (MR 98: 531, 1994; RAPDs), Leuchtmann *et al.* (*Mycol.* 88: 384, 1996; isozymes), Samuels (MR 100: 923, 1996; review), Samuels & Lodge (*Mycol.* 88: 302, 1996), Gómez *et al.* (*Molecular & General Genetics* 256: 127, 1997; genetic diversity), Grondona *et al.* (*Appl. Environm. Microbiol.* 63: 3189, 1997; physiology, biochemistry), Kuhls *et al.* (*Mycol.* 89: 442, 1997; phylogeny), Turner *et al.* (MR 101: 449, 1997), Castle *et al.* (*Appl. Environm. Microbiol.* 64: 133, 1998; N America, on mushrooms), Gams & Bissett (*Trichoderma and Gliocladium* Vol. 1. Basic Biology, Taxonomy and Genetics: 3, 1998; morphology), Gams & Meyer (*Mycol.* 90: 904, 1998), Harman *et al.* (*Trichoderma and Gliocladium* Vol. 1. Basic Biology, Taxonomy and Genetics: 243, 1998; genetics), Kindermann *et al.* (*Fungal Genetics Biol.* 24: 298, 1998; phylogeny), Lieckfeldt *et al.* (*Trichoderma and Gliocladium* Vol. 1. Basic Biology, Taxonomy and Genetics: 35, 1998; phylogeny), Muthumeenakshi *et al.* (MR 102: 385, 1998; on mushrooms), Ospina-Giraldo *et al.* (*Mycol.* 90: 76, 1998; on mushrooms), Samuels *et al.* (*Stud. Mycol.* 41, 1998), Schickler *et al.* (MR 102: 373, 1998; chitinases), Kuhls *et al.* (*Medical Mycology* 37: 25, 1999; from humans), Lieckfeldt *et al.* (*Appl. Environm. Microbiol.* 65: 2418, 1999), Lieckfeldt *et al.* (*CJB* 76: 1507, 1998), Lübeck *et al.* (MR 103: 289,

- 1999), Ospina-Giralda *et al.* (*Phytopathology* 89: 308, 1999; phylogeny), Samuels *et al.* (*Sydowia* 51: 71, 1999), Hermosa *et al.* (*Appl. Environm. Microbiol.* 66: 1890, 2000; biocontrol strains), Lieckfeldt *et al.* (*Microbiol. Res.* 155: 7, 2000; endochitinases), Lieckfeldt *et al.* (*Mycol.* 92: 374, 2000), Lübeck *et al.* (*FEMS Microbiol. Lett.* 185: 129, 2000; from buildings), Samuels *et al.* (*MR* 104: 760, 2000), Chaverri *et al.* (*Mycol.* 93: 1113, 2001), Kullnig *et al.* (*MR* 105: 770, 2001; biocontrol), Lieckfeldt *et al.* (*MR* 105: 313, 2001; phylogeny), Thrane *et al.* (*FEMS Microbiol. Lett.* 203: 249, 2001; HPLC), Chaverri & Samuels (*Mycol. Progr.* 1: 283, 2002), Kullnig-Gradinger *et al.* (*MR* 106: 757, 2002; phylogeny), Lee & Hseu (*Can. J. Microbiol.* 48: 831, 2002), Samuels *et al.* (*Mycol.* 94: 146, 2002; from mushrooms), Chaverri & Samuels (*Stud. Mycol.* 48, 2003; revision), Chaverri *et al.* (*Mol. Phylogen. Evol.* 27: 302, 2003; phylogeny), Chaverri *et al.* (*Mycol.* 95: 1100, 2003), Dodd *et al.* (*Mycol.* 95: 27, 2003), Grinyer *et al.* (*Curr. Genet.* 45: 163, 2004; proteomics), Hermosa *et al.* (*MR* 108: 897, 2004; genetic diversity), Lu *et al.* (*Mycol.* 96: 310, 2004), Rey *et al.* (*Applied Mycology and Biotechnology* 4: [225], 2004; genetics), Druzhinina *et al.* (*Fungal Genetics Biol.* 42: 813, 2005; barcoding), Kopchinskiy *et al.* (*MR* 109: 658, 2005; molecular identification), Druzhinina *et al.* (*Mycoscience* 47: 55, 2006; review), Jaklitsch *et al.* (*Stud. Mycol.* 56: 135, 2006), Overton *et al.* (*Stud. Mycol.* 56: 1, 2006), Overton *et al.* (*Stud. Mycol.* 56: 39, 2006), Samuels (*Phytopathology* 96: 195, 2006; review), Samuels *et al.* (*Stud. Mycol.* 56: 67, 2006), Samuels *et al.* (*MR* 110: 381, 2006; from cacao).
- Trichoderma** Pers. (1801) nom. conf., Fungi.
- Trichoderma** Hoffm. (1795) = *Trichothecium* fide Saccardo (*Syll. fung.* 4: 178, 1886).
- Trichodesmium** Chevall. (1826) nom. rej. prop. ≡ *Graphiola*.
- Trichodiscula** Vouaux (1910), anamorphic *Pezizomycotina*. 1 (on cardboard), France.
- Trichodiscus** Kirschst. (1924) [non *Trichodiscus* Welsford 1912, *Algae*] ≡ *Dennisiodiscus*.
- Trichodochium** Syd. (1927), anamorphic *Pezizomycotina*, Hsp.1eP.19. 2, C. America; India. See Ellis (*Mycol. Pap.* 111, 1967).
- Trichodothella** Petr. (1946), *Venturiaceae*. 1, Europe.
- Trichodothis** Theiss. & Syd. (1914), *Venturiaceae*. 3, N. America; Africa. See Barr (*Sydowia* 41: 25, 1989).
- Trichoduboscqia** L. Léger (1926), *Microsporidia*. 1.
- Trichodytes** Kleb. (1898) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Trichofusarium** Bubák (1906) = *Fusarium* fide Booth (*The genus Fusarium*, 1971).
- Trichoglossum** Boud. (1885), *Geoglossaceae*. 20, widespread (esp. temperate). See Mains (*Mycol.* 46: 61, 1954; key N. Am. spp.), Rifai (*Lloydia* 28: 113, 1965; key Javanese spp.), Benkert (*Mykol. MittBl.* 20: 47, 1977; Germany), Spooner (*Biblhca Mycol.* 116, 1987; key Australasian spp.), Verkley (*Persoonia* 15: 405, 1994; asci), Zhuang & Wang (*Mycotaxon* 63: 307, 1997), Zhuang (*Fl. Fung. Sinicorum* 8, 1998; 15 spp. China), Wang (*Bull. natn. Mus. Nat. Sci. Taiwan* 13: 147, 2001; Taiwan), Wang *et al.* (*Mycol.* 94: 641, 2002; phylogeny), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006; phylogeny).
- trichogyne**, the receptive hypha of the female organ, esp. in certain ascomycetes.
- Trichohelotium** Killerm. (1935), *Helotiales*. 2, Europe.
- Trichohleria** Sacc. (1908) ? = *Trichosphaerella* fide von Arx & Müller (*Stud. Mycol.* 9, 1975), Samuels & Barr (*CJB* 75: 2165, 1998).
- Tricholechia** A. Massal. (1853) ≡ *Byssoloma*.
- Tricholeconium** Corda (1837) = *Sarcopodium* fide Saccardo (*Syll. fung.* 4: 312, 1886).
- Tricholoma** (Fr.) Staude (1857) nom. cons., *Tricholomataceae*. c. 200, widespread (esp. north temperate). See Horak (*Sydowia* 17: 153, 1964; key 11 S. Am. spp.), Bon (*Docums Mycol.* 3: 1, 1971), Gulden (*Musseronflora Slekton Tricholoma sensu lato*, 1972), Haluwyn (*Docums Mycol.* 4: 43, 1972; ecology), Bon (*Docums Mycol.* 6: 165, 1974-76), Bon (*Docums Mycol.* 4: 55, 1974-76), Bon (*Docums Mycol.* 5: 111, 1974-76), Bon (*Encycl. Mycol.* 36, 1984), Riva (*Tricholoma*, 1988) See matsutake, Riva (*Fungi Europaei* 3 A: 626, 2003), Matsushita *et al.* (*Mycoscience* 46: 90, 2005; genetic relationship of *Tricholoma matsutake* and *T. nauseosum*), Jacobsson *et al.* (*Mycotaxon* 95: 195, 2006; new sp. Fennoscandia).
- Tricholomataceae** R. Heim ex Pouzar (1983) nom. cons., *Agaricales*. 78 gen. (+ 57 syn.), 1020 spp.
- Lit.*: Mankel *et al.* (*Microbiol. Res.* 153: 377, 1999), Noordeloos (*Coolia* 42: 163, 1999), Hwang & Kim (*Curr. Microbiol.* 40: 250, 2000), Kalamees (*Folia cryptog. Estonica* 38: 13, 2001), Suh *et al.* (*Mycobiology* 29: 179, 2001), Moncalvo *et al.* (*Mol. Phylogen. Evol.* 23: 357, 2002), Lian *et al.* (*Mycorrhiza* 13: 27, 2003), Chapela & Garbelotto (*Mycol.* 96: 730, 2004), Matsushita *et al.* (*Mycoscience* 46: 90, 2005), Murata & Babasaki (*Mycorrhiza* 15: 381, 2005).
- Tricholomella** Zerova ex Kalamees (1992) = *Calocybe* fide Kuyper (*in litt.*).
- tricholomic acid**, an insecticidal amino-acid derivative produced by *Tricholoma muscarium* (Takemoto, *Jap. J. Pharm. Chem.* 33: 252, 1961). Cf. muscazone.
- Tricholomopsis** Singer (1939), *Agaricales*. c. 30, widespread. Belongs to *Tricholomataceae* or *Marasmiaceae*. See Smith (*Brittonia* 12: 41, 1960), Liu (*Acta Mycol. Sin.* 13: 181, 1994; China).
- Tricholosporum** Guzmán (1975), *Tricholomataceae*. 5, widespread. See Guzmán (*Boletín de la Sociedad Mexicana de Micología* 9: 61, 1975), Contu & Mua (*Rivista di Micologia* 43: 249, 2000; European spp.), Guzmán *et al.* (*Docums Mycol.* 33 no. 131: 23, 2004).
- Trichomaritis** Hibbits, G.C. Hughes & Sparks (1981), *Halosphaeriaceae*. 1 (on tanner crab), Alaska. See Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 34: 1, 1991), Sakayaroj *et al.* (*Mycol.* 97: 804, 2005; phylogeny).
- Trichomatomyces** Dorn.-Silva & Dianese (2004), anamorphic *Pezizomycotina*. 1, Brazil. See Dornelo-Silva & Dianese (*Mycol.* 96: 879, 2004).
- Trichomerium** Speg. (1918), *Capnodiaceae*. Anamorph *Tripaspermum*. 23, widespread. See Hughes (*Mycol.* 68, 1976; synonymy with *Phragmocapnias*), Reynolds (*Mycotaxon* 14: 189, 1982), Reynolds (*Mycotaxon* 27: 377, 1986).
- Trichometasphaeria** Munk (1953), *Lophiostomataceae*. Anamorph *Ascochyta*-like. 7, N. America. See Barr (*Mycotaxon* 45: 191, 1992).
- Trichomonascaceae** Locq. (1972), *Saccharomycetales*. 5 gen., 21 spp.

- Lit.*: Kurtzman & Robnett (*FEMS Yeast Res.* 7: 141, 2007).
- Trichomonascus** H.S. Jacks. (1948), Trichomonasaceae. Anamorph *Blastobotrys*. 1 (on *Corticium*), Canada. See Kurtzman & Blanz in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 69, 1998; rDNA), Malloch & de Hoog in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 197, 1998), Kurtzman & Robnett (*FEMS Yeast Res.* 7: 141, 2007).
- Trichomyces** Malmsten (1848) = Trichophyton fide Dodge (*Medical Mycology*, 1935).
- Trichomycetes** Alexop. (1962), Zygomycota. A polyphyletic taxon as traditionally circumscribed at this rank. Manier & Lichtwardt (1968) recognized 4 Orders but two, the *Amoebidales* and *Eccrinales*, are now placed in the *Protozoa* and the other two, the *Asellariales* and *Harpellales* and referred to the *Kickxellomycotina*.
- Lit.*: Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986, in Ainsworth *et al.* (Eds), *The Fungi* 4B: 651, 1973, in Jones (Ed.), *Recent advances in aquatic mycology*, 1976; keys, *Mycol.* 65: 1, 1973; phylogeny, in Parker (Ed.), 1982, 1: 195), Cavalier-Smith (in Coombs *et al.*, *Evolutionary relationships among Protozoa*, 1998), Moss (*TBMS* 65: 115, 1975; phylogeny), Moss & Young (*Mycol.* 70: 944, 1978; phylogeny), Benjamin (in Kendrick (Ed.), *The whole fungus* 2: 573, 1979; phylogeny), Porter & Smiley (*Exp. Mycol.* 3: 188, 1979; phylogeny), Lichtwardt *et al.* (*Trans. mycol. Soc. Japan* 28: 359, 1987; Japan).
- Reviews*: Duboscq *et al.* (*Arch. Zool. Exp. Gén.* 86: 29, 1948), Manier (*Ann. Sci. nat., Bot. sér.* 12, 10: 565, 1969), Moss (in Batra (Ed.), *Insect-fungus symbiosis*: 175, 1979), Lichtwardt & Williams (*CJB* 66: 1259, 1988; spp. diversity & distrib., 68: 1057, 1990; Australia), Williams & Lichtwardt (*CJB* 68: 1045, 1990; NZ).
- trichomycin**, an antibiotic from *Streptomyces hachijoensis* (Hosoya *et al.*, 1955); antifungal (esp. against *Candida albicans*) and anti-*Trichomonas*.
- Trichonectria** Kirschst. (1907), Bionectriaceae. 15 (rotten wood, often associated with lichen thalli or liverworts), widespread. See Döbblers (*Mitt. bot. StSamml., München* 14: 1, 1978; on *Musci*), Hawksworth (*Notes R. bot. Gdn Edinb.* 36: 181, 1978), Hawksworth (*Lichenologist* 12: 100, 1980; nomencl.), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Trichonosema** E.U. Canninga, D. Refardt, C.R. Vossbrinck, B. Okamurad & A. Curry (2002), Microsporidia. 2. See Canninga *et al.* (*Eur. J. Protist.* 38: 247, 2002).
- Trichopeltella** Höhn. (1910), ? Microthyriaceae. 1, Java.
- Trichopeltheca** Bat., C.A.A. Costa & Cif. (1958), Euantennariaceae. Anamorphs *Plokamidomyces*, *Trichothallus*. 2, Asia; Pacific. See Hughes (*N.Z. J. Bot.* 10: 230, 1972).
- Trichopeltidaceae** Theiss. (1914) = Microthyriaceae.
- Trichopeltina** Theiss. (1914), ? Microthyriaceae. 2, S. America.
- Trichopeltinaceae** Bat., C.A.A. Costa & Cif. (1958) = Microthyriaceae.
- Trichopeltinites** Cookson (1947), Fossil Fungi. 4 (Cretaceous, Tertiary), widespread.
- Trichopeltis** Speg. (1889) = Trichothyrium fide Spooner & Kirk (*MR* 94: 223, 1990).
- Trichopeltium** Clem. (1909) = Trichopeltulum fide Sutton (*Mycol. Pap.* 141, 1977).
- Trichopeltopsis** Höhn. (1909) = Trichothyrium fide Spooner & Kirk (*MR* 94: 223, 1990).
- Trichopeltospora** Bat. & Cif. (1958), ? Microthyriaceae. 1, Brazil. See Batista & Ciferri (*Publicações Inst. Micol. Recife* 90: 17, 1958).
- Trichopeltula** Theiss. (1914) = Trichothyrium fide Clements & Shear (*Gen. Fung.*, 1931).
- Trichopeltulum** Speg. (1889), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, Brazil. See Petrak & Sydow (*Annls mycol.* 33: 173, 1935), Reynolds & Gilbert (*Aust. Syst. Bot.* 18: 265, 2005).
- Trichopeltum** Bat., Cif. & C.A.A. Costa (1957), ? Microthyriaceae. 1, Hawaii. See Batista *et al.* (*Publicações Inst. Micol. Recife* 90: 20, 1958).
- Trichopeziza** Fuckel (1870), Hyaloscyphaceae. 26, widespread (esp. temperate). See Raitviir (*Eesti NSV Tead. Akad. Toim. Biol. seer* 36: 313, 1987), Verkley (*Nova Hedwigia* 63: 215, 1996; ultrastr.), Cantrell & Hanlin (*Mycol.* 89: 745, 1997; DNA).
- Trichopezizella** Dennis ex Raitv. (1969) = Lachnum fide Haines (*Mycol.* 66: 216, 1974; key), Spooner (*Bibliotheca Mycol.* 116, 1987; status).
- Trichophaea** Boud. (1885), Pyronemataceae. Anamorph *Dichobotrys*. c. 25, widespread (north temperate). See Kanouse (*Mycol.* 50: 128, 1958; key), Svrček (*Česká Mykol.* 28: 129, 1974), Svrček (*Česká Mykol.* 31: 69, 1977), Waraitch (*TBMS* 68: 303., 1977), Pant (*Norw. J. Bot.* 27: 31, 1980), Thind & Kaushal (*Kavaka* 7: 47, 1980), Korf & Zhuang (*Mycotaxon* 22: 483, 1985), Zhuang & Korf (*Mycotaxon* 35: 297, 1989), Häffner & Christian (*Z. Mykol.* 57: 161, 1991), Korf & Zhuang (*Mycotaxon* 40: 413, 1991), Egger (*CJB* 74: 773, 1996; DNA), Wu & Kimbrough (*Int. J. Pl. Sci.* 157: 595, 1996; ultrastr.), Landvik *et al.* (*Nordic J. Bot.* 17: 403, 1997; DNA), Jamoni (*Funghi e Ambiente* 76: 13, 1998), Liu & Zhuang (*Mycosystema* 25: 546, 2006), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Trichophaeopsis** Korf & Erb (1972), Pyronemataceae. 3, widespread. See Häffner & Krieglsteiner (*Z. Mykol.* 57: 167, 1991), Landvik *et al.* (*Nordic J. Bot.* 17: 403, 1997; DNA), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Trichophila** Oudem. (1889) ? = Piedraia fide Sutton (*Mycol. Pap.* 141, 1977).
- Trichophyma** Rehm (1904), ? Arthoniales. 2 (on lichens), tropical. See Santesson (*Svensk bot. Tidskr.* 43: 547, 1949), Matzer (*Mycol. Pap.* 171, 1996).
- Trichophysalospora** Lebedeva (1933) = Physalospora fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- trichophytin**, an antigen prepared from dermatophytes, esp. for use in skin testing. Commercial trichophytin is usually a mixture of antigens of several spp. of *Trichophyton* and *Microsporum*.
- Trichophyton** Malmsten (1848), anamorphic *Arthroderma*, Hso. = eP.2. 22 (on humans and animals, causing trichophytoses, and in soil and river sediments), widespread. *T. mentagrophytes* (syns. *T. asteroides*, *T. gypseum*); *T. schoenleinii* (human favus); *T. concentricum* (tinea imbricata); *T. verrucosum* (cattle ringworm). See also tinea. See Dodge (*Medical Mycology*, 1935), Ajello (*Sabouraudia* 6: 153, 1968), Ajello & Padhye

- (*Mykosen* 30: 258, 1987; stimulation of macroconidia in culture), Padhye *et al.* (*J. Med. Vet. Mycol.* 25: 195, 1987; mating behaviour), Mochizuki *et al.* (*J. Med. Vet. Mycol.* 28: 191, 1990; taxonomy of *T. interdigitale*), Symoens *et al.* (*Mycoses* 32: 652, 1990; isoelectric focusing to differentiate *T. mentagrophytes* and *T. interdigitale*), Devliotou-Panagiotidou *et al.* (*Mycoses* 35: 375, 1992; *T. rubrum* in Greece). See also tinea), Nishio *et al.* (*Mycopathologia* 117: 127, 1992; phylogeny by mitochondrial DNA), Kano *et al.* (*Curr. Microbiol.* 37: 236, 1998; chitin synthase), Khosravi & Abedian (*Journal of the Faculty of Veterinary Medicine, University of Tehran* 53: 11, 1998; protein electrophoresis), Makimura *et al.* (*J. Clin. Microbiol.* 36: 2629, 1998; phylogeny), Gräser *et al.* (*Medical Mycology* 37: 315, 1999), Gräser *et al.* (*Medical Mycology* 37: 105, 1999; phylogeny), Kane & Summerbell (*Manual of Clinical Microbiology*: 1275, 1999; review), Kano *et al.* (*Mycoses* 42: 71, 1999; molecular identification), Makimura *et al.* (*J. Clin. Microbiol.* 37: 807, 1999; phylogeny), Gräser *et al.* (*J. Clin. Microbiol.* 38: 3329, 2000; phylogeny), Kano *et al.* (*Medical Mycology* 38: 47, 2000; chitin synthase), Kano *et al.* (*Mycopathologia* 146: 111, 1999; phylogeny), Kim *et al.* (*Mycoses* 44: 157, 2001; RAPDs), Liu *et al.* (*Journal of Medical Microbiology* 51: 117, 2002; molecular identification), Summerbell *et al.* (*Stud. Mycol.* 47: 75, 2002; biological species concept), Untereiner *et al.* (*Stud. Mycol.* 47: 25, 2002; phylogeny), Gaedigk *et al.* (*J. Clin. Microbiol.* 41: 5478, 2003; genetic diversity), Kaszubiak *et al.* (*Infect. Genet. Evol.* 4: 179, 2004; population biology), Ohst *et al.* (*J. Clin. Microbiol.* 42: 4444, 2004; microsatellites), Brilhante *et al.* (*Journal of Medical Microbiology* 55: 1583, 2006; from dog).
- Trichophytonaceae** Vuill. ex E.K. Novák & Galgoczy (1969) = Arthrodermataceae.
- Trichopilus** (Romagn.) P.D. Orton (1991) = Entoloma fide Kuyper (*in litt.*).
- Trichoplacia** A. Massal. (1853) nom. dub., ? Dothideomycetes. See Zahlbruckner (*Nat. Pflanzenfam.* 8: 61, 1926).
- Trichopsora** Lagerh. (1892), Pucciniosiraceae. 1 (on *Tournefortia* (0, III) (*Boraginaceae*)), Ecuador.
- Trichoramalina** Rundel & Bowler (1974) ? = Ramalina fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Trichoscypha** (Cooke) Sacc. (1889) = Cookeina.
- Trichoscypha** Boud. (1885) [non *Trichoscypha* Hook. f. 1862, *Anacardiaceae*] = Trichoscyphella.
- Trichoscyphella** Nannf. (1932) = Lachnellula fide Dennis (*Persoonia* 2: 171, 1962).
- Trichoseptoria** Cavara (1892), anamorphic *Pezizomycotina*, Cpd.0fH.?. 2, Europe; N. America. *T. fructigena* (soft rot of apples).
- Trichosia** Bat. & R. Garnier (1960) = Trichasterina fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Trichoskytale** Corda (1842) = Trichocoma.
- Trichosperma** Speg. (1888) [non *Trichospermum* Blume 1825, *Tiliaceae*] = Spermotrichum.
- Trichospermella** Speg. (1912), *Pezizomycotina*. 1, S. America. See Petrak & Sydow (*Annls mycol.* 33: 175, 1935).
- Trichosphaera** Dumort. (1822) nom. dub., *Pezizomycotina*. Used for diverse fungi with flask-like sporocarps in stromata.
- Trichosphaerella** E. Bommer, M. Rousseau & Sacc. (1891), Niessliaceae. Anamorph *Acremonium*-like. 2, Europe; Africa. See Samuels & Barr (*CJB* 75: 2165, 1998), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Trichosphaeria** Fuckel (1870), Trichosphaeriaceae. 27 (from wood and bark), widespread. See Réblová *et al.* (*Sydowia* 51: 49, 1999), Réblová (*Mycol.* 98: 68, 2006; phylogeny).
- Trichosphaeriaceae** G. Winter (1885), Trichosphaeriales. 11 gen. (+ 11 syn.), 65 spp.
Lit.: Seifert (*CJB* 65: 2196, 1987), Réblová (*Mycotaxon* 70: 387, 1999), Réblová (*Mycotaxon* 70: 421, 1999), Réblová (*Mycotaxon* 71: 45, 1999), Réblová *et al.* (*Sydowia* 51: 49, 1999), Réblová *et al.* (*Sydowia* 51: 49, 1999), Gams (*Stud. Mycol.* 45: 192, 2000), Campbell & Shearer (*Mycol.* 96: 822, 2004), Réblová & Seifert (*Mycol.* 96: 343, 2004).
- Trichosphaeriales** M.E. Barr (1983). Sordariomycetes. 1 fam., 14 gen., 73 spp. Stromata absent, or reduced to a hyphal subiculum. Ascomata perithecial, superficial, often aggregated, ± globose, black, often thick-walled, usually setose, the ostiole papillate, periphysate. Interascal tissue of narrow persistent thin-walled true paraphyses. Asci cylindrical, persistent, thin-walled, not fissitunicate, often with a small J-apical ring. Ascospores variously shaped, hyaline to versicolored, usually septate and rarely muriform, sometimes with polar pores, sometimes fragmenting at the septa, without germ pores, sometimes with a sheath. Anamorphs varied, hyphomycetous, with simple pigmented conidiophores, often with tetric conidiogenesis and often with complex conidia. Saprobiic esp. on wood and bark, occ. on other fungi, cosmop. Fam.:
- Trichosphaeriaceae**
For Lit. see under fam.
- Trichosphaeropsis** Bat. & Nascim. (1960), *Pezizomycotina*. 1, Brazil. See Batista & Nascimento (*Atas Inst. Micol. Univ. Recife* 1: 299, 1960).
- trichospore**, a caducous, dehiscent, monosporous sporangium with basal appendages characteristic of the *Harpellales* (Moss & Lichtwardt, *CJB* 54: 2346, 1976).
- Trichosporiella** Kamyschko (1960), anamorphic *Laetinaevia*, Hso.0eH.1/10. 4, widespread. See van Oorschot (*Stud. Mycol.* 20, 1980), de Hoog *et al.* (*Antonie van Leeuwenhoek* 51: 79, 1985).
- Trichosporites** Félix (1894), Fossil Fungi. 1 (Cretaceous), Sweden.
- Trichosporodochium** Dorn.-Silva & Dianese (2004), anamorphic *Pezizomycotina*. 1, Brazil. See Dornelo-Silva & Dianese (*Mycol.* 96: 881, 2004).
- Trichosporon** Behrend (1890), anamorphic *Trichosporonaceae*. c. 20, widespread. *T. beigelii* (white piedra of man). See Herbrecht *et al.* (*J. Mycol. Médic.* 3: 129, 1993; medical), de Hoog *et al.* (*Mycotaxon* 63: 345, 1997; nomenclature), Müller *et al.* (*Microbiology* 144: 1721, 1998; ultrastr.), Sugita *et al.* (*Mycoscience* 39: 7, 1998; mol. phylogeny), Sugita *et al.* (*J. Clin. Microbiol.* 36: 1458, 1998; PCR detection), Barnett *et al.* (*Yeasts: Characteristics and Identification* 3rd edn, 2000), Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 1351, 2000; mol. phylogeny), Zhao *et al.* (*Mycosystema* 21: 533, 2002; 26S rDNA), Middelhoven (*Mycoses* 46: 7, 2003; clinically relevant species), Biswas *et al.* (*Journal of Clinical Microbiology* 43: 5171, 2005; phylogeny).
- Trichosporonaceae** Nann. (1934), Tremellales. 2 gen.

- (+ 8 syn.), 21 spp.
- Trichosporonales** Boekhout & Fell (2001) = Tremellales.
- Trichosporonoides** Haskins & J.F.T. Spencer (1967), anamorphic *Tremellomycetes*. 6, widespread. See de Hoog (*Stud. Mycol.* 15: 20, 1979; gen. revision), Ramirez (*Mycopathologia* 108: 25, 1989; key), Inglis *et al.* (*Mycol.* 84: 555, 1992), de Hoog & Smith in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 873, 1998).
- Trichosporum** Fr. (1825) nom. conf., nom. illeg., Ascomycota. See Hughes (*CJB* 36: 727, 1958; nomencl.).
- Trichosporum** Vuill. (1901) [non *Trichosporum* D. Don 1822, *Gesneriaceae*] ? = *Piedraia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Trichosterigma** Petch (1923) [non *Trichosterigma* Klotzsch & Garcke 1859, *Euphorbiaceae*] = *Hirsutella* fide Petch (*TBMS* 9: 93, 1923).
- Trichostroma** Corda (1829) nom. dub., anamorphic *Pezizomycotina*. See Hughes (*CJB* 36: 747, 1958).
- Trichostroma** Link (1826) nom. dub., anamorphic *Pezizomycotina*. No spp. Included.
- Trichothallaceae** Bat. & Cif. (1959) = *Euantennariaceae*.
- Trichothallus** F. Stevens (1925), anamorphic *Trichopeltheca*, Cpt.-.-. 1, Hawaii. See Reynolds & Gilbert (*Aust. Syst. Bot.* 18: 282, 2005).
- Trichotheca** P. Karst. (1887) ? = *Bloxamia* fide Sutton (*Mycol. Pap.* 141, 1977).
- trichothecenes**, toxins (scirpenes) of *Fusarium tricinctum*, *F. sporotrichioides*, *F. poae*, *Trichothecium*, etc.; the cause of alimentary toxic aleukia in farm animals and humans. See Beasley (*Trichothecene mycotoxicosis*, 2 vols, 1991).
- trichothecin**, an antifungal metabolic product of *Trichothecium roseum* (Freeman & Morrison, *Biochem. J.* 44: 1, 1949).
- Trichotheciopsis** J.M. Yen (1979) = *Trichothecium* fide Sutton (*in litt.*).
- Trichothecium** Link (1809), anamorphic *Hypocreales*, Hso.1eH.34. 5, widespread. *T. roseum* (pink rot of apples). See Park (*TBMS* 39: 239, 1956; conidia), Rifai & Cooke (*TBMS* 49: 147, 1966; status), Sesan (*Probl. Prot. Plant.* 13: 381, 1985; bibliogr.), Seifert *et al.* (*Mycol.* 89: 250, 1997; phylogeny).
- Trichotheliaceae** Bitter & F. Schill. (1927) = *Porinaceae*.
- Trichotheliales** Hafellner & Kalb (1995) = *Ostropales*.
- Trichotheliomyces** Cif. & Tomas. (1953) = *Trichothelium*.
- Trichothelium** Müll. Arg. (1885), *Porinaceae* (L). 40, widespread (tropical). See Santesson (*Symb. bot. upsal.* 12 no. 1: 1, 1952), Vězda (*Nova Hedwigia* 58: 123, 1995; key 4 spp.), McCarthy & Malcolm (*Lichenologist* 29: 1, 1997), Lücking (*Nova Hedwigia* 66: 375, 1998), McCarthy (*Lichenologist* 33: 393, 2001; Christmas Island), McCarthy (*Biblthca Lichenol.* 87, 2003), Grube *et al.* (*MR* 108: 1111, 2004; phylogeny), Lücking (*Biblthca Lichenol.* 88: 409, 2004; key), Lücking & Cáceres (*MR* 108: 571, 2004; corticolous spp.), Baloch & Grube (*MR* 110: 125, 2006; phylogeny).
- Trichothyriaceae** Theiss. (1914) = *Microthyriaceae*.
- Trichothyriella** Theiss. (1914), *Microthyriaceae*. 1, S.E. Asia. See Spooner & Kirk (*MR* 94: 223, 1990).
- Trichothyrina** (Petr.) Petr. (1950) = *Lichenopeltella* fide Santesson (*SA* 9: 15, 1991).
- Trichothyrinula** Petr. (1950), *Microthyriaceae*. 1, Ecuador. See Petrak (*Sydowia* 4: 171, 1950).
- Trichothyriomyces** Bat. & H. Maia (1955), *Microthyriaceae*. 1, Brazil. See Spooner & Kirk (*MR* 94: 223, 1990).
- Trichothyriopsis** Theiss. (1914), *Microthyriaceae*. 3 or 4, Indonesia; Brazil. See Spooner & Kirk (*MR* 94: 223, 1990).
- Trichothyrites** Rosend. (1943), *Fossil Fungi*. 2 (Eocene, Pleistocene), British Isles; USA. See Smith (*The mushroom hunter's field guide* edn 3, 1980).
- Trichothyrium** Speg. (1889), *Microthyriaceae*. Anamorphs *Hansfordiella*, *Isthmospora*. 12, widespread (subtropical). See Hughes (*Mycol. Pap.* 50, 1953), Spooner & Kirk (*MR* 94: 223, 1990).
- trichotomous**, with three branches arising from the same point.
- Trichotrema** Clem. (1909) ? = *Pleurotrema* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Trichotuzetia** J. Vavra, J.I.R. Larsson & Baker (1997), *Microsporidia*. 1.
- Trichozygospora** Lichtw. (1972), *Legeriomycetaceae*. 1 (in *Diptera*), USA; Europe. See Moss & Lichtwardt (*CJB* 54: 2346, 1976), Moss & Lichtwardt (*CJB* 55: 3099, 1977; ultrastr.), Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986).
- Trichurus** Clem. (1896), anamorphic *Microascaceae*, Hsy.0eP.19. 5, widespread (temperate). See Issaikainen *et al.* (*Medical Mycology* 41: 31, 2003; phylogeny).
- Tricladiella** K. Ando & Tubaki (1984), anamorphic *Pezizomycotina*, Hso.1bH.1. 1 (aquatic), Japan. See Ando & Tubaki (*TMSJ* 25: 41, 1984).
- Tricladiomyces** Nawawi (1985), anamorphic *Agaricomycetes*. 1 (aquatic, dolipore septa), Malaysia. See Nawawi (*J. Linn. Soc. Bot.* 91: 58, 1985), Nawawi & Kuthubutheen (*TBMS* 90: 670, 1988).
- Tricladiopsis** Descals (1982), anamorphic *Pezizomycotina*, Hso.1bH.10. 2 (aquatic), British Isles. See Descals (*TBMS* 78: 417, 1982).
- Tricladiospora** Nawawi & Kuthub. (1988), anamorphic *Pezizomycotina*, Hso.1bH.19. 3, Malaysia. See Nawawi & Kuthubutheen (*TBMS* 90: 484, 1988).
- Tricladium** Ingold (1942), anamorphic *Hymenoscyphus*, *Cudoniella*, Hso.1bH.1/10. 10 (aquatic), widespread. See Petersen (*Mycol.* 54: 135, 1962; key), Ando & Kawamoto (*TMSJ* 26: 471, 1985), Marvanová & Bandoni (*TBMS* 85: 747, 1985), Webster *et al.* (*Nova Hedwigia* 60: 493, 1995; teleomorph), Baschien *et al.* (*Nova Hedwigia* 83: 311, 2006; phylogeny).
- Triclinum** Fée (1825), *Pannariaceae* (L). 1, widespread (tropical). See Jørgensen (*Op. Bot.* 45, 1978).
- Tricornia** Pell & E.U. Canning (1992), *Microsporidia*. 1.
- Tricornispora** Bonar (1967) = *Tridentaria* fide Kendrick (*in litt.*).
- Tridens** Massee (1901), ? *Rhytismataceae*. 1, N. America.
- Tridentaria** Preuss (1852), anamorphic *Pezizomycotina*, Hso.1bH.1. 2, widespread (temperate). See Drechsler (*J. Wash. Acad. Sci.* 27: 391, 1937), van der Aa & Oorschot (*Persoonia* 12: 415, 1985; redispotion spp.).
- Trifurcospora** K. Ando & Tubaki (1988), anamorphic *Pezizomycotina*, Hso.1bH.10. 1 (aquatic), Japan; USA. See Ando & Tubaki (*TMSJ* 28: 471, 1987).

- Triglyphium** Fresen. (1852), anamorphic *Pezizomycotina*, Hso.1bH.?. 2, widespread. See Marvanová & Bärlocher (*Czech Mycol.* 53: 1, 2001; Canada).
- Trigonia** J.F.H. Beyma (1933) [non *Trigonia* Aubl. 1775, *Trigoniaceae*] = *Triangularia*.
- Trigonipes** Velen. (1939) = *Clitocybe* fide Singer (*Agaric. mod. Tax.* edn 3, 1975).
- Trigonopsis** Schachner (1929), anamorphic *Saccharomycetales*, Hso.0eH.?. 1, Europe. See Sentheshanmuganathan & Nickerson (*J. gen. Microbiol.* 27: 437, 1962; nutrition, form), Yarrow in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 605, 1998), Kurtzman & Robnett (*FEMS Yeast Res.* 7: 141, 2007).
- Trigonosporium** Tassi (1900), anamorphic *Pezizomycotina*, Cpd.0eP.?. 2, Australasia. See Sutton (*Mycol. Pap.* 123, 1971).
- Trihyphaecites** Peppers (1970), Fossil Fungi. 1 (Carboniferous), USA.
- Trihyphites** Kalgutkar & Janson. (2000), Fossil Fungi, anamorphic *Ascomycota*. 1, China. See Kalgutkar & Jansonius (*AASP Contributions Series* 39: 305, 2000).
- trimerous**, in threes.
- trimitic**, see hyphal analysis.
- Trimitiella** Dhingra (2006), *Agaricomycetes*. 1. See Dhingra (*Mycotaxon* 97: 126, 2006).
- Trimmatostroma** Corda (1837), anamorphic *Helotiales*, Hsp.#eP.36. 18, widespread. See Ellis (*More Dematiaceous Hyphomycetes*, 1976), Zalar *et al.* (*Stud. Mycol.* 43: 57, 1999), Hawksworth & Cole (*Fungal Diversity* 11: 87, 2002), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny), Crous *et al.* (*Stud. Mycol.* 58: 1, 2007), Winton *et al.* (*Mycol.* 99: 240, 2007; phylogeny).
- Trimmatothele** Norman ex Zahlbr. (1903) = *Verrucaria* Schrad. fide Ertz & Diederich (*Mycol. Progr.* 3: 229, 2004).
- Trimmatothelopsis** Zschacke (1934) = *Acarospora* fide Ertz & Diederich (*Mycol. Progr.* 3: 229, 2004).
- Trimorphomyces** Bandoni & Oberw. (1983), *Tremellaceae*. 1, N. America. See Kang *et al.* (*Nucl. Acids Res.* 20: 5229, 1992; 5S rRNA sequence), Bandoni & Boekhout (*The Yeasts, A Taxonomic Study*: 705, 1998), Scorzetti (*FEMS Yeast Research* 2: 495, 2002; phylogeny).
- Trinacriaceae** Nann. (1934) = *Orbiliaceae*.
- Trinacrium** Riess (1852), anamorphic *Orbilina*, Hso.1bH.1. 13, Europe; America. See Tzean & Chen (*MR* 93: 391, 1989; comparison of spp.), Chen & Tzean (*Fungal Science Taipei* 14: 111, 1999; Taiwan), Soosamma *et al.* (*Mycol.* 93: 1200, 2001; India).
- Triophthalmidium** (Müll. Arg.) Gyeln. (1933) = *Caloplaca* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Triparticalcar** D.J.S. Barr (1980), *Spizellomycetaceae*. 1, Arctic. See Barr (*CJB* 58: 2386, 1980).
- tripartite tubular hair**, filamentous appendage on the flagellum composed of a tapered solid base, a hollow cylindrical shaft and one or more terminal filaments. See straminipile.
- Tripedotrichum** G.F. Orr & Kuehn (1964) = *Gymnoascus* fide Benny & Kimbrough (*Mycotaxon* 12: 1, 1980).
- Triphragmiopsis** Naumov (1914), ? *Raveneliaceae*. 3 (on *Berberidaceae*, *Ranunculaceae*, *Larix* (*Pinaceae*)), Europe; Asia. See Monoson (*Mycopathologia* 52: 115, 1974), Lohsomboon *et al.* (*TMSJ* 31: 335, 1990).
- Triphragmium** Link (1825), ? *Raveneliaceae*. 3 (on *Filipendula* (*Rosaceae*)), widespread (north temperate). See Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983; under *Sphaerophragmiaceae*), Lohsomboon *et al.* (*TMSJ* 31: 215, 1990), Helfer (*Nova Hedwigia* 81: 325, 2005; Europ. spp.) Probably *Phragmidiaceae*.
- Triplicaria** P. Karst. (1889), anamorphic *Hypoxylon*, Hsp.0eH.10. 1, Finland. See Petrak (*Sydowia* 7: 299, 1953).
- Triplosporium** (Thaxt.) A. Batko (1964) = *Entomophthora* Fresen. fide Krejzova (*Česká Mykol.* 30: 207, 1976) = *Neozygites* (*Entomophthor.*) fide, Remaudière & Keller (*Mycotaxon* 11: 323, 1980).
- Tripoconidium** Subram. (1978), anamorphic *Pezizomycotina*, Hso.1bH.1. 1 (on nematodes), USA. See Subramanian (*Kavaka* 5: 95, 1978).
- Tripocorynelia** Kuntze (1898) = *Tripodopora*.
- Triporicellaesporites** Ke & Shi (1978), Fossil Fungi. 3 (Paleocene, Tertiary), China.
- Triporisporites** Hammen (1954), Fossil Fungi. 1 (Cretaceous), Colombia.
- Triporisporonites** Sheffy & Dilcher (1971), Fossil Fungi. 1 (Eocene), USA.
- Tripospermum** Speg. (1918), anamorphic *Trichomerium*, Hso.0bP.1. 10, widespread. See Hughes (*Mycol. Pap.* 46, 1951), Ando (*MR* 98: 879, 1994; behaviour in culture).
- Tripodopora** Sacc. (1886), *Coryneliaceae*. 4 (on *Podocarpus*), S. Africa; S. America. See Benny *et al.* (*Bot. Gaz.* 146: 431, 1985; key), Catania & Romero (*MR* 105: 1020, 2001; key).
- Tripodoporiaceae** Nann. (1934) = *Asterinaceae*.
- Tripodopora** Höhn. (1912), anamorphic *Pezizomycotina*, Hso.1bH.19. 2, Java; N. America. See Deighton & Pirozynski (*Mycol. Pap.* 128: 96, 1972).
- Tripodoporiopsidaceae** S. Hughes (1976) = *Capnodiaceae*.
- Tripodoporiopsis** W. Yamam. (1955) = *Trichomerium* fide Reynolds (*Mycotaxon* 14: 189, 1982).
- Tripodoporum** Corda (1837), anamorphic *Batistinula*, Hso.0bP.19. 13, widespread. See Hughes (*Mycol. Pap.* 46, 1951), Kuthubutheen & Nawawi (*MR* 95: 158, 1991).
- Tripodoporonites** Sheffy & Dilcher (1971), Fossil Fungi. 1 (Eocene), USA.
- Tripterospira** Cain (1956) = *Zopfiella* fide Guarro *et al.* (*SA* 10: 79, 1991), Cai *et al.* (*MR* 110: 359, 2006).
- Tripterospiraceae** Cain (1956) = *Lasiosphaeriaceae*.
- Tripterosporella** Subram. & Lodha (1968), *Lasiosphaeriaceae*. 1 (coprophilous), India; Africa. See Subramanian & Lodha (*Curr. Sci.* 37: 246, 1968).
- triquetrous**, three-edged, three-cornered.
- Triramulispora** Matsush. (1975), anamorphic *Pezizomycotina*, Hso.1bH.1. 3, Japan. See Matsushima (*Icon. microfung. Matsush. lect.*: 158, 1975).
- Triscelophorus** Ingold (1944), anamorphic *Pezizomycotina*, Hso.1bH.1. 4 (aquatic), widespread. See Petersen (*Mycol.* 54: 162, 1962; key).
- Triscelosporium** Nawawi & Kuthub. (1987), anamorphic *Pezizomycotina*, Hso.0bP.2. 1 (aero-aquatic), Malaysia. See Nawawi & Kuthubutheen (*Mycotaxon* 29: 285, 1987).
- trisporic acid** C, a hydroxy-keto acid from mated cultures of *Blakeslea trispora* able to induce caro-

- tenogenesis in separate strains (Caglioti *et al.*, *Chimica Industria* 46: 961, 1964).
- tristichous**, in three rows.
- Trisulcosporium** H.J. Huds. & B. Sutton (1964), anamorphic *Pezizomycotina*, Hso.1bH.1. 1 (aquatic), British Isles. See Hudson & Sutton (*TBMS* 47: 200, 1964).
- Tritirachium** Limber (1940), anamorphic *Pezizomycotina*, Hso.0eH.10. 3 (some on humans), widespread. See MacLeod (*CJB* 32: 818, 1954), de Hoog (*Stud. Mycol.* 1, 1972; 2 spp. accepted).
- trivial name** (1) the zoological term for specific epithet; (2) a common name for a chemical, see Fungal metabolites.
- Trochila** Fr. (1849), Helotiales. Anamorph *Cryptocline*. c. 15, widespread (temperate). See Greenhalgh & Jones (*TBMS* 47: 311, 1964), Nauta & Spooner (*Mycologist* 14: 65, 2000; key British spp.).
- Trochodium** Syd. & P. Syd. (1920) = *Uromyces* fide Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983).
- Trochoideomyces** Thaxt. (1931), Laboulbeniaceae. 1, Indonesia. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- Trochophora** R.T. Moore (1955), anamorphic *Pezizomycotina*, Hso.0 = hP.10. 1, India; S.E. Asia. See Goos (*Mycol.* 78: 744, 1986).
- Trogia** Fr. (1836), Marasmiaceae. c. 20, widespread (tropical). See Corner (*Monogr. Cantharelloid Fungi*, 1966), Corner (*Gdms' Bull.* Singapore, Suppl. 2, 1991; Asian species, very broad generic concept), Wilson & Desjardin (*Mycol.* 97: 667, 2005; polyphyletic, sister group to marasmioid clade).
- Troglobiomyces** Pacioni (1980) = *Hirsutella* fide Samson *et al.* (*Persoonia* 12: 123, 1984).
- troglobiotic**, living in caves.
- Troglomyces** S. Colla (1932), Laboulbeniaceae. 1, Europe. See Rossi & Balazuc (*Revue Mycol. Paris* 41: 525, 1977), Tavares (*Mycol. Mem.* 9: 627 pp., 1985).
- troll**, a goblin or dwarf in Scandinavian mythology, said to carry off naughty children; dolls were traditionally made of *Alectoria*, *Bryoria* and *Usnea* spp. and given to children to remind them to behave.
- Trolliomyces** Ulbr. (1938) = *Teloconia*.
- Trombetta** Adans. (1763) nom. rej. = *Craterellus*.
- Tromera** A. Massal. ex Körb. (1865) = *Sarea* fide Hawksworth & Sherwood (*CJB* 59: 357, 1981).
- Tromera**, see *Tromera* A. Massal. ex Körb.
- Tromeropsis** Sherwood (1981), *Pezizomycotina*. 1, Finland. See Sherwood (*CJB* 59: 370, 1981).
- troop**, a group of sporocarps (esp. basidiomata), generally from one mycelium.
- trophocyst** (of *Pilobolus*), a hyphal swelling from which a sporangiophore is produced.
- trophogonium** (**trophogone**) (of ascomycetes), an antheridium of which the only use is supplying food (Dangeard).
- Tropism** (frequently as a suffix). A turning or growth in response to an environmental stimulus. The response is dependent on the direction of the stimulus and can be + (positive) when towards or – (negative) when away from the stimulus. Among the more important tropisms seen in fungi are:
- (1) **autotropism**, an avoidance (–) response between neighbouring hyphae which in part is responsible for the spacing of hyphae at the colony margin (Trinci, in Jennings & Rayner (Eds), *The ecology and physiology of the fungal mycelium*: 23, 1984).
- (2) **chemotropism**, a reaction to a chemical, e.g. oxygen (Robinson, *New Phytologist* 72: 1349, 1973), a hormone (Banbury, *J. Exper. Bot.* 6: 235, 1975) or (in the case of water moulds but not other fungi), nutrients (Musgrove *et al.*, *J. Gen. Microbiol.* 101: 65, 1977) or toxic metals (Fomina *et al.*, *MR* 107: 861, 2003). *Microdochium bolleyi* exhibited tropism toward oxygen released from roots or air-filled tubes in an anoxic environment (Damm *et al.*, *FEMS Microbiology Ecology* 45: 293, 2003); *Trichophyton rubrum* reacts positively to oxygen (Behzadi & Behzadi, *Turkiye Klinikleri J. Med. Sci.* 26: 607, 2006); the dry rot fungus, *Serpula lacrymans*, however has linear tropism away from the air supply, and applying a controlled air flow results in mycelium shrivelling, discolouring and becoming susceptible to attack by moulds (Low *et al.*, *Holzforschung* 53: 129, 1999). Species of *Aphanomyces*, *Phytophthora*, *Pythium* and the nematode-trapping fungus *Arthrobotrys oligospora* are characterized by positive chemotropism to root diffusates due to receptor-based recognition systems (Deacon, *New Phytologist* 133: 135, 1996; Bordallo *et al.*, *New Phytologist* 154: 491, 2002). Chemotropism observed in arbuscular mycorrhizal fungi may represent an important mechanism functional to host root location, appressorium formation and symbiosis establishment (Sbrana & Giovannetti, *Mycorrhiza* 15: 539, 2005). Toxic metals stimulate negative tropism. Hyphae of *Geotrichum candidum*, *Gliocladium roseum*, *Humicola grisea* and *Trichoderma viride* curl and grow away from Cu and Cd (Fomina *et al.*, *FEMS Microbiol. Lett.* 193: 207, 2000).
- (3) **galvanotropism**, a reaction to an electrical field (McGillivray & Gow, *J. Gen. Microbiol.* 132: 2515, 1986).
- (4) **geotropism** (**gravitropism**), a reaction to gravity, e.g. sporangiophores of *Mucorales* and stipes, gills and tubes of fruit bodies of *Basidiomycota* (Moore, *New Phytol.* 117: 3, 1991). A mathematical model for gravitropic reactions of fruit bodies has been made for *Coprinus cinereus*, with potential as a predictive tool for further analysis of mushroom gravitropism (Meskauskas *et al.*, *New Phytologist* 143: 387, 1999).
- (5) **phototropism**, a reaction of conidiophores, sporangiophores, asci, stipes etc. to light (Bergman *et al.*, *Bact. Rev.* 33: 99, 1969; Carlile, *J. gen. Microbiol.* 28: 161, 1962; Shropshire, *Physiological Reviews* 43: 38, 1963). Classical examples are fungi of the genera *Phycomyces* and *Pilobolus* which have spore-bearing structures showing a phototropic response, bending towards a light source to facilitate dispersal. *Trichophyton rubrum* exhibits negative tropism to ultraviolet light (Behzadi & Behzadi, *Turkiye Klinikleri J. Med. Sci.* 26: 607, 2006).
- (6) **thigmotropism**, a reaction of germ tubes and hyphae to plant and other surfaces (Dickson, *Phytopath. Z.* 66: 38, 1969; Kwon & Hoch, *Exp. Mycol.* 15: 116, 1991). Almost all rust fungi show topographical sensing of stomata location by uredospore germ tubes and respond by producing an appressorium. Rust fungi respond to different surface microheights, reflecting adaptations to different host plants: the elevation of stomatal guard cells may provide the signal for production of an appressorium (Allen *et al.*, *Phytopathology* 81: 323, 1991). Surface topography provides

signals for growth orientation in *Uromyces appendiculatus* (Hoch *et al.*, *Science* **235**: 1659, 1987). Tests with this fungus on silicon wafers demonstrated that germ tubes produce appressoria in the presence of a ridge/groove of about 0.5 µm high, and heights above 1 µm elicit no fungal response (Kwon & Hoch, 1991). Germ tubes of *Puccinia graminis* grow perpendicular to the rows of wheat leaf cells or even to an inert replica of a wheat leaf (Read *et al.*, *Perspectives in Plant Cell Recognition* pp. 137-172, 1992). Germ tube thigmotropism, induction and formation of appressoria following topographic signals have been observed for *Cochliobolus sativus* on artificial replicas of barley leaf surfaces (Clay *et al.*, *Protoplasma* **178**: 1615, 1994).

(6) **ecotropism**, a reaction to a particular ecological niche (close to **chemotropism** and **host specificity**, see **gene for gene**, **phytoalexin**, **axeny**). Dermato-phytes (such as *Microsporum* spp. or *Trichophyton* spp.) exhibit tropism in the presence of cutaneous adnexa such as skin, nails or hair (Martino *et al.*, *Proceedings of the 8th Congress of the World Rabbit Science Association* Mexico, 576, 2004); *Paracoccidioides brasiliensis* exhibits tropism to lymphoid tissues (Brummer *et al.*, *Clin. Microbiol. Rev.* **6**: 89, 1993); germinating spores of *Verticillium biguttatum* show tropism towards the host-fungus hyphae of *Rhizoctonia solani*, leading to invasion and production of haustoria within the living host hypha (Boogert & Deacon, *Eur. J. Plant Path.* **100**: 137, 1994).

(7) **radiotropism**, the reaction of germ tubes and hyphae to a source of ionizing radiation (Zhdanova *et al.*, *MR* **108**: 1089, 2004). Free-living and mycorrhizal fungi can colonize depleted uranium and transform it into uranyl phosphate (Fomina *et al.*, *Curr. Biol.* **18**: 375, 2007). Some microfungi can grow into and decompose radioactive graphite and direct their growth toward sources of radioactivity. This response was studied for 2000 strains of 200 species of 98 genera of soil microfungi, most of which expressed positive tropism towards sources of beta and gamma radiation (See also Radiation and fungi).

Lit.: Carlile (*Ann. Rev. Plant Phys.* **16**: 175, 1965); Deacon (*Modern Mycology*, edn 3, 303 pp., 1997); Moore (*Int. J. Medicinal Mushrooms* **7**: 79, 2005).

Troposporella P. Karst. (1892), anamorphic *Pezizomycotina*, Hsp.0≡ hP.1. 2, widespread (north temperate). See Sutton (*Mycol. Pap.* **132**, 1973).

Troposporium Harkn. (1884), anamorphic *Pezizomycotina*, Hsp.0≡ hH.1. 1, N. America. See Peek & Solheim (*Mycol.* **50**: 847, 1959).

Troposporopsis S.R. Whitton, McKenzie & K.D. Hyde (1999), anamorphic *Pezizomycotina*. 2, widespread. See Whitton *et al.* (*Fungal Diversity* **3**: 174, 1999).

Trotteria Sacc. (1919) = *Actinopeltis* fide Sutton (*Mycol. Pap.* **141**, 1977).

Trotterula Speg. (1921) = *Chaetothyrium* fide Petrak & Sydow (*Annls mycol.* **32**: 6, 1934), Hughes (*Mycol.* **68**: 693, 1976).

TRTC, Cryptogamic Herbarium, Royal Ontario Museum (Toronto, Canada); founded 1887; transferred from the University of Toronto to the Museum in 1992.

Truffle. An ascoma, generally subterranean, of *Tuber* or other *Pezizales* or *Elaphomycetales* (see below), or a basidioma of *Hymenogastrales*; over 180 truffle-

forming spp. are known. **Burgundy** -, *Tuber uncinatum*; **desert** -, *Mattirolomyces*, *Terfezia* and *Tirmania*; **false** -, *Hymenogaster*; **hart's** -, *Elaphomyces*; **Périgord (French)** -, *T. melanosporum*; **red** -, *Melanogaster variegatus*; **summer** -, *T. aestivum* (the best British sp.); **white** -, *Choiromyces meandri-formis*; **white Piedmont** -, *T. magnatum*; **white winter** -, *T. hiemalbum*; **winter** -, *T. brumale*; **yellow** -, *Mattirolomyces*, *Terfezia* and *Tirmania*.

Growth of many truffles is best in well-drained, calcareous soils, and there is, probably always, an association between truffles and the roots of certain trees, esp. oaks (*Quercus petraea*, *Q. robur*, and the evergreen *Q. ilex* and *Q. coccifera*, among others) or, for desert-truffles, *Cistus* or *Helianthemum*. The position of the truffles is sometimes given by cracks in the soil, by the 'scorched' look of the plants over the truffles, by the look of the 'truffle trees', or by noting the habitat of the truffle fly, *Anistoma cinnamomea*; but they are generally looked for with the help of trained dogs or pigs. The ascomata themselves can be regarded as a complex ecosystem in that they frequently host mycelium of other fungi (Pacioni *et al.*, *MR* **111**: 1450, 2007).

For over one hundred years truffle culture has been undertaken in France where 'truffières' have been started by planting oak trees in good places, by inoculating the soil with soil from under truffle trees or with truffle tissue, and (the best method) by planting young trees taken from soil in which the truffle fungus is present. Truffles are first produced under such trees after 7 to 15 years; then generally for 20 to 30 or more years. In the south of France and Italy the crop is taken from December to March. Over the last about twenty years truffle culture technology has improved and some successful truffle plantations have been established well outside the natural range of these fungi, for example in Australia and New Zealand. There is also, however, concern about competition from exotic truffles, e.g. *Tuber indicum* from China. In addition to their use as food, truffles have been used in liqueur making, for scenting tobacco, and in certain perfumes; the widespread belief that some may be aphrodisiacs, together with their culinary value, high cost, strange ecology, and association in the public eye with chocolate products has resulted in them enjoying a mystique and a positive image almost unique among fungi, making them ideal as charismatic species for the conservation movement.

See Malençon (*Rev. Myc. n.s.* **3**(Mém. hors sér.), **1**, 1938, *Persoonia* **7**: 261, 1973), Kaltenbach (*Int. Rev. Agric.* **26**: 267T, 1935), Singer (*Mushrooms and truffles*, 1961), Chang & Hayes (Eds) (*Biology and cultivation of edible mushrooms*, 1978), Torini (*Il Tartufo e la sua coltivazione*, 1984; cultivation), Bokhary (*Arab Gulf J. scient. Res., agric. biol. sci.* **B5**: 245, 1987; desert truffles).

The ascomycete truffles were formerly placed in a special order, the *Tuberales*, characterized by fleshy to leathery, ± globose ascomata with the hymenium lining a single or complex series of locules. They are now believed to be the result of the convergent evolution of various discomycete lines and are mainly referred to the *Pezizales* by Trappe (*Mycotaxon* **9**: 247, 1979) except for the isolated *Elaphomycetales* (for *Elaphomyces* only).

Lit.: Fischer (*Nat. PflFam.* **5b**, viii, 1938), Gilkey

- (*Ore. St. Monogr. Stud. Bot.* 1, 1939, *Mycol.* 46: 783, 1954; keys, *N. Am. Flora, ser. 2*, 1: 1, 1954; N. Am.), Lange (*Dansk Bot. Arkiv.* 16, 1956; Denmark), Hawker (*Phil. Trans.* B237: 453, 1954), Dennis (1968: 71; Br. Isl.), Trappe (*TBMS* 57: 87, 1971; *Terfeziaceae*, *Carbomycetaceae*, *Mycotaxon* 2: 109, 1975; gen. names, 9: 297, 1979; re-classification), Ławrynowicz (*Fl. Polska, Grzyby* 18, 1988; keys 75 spp. Poland, SEM). Trappe *et al.* (*Austr. Syst. Bot.* 5: 597, 613, 617, 631, 693, 1992; Australian spp.), Montecchi & Lazzari (*Funghi ipogei*, 1993; col. pls, keys, bibliogr.), Pegler *et al.* (*British truffles*, 1993; keys, descriptions, illustrations, UK spp.).
- Truittella** Karling (1949), ? Endochytriaceae. 1, USA.
- Trullula** Ces. (1852), anamorphic *Pezizomycotina*. 15, widespread (north temperate). See Sutton (*Mycol. Pap.* 141, 1977; nomencl.).
- truncate**, ending abruptly, as though with the end cut off horizontally (Fig. 23.4c).
- Truncatella** Steyaert (1949), anamorphic *Broomella*, Cac.≡ eP.19. 10, widespread. See Watanabe *et al.* (*Nippon Kingakukai Kaiho* 39: 21, 1998; characters in cult.), Jeewon *et al.* (*Mol. Phylogen. Evol.* 25: 378, 2002; phylogeny), Jeewon *et al.* (*MR* 107: 1392, 2003; phylogeny).
- Truncicola** Velen. (1934) = *Hyaloscypha* fide Huhtinen (*Karstenia* 29: 545, 1990).
- Truncocolumella** Zeller (1939), Suillaceae. 3, N. America; Africa (tropical). See Smith & Singer (*Brittonia* 11: 205, 1959).
- Truncocolumellaceae** Agerer (1999) = Suillaceae.
- Truncospora** Pilát ex Pilát (1953) = *Perenniporia* fide Ryvarden (*Syn. Fung.* 5, 1991).
- Tryblidaria** (Sacc.) Rehm (1903), ? Patellariaceae. 4 or 9, widespread (subtropical). See Kutorga & Hawksworth (*SA* 15: 1, 1997), Magnes (*Bibliotheca Mycol.* 165, 1997).
- Tryblidiaceae**, see *Triblidiaceae*.
- Tryblidiella** Sacc. (1883) = *Rhytidhysterium* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Tryblidiopsis** P. Karst. (1871), Rhytismataceae. Anamorph *Tryblidiopycnis*. 1, widespread (north temperate). See Gams (*Taxon* 41: 99, 1992; nomencl.), Livsey & Minter (*CJB* 72: 549, 1994), Magnes (*Arnoldia* 10: 17, 1995), Magnes (*Bibliotheca Mycol.* 165: 177 pp., 1997), Gernandt *et al.* (*Mycol.* 93: 915, 2001; phylogeny).
- Tryblidiopycnis** Höhn. (1918), anamorphic *Tryblidiopsis*, St.0fH.10. 1, widespread.
- Tryblidis** Clem. (1909) = *Tryblidiopsis*.
- Tryblidium** Wallr. (1833) = *Triblidium*.
- Tryblis** Clem. (1931), Odontotremataceae. 2, Europe. See Magnes (*Bibliotheca Mycol.* 165, 1997).
- trypacidin**, an antitrypanosome antibiotic from *Aspergillus fumigatus* (Balan *et al.*, *J. Antibiotics* A 16: 157, 1963).
- Trypetheliaceae** Zenker (1827), Trypetheliales (L.). 13 gen. (+ 18 syn.), 192 spp.
Lit.: Harris (*Acta Amazon. Supl.* 14: 55, 1984; fam. concept, key 9 gen.), Makhija & Patwardhan (*Mycotaxon* 31: 565, 1988), Makhija & Patwardhan (*Biovi-gyanam* 15: 61, 1989; India), Harris (*Bolm Mus. paraense 'Emilio Goeldi' sér. bot.* 7: 619, 1991), Makhija & Patwardhan (*J. Hattori bot. Lab.* 73: 183, 1993), McCarthy (*Lichenologist* 27: 310, 1995), Harris (*Lichenogr. Thomsoniana North American Lichenology in Honor of John W. Thomson*: 133, 1998), Del Prado *et al.* (*MR* 110: 511, 2006).
- Trypetheliales** Lücking, Aptroot & Sipman (2008). Dothideomycetes. 1 fam., 13 gen., 192 spp. Fam.:
Trypetheliaceae
 For *Lit.* see under fam.
- Trypetheliomyces** Cif. & Tomas. (1953) = *Trypethelium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Trypetheliopsis** Asahina (1937), Monoblastiaceae (L.). 6, widespread (tropical). fide Lücking & Sérusiaux (*Nordic Jl Bot.* 16: 661, 1996), Aptroot *et al.* (*Bibliotheca Lichenol.* 64, 1997), Aptroot *et al.* (*Bibliotheca Lichenol.* 97, 2008; Costa Rica).
- Trypethelium** Spreng. (1804) nom. cons., Trypetheliaceae (L.). c. 50, widespread (esp. tropical). See Lambright & Tucker (*Bryologist* 83: 170, 1980; ultrastr., biology), Harris (*Acta Amazon. Supl.* 14: 55, 1984; key 11 spp. Amazonia), Makhija & Patwardhan (*J. Hattori bot. Lab.* 73: 183, 1993; key 30 spp. India), Prado *et al.* (*MR* 110: 511, 2006; phylogeny), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny), Aptroot *et al.* (*Bibliotheca Lichenol.* 97, 2008; Costa Rica).
- Tryssglobulus** B. Sutton & Pascoe (1987), anamorphic *Pezizomycotina*, Hso.0eP.16. 1, Australia. See Sutton & Pascoe (*TBMS* 88: 44, 1987).
- Tsuchiyaea** Y. Yamada, H. Kawas., Itoh, I. Banno & Nakase (1988), anamorphic *Tremellaceae*, Hso.0eH.1. 1, S. Africa. See Yamada *et al.* (*Agric. Biol. Chem.* 53: 2993, 1989; phylogeny), Yamada & Banno (*The Yeasts, A Taxonomic Study*: 878, 1998).
- Tubaki** (Keisuke; 1924-2005; Japan). Student, Tokyo University of Agriculture (1948); DSc, Hiroshima University (1959); Institute for Fermentation, Osaka (1961-1976), becoming Deputy Director (1974); Professor, Institute of Biological Sciences, University of Tsukuba (1976-1988). An expert on hyphomycetes, particularly their systematics and role in nature. He, like Barron, contributed to the classification system for anamorphic fungi initiated by Hughes (see Conidiogenesis), which became known as the Hughes-Tubaki-Barron system. Author of over 200 papers and an outstanding ambassador of Japanese mycology. President, Mycological Society of Japan (1985-1987), Chairman of the IMA Committee for Asia (q.v.) (1983-1990), and General Secretary of the 3rd International Mycological Congress (q.v.). *Publs. Studies on Japanese hyphomycetes. J. Hattori Bot. Lab.* 20: 142, 1958. *Biogs, obits etc.* Bandoni (*Mycoscience* 46: 381, 2005).
- Tubakia** B. Sutton (1973), anamorphic *Dicarpella*, Cpt.0eH/1eH.15. 5, widespread (north temperate). See Limber & Cash (*Mycol.* 37: 129, 1945), Yokoyama & Tubaki (*Res. Commun. Inst. Ferm., Osaka* 5: 43, 1971), Glawe & Crane (*Mycotaxon* 29: 101, 1987; *T. dryina* revised), Belisario (*Infitore fitopatol.* 40: 54, 1990; disease caused by *T. dryina*), Belisario (*Mycotaxon* 41: 147, 1991; teleomorph), Munkvold & Neely (*CJB* 69: 1865, 1991; development of *T. dryina* in host tissue).
- Tubaria** (W.G. Sm.) Gillet (1876), Inocybaceae. c. 20, widespread (temperate). See Romagnesi (*Revue Mycol. Paris* 5: 29, 1940), Romagnesi (*Revue Mycol. Paris* 8: 26, 1943), Volders (*Sterbeekia* 21-22: 3, 2002; Belgium spp.), Horak & Moreau (*BSMF* 120: 215, 2004; France spp.).
- Tubariella** E. Horak & Hauskn. (2002), Bolbitiaceae. 1, Papua New Guinea. See Horak & Hausknecht (*Öst. Z. Pilzk.* 11: 213, 2002).

- Tubariopsis** R. Heim (1931), Bolbitiaceae. 1, Madagascar. See Heim (*Inocybe*: 62, 1931).
- Tuber** P. Micheli ex F.H. Wigg. (1780), Tuberaceae. 86 (hypogeous), widespread. See truffles. See Gross (*Z. Pilzk.* 41: 143, 1975; key 13 spp.), Parguey-Leduc & Janex-Favre (*Revue Mycol.* Paris 41: 1, 1977; ontogeny), Janex-Favre & Parguey-Leduc (*Cryptog. Mycol.* 4: 353, 1984; spore ultrastr.), Mostecchi & Lazzari (*Boll. Gruppo Micol. 'G. Bresadola'* 27: 196, 1984; col. pls), Parguey-Leduc *et al.* (*C.R. Acad. Sci. Paris Sér. III* 301: 143, 1985; ontogeny), Parguey-Leduc *et al.* (*Cryptog. Mycol.* 8: 173, 1987; ascoma), Parguey-Leduc *et al.* (*CJB* 65: 1491, 1987; ascospores), Parguey-Leduc *et al.* (*BSMF* 105: 227, 1989; ascoma ontogeny), Gross (*Docums Mycol.* 21: 1, 1991; key 30 spp., Europe), Parguey-Leduc *et al.* (*Cryptog. Mycol.* 12: 165, 1991; ontogeny), Pegler *et al.* (*British truffles*, 1993; key 11 Br. spp.), Trappe *et al.* (*Mycotaxon* 60: 365, 1996), O'Donnell *et al.* (*Mycol.* 89: 48, 1997; phylogeny), Amicucci *et al.* (*Mol. Ecol.* 7: 273, 1998; ITS primers), Mello *et al.* (*New Phytol.* 141: 511, 1999; primers), Neuner-Plattner *et al.* (*MR* 103: 403, 1999; immunology), Percudani *et al.* (*Mol. Phylogen. Evol.* 13: 169, 1999; phylogeny), Roux *et al.* (*FEMS Microbiol. Lett.* 180: 147, 1999; ITS), Amicucci *et al.* (*FEMS Microbiol. Lett.* 189: 265, 2000; molecular identification), Giomaro *et al.* (*Mycorrhiza* 10: 107, 2000; mycorrhizas), Frizzi *et al.* (*MR* 105: 365, 2001; isozymes), Mello *et al.* (*Microbiol. Res.* 155: 279, 2001), Murat *et al.* (*New Phytol.* 164: 401, 2004; evolution), Paolocci *et al.* (*FEMS Microbiol. Lett.* 235: 109, 2004), Patil *et al.* (*Journal of Mycology and Plant Pathology* 34: 778, 2004; phylogeography), Urban *et al.* (*MR* 108: 749, 2004; anamorph), Mello *et al.* (*Environmental Microbiology* 7: 55, 2005; genetic diversity), Zhang *et al.* (*FEMS Microbiol. Lett.* 245: 85, 2005; phylogeny), Baciarelli-Falini *et al.* (*Mycorrhiza* 16: 475, 2006; novel morphotypes), Bertini *et al.* (*Microbiol. Res.* 161: 59, 2006; molecular detection), Chen *et al.* (*Mycotaxon* 94: 1, 2005; key), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Paolocci *et al.* (*Appl. Environm. Microbiol.* 72: 2390, 2006; life cycle), Suz *et al.* (*FEMS Microbiol. Lett.* 254: 251, 2005; molecular detection), Tedersoo *et al.* (*New Phytol.* 170: 581, 2006; mycorrhizas), Wang *et al.* (*MR* 110: 1034, 2006; phylogeny), Chen & Liu (*Mycol.* 99: 475, 2007; China), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Tuberaceae** Dumort. (1822), Pezizales. 7 gen. (+ 13 syn.), 111 spp.
Lit.: Beaton & Malajczuk (*TBMS* 86: 503, 1986), Trappe *et al.* (*Aust. Syst. Bot.* 5: 597, 1992), Pegler *et al.* (*British truffles*, 1993), Comandini & Pacioni (*Mycotaxon* 63: 77, 1997), Landvik *et al.* (*Nordic J Bot.* 17: 403, 1997), O'Donnell *et al.* (*Mycol.* 89: 48, 1997; phylogeny), Amicucci *et al.* (*Mol. Ecol.* 7: 273, 1998), Bertini *et al.* (*New Phytol.* 139: 565, 1998), Harrington *et al.* (*Mycol.* 91: 41, 1999), Mello *et al.* (*New Phytol.* 141: 511, 1999), Percudani *et al.* (*Mol. Phylogen. Evol.* 13: 169, 1999; phylogeny), Roux *et al.* (*FEMS Microbiol. Lett.* 180: 147, 1999), Amicucci *et al.* (*FEMS Microbiol. Lett.* 189: 265, 2000), Mello *et al.* (*Mycol.* 92: 326, 2000), Zambonelli *et al.* (*Mycotaxon* 74: 57, 2000), Iotti *et al.* (*New Phytol.* 155: 499, 2002), Mello *et al.* (*Envir. Microbiol.* 4: 584, 2002), Mabru *et al.* (*Int. J. Food Microbiol.* 94: 33, 2004), Paolocci *et al.* (*FEMS Microbiol. Lett.* 235: 109, 2004), Urban *et al.* (*MR* 108: 749, 2004), Halász *et al.* (*Mycol. Progr.* 4: 281, 2005), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Læssøe & Hansen (*MR* 111: 1075, 2007; phylogeny).
- Tuberales** G. Winter (1884) = Pezizales. See also *Elaphomycetaceae* and truffles.
- Tuberaster** Boccone (1697) = Polyporus P. Micheli ex Adans.
- Tubercularites** Barsanti (1903), Fossil Fungi, anamorphic *Pezizomycotina*. 1 (Carboniferous), Italy.
- Tubercularia** Weber ex F.H. Wigg. (1780) nom. rej. prop. = Dibaeis fide Gierl & Kalb (*Herzogia* 9: 593, 1993).
- Tubercularia** Tode (1790) nom. cons., anamorphic *Nectria*, Hsp.0eH.15. 26, widespread. See Seifert (*Stud. Mycol.* 27: 95, 1985), Wang *et al.* (*FEMS Microbiol. Lett.* 193: 249, 2000; taxol production), Rossman *et al.* (*Mycol.* 93: 100, 2001; phylogeny).
- Tuberculariaceae** Fr. (1825) = Nectriaceae. (obsol.). Anamorphic fungi (hyphomycetes) with conidiomata.
- Tuberculariella** Höhn. (1915) = Cryptosporiopsis fide Petrak (*Sydowia* 19: 227, 1966).
- Tuberculariopsis** Höhn. (1909), anamorphic *Pezizomycotina*, Hsp.0eH.10. 1, Java.
- Tubercularis** Clem. & Shear (1931) = Tuberculariopsis.
- Tubercularites** Arcang. (1903), Fossil Fungi. 1 (Carboniferous), Italy.
- tuberculate solarium**, see solarium.
- tubercule (tubercle)**, a small wart-like process; **tuberculate**, having tubercles, syn. of punctate (Fig. 20.5);.
- Tuberculina** Tode ex Sacc. (1880), anamorphic *Helicobasidium*, Hsp.0eH.15. c. 10 (on rusts), widespread. See Bauer *et al.* (*Mycol.* 96: 960, 2004), Lutz *et al.* (*Mycol.* 96: 1316, 2004), Lutz *et al.* (*MR* 108: 227, 2004).
- Tuberculinia** Velen. (1922) nom. nud., Agaricomycetidae. See Stalpers (*in litt.*).
- Tuberculis** Clem. & Shear (1931) = Tuberculariella.
- Tuberculispora** Deighton & Piroz. (1972), anamorphic *Pezizomycotina*, Hso.1bH.15. 1 (on *Irenopsis*), Jamaica. See Deighton & Pirozynski (*Mycol. Pap.* 128: 92, 1972).
- Tuberculopsis** Sacc. (1914) nom. nud., Fungi. See Saccardo (*Annls mycol.* 12: 303, 1914).
- Tuberculostoma** Sollm. (1864) = Robergea fide Sherwood (*Mycotaxon* 6: 215, 1977).
- Tuberium** Raf. (1815) = Tuber.
- Tuberosurculus** Paulet (1791) nom. dub., *Pezizomycotina*. Used for diverse taxa, incl. *Clavicipitaceae* and *Xylariaceae*.
- Tubeufia** Penz. & Sacc. (1898), Tubeufiaceae. Anamorphs *Helicoma*, *Helicosporium*, *Monodictys*-like. 29, widespread (esp. tropical). See Rossman (*Mycol. Pap.* 157, 1987; key *Tubeufia* s.l.), Crane *et al.* (*CJB* 76: 602, 1998), Kodsueb *et al.* (*Mycol.* 96: 667, 2004; Hong Kong), Kodsueb *et al.* (*Fungal Diversity* 21: 105, 2006; phylogeny), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny), Tsui *et al.* (*Mycol.* 98: 94, 2006; phylogeny), Tsui *et al.* (*Mycol.* 99: 884, 2007; phylogeny, anamorph).
- Tubeufiaceae** M.E. Barr (1979), Dothideomycetes (inc. sed.). 32 gen. (+ 17 syn.), 241 spp.
Lit.: Barr (*Mycotaxon* 12: 137, 1980), Goos (*Mycol.* 78: 744, 1986), Goos (*Mycol.* 79: 1, 1987), Rossman (*Mycol. Pap.* 157, 1987; key gen.), Rossman (*Mycol. Pap.* 157: 71 pp., 1987), Goos

- (*Mycol.* 81: 356, 1989), Scheuer (*MR* 95: 811, 1991), Rodrigues & Samuels (*Mycol.* 86: 254, 1994), Untereiner *et al.* (*MR* 99: 897, 1995), Crane *et al.* (*CJB* 76: 602, 1998; saprobic gen.), Inderbitzin *et al.* (*Am. J. Bot.* 88: 54, 2001), Lumbsch & Lindemuth (*MR* 105: 901, 2001), Kodsueb *et al.* (*Mycol.* 96: 667, 2004), Kodsueb *et al.* (*Fungal Diversity* 21: 105, 2006), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny), Tsui *et al.* (*Mycol.* 98: 94, 2006).
- Tubipeda** Falck (1923) = *Leptopodia*.
- Tubiporus** P. Karst. (1881) = *Boletus* Fr.
- Tubolachnum** Velen. (1934), ? Helotiales. 2, former Czechoslovakia.
- Tubosaeta** E. Horak (1967), Boletaceae. 5, Africa (tropical), Asia. See Horak (*Ber. schweiz. bot. Ges.* 77: 367, 1967), Zang (*Mycosystema* 20: 8, 2001; China).
- Tubulicium** Oberw. (1965), Hydnodontaceae. 7, widespread. See Oberwinkler (*Sydowia* 19: 53, 1965), Hjortstam (*Windahlia* 24: 1, 1998), Dämon & Hausknecht (*Öst. Z. Pilzk.* 12: 129, 2003; on tree ferns in Europe).
- Tubulicrinaceae** Jülich (1982) Schizoporaceae.
- Tubulicrinis** Donk (1956), Tubulicrinaceae. 31, widespread. See Weresub (*CJB* 39: 1456, 1961), Hayashi (*Bull. Govt For. Exp. Stn* 260, 1974), Hjortstam (*Windahlia* 24: 1, 1998).
- Tubulicrinopsis** Hjortstam & Kotir. (2007), Agaricomycetes. 4, Europe. See Kotiranta, H.; Hjortstam, K.; Miettinen, O.; Kulju, M. (*Ann. bot. fenn.* 44: 128, 2007).
- Tubulinosema** C. Franzen, S. Fischer, J. Schroeder, J. Schölmerich & S. Schneuwly (2005), Microsporidia. 3. See Franzen *et al.* (*J. Eukary. Microbiol.* 52: 141, 2005).
- Tubulixenasma** Parmasto (1965) = *Tubulicium*.
- Tuburcinia** Fr. (1832) [non *Tuburcinia* Woronin 1882] nom. rej. = *Urocystis*.
- Tuburcinia** Woronin (1882) = *Urocystis* fide Vánky (*Europ. Smut Fungi*: 280, 1994).
- Tuburciniella** Zambett. (1970) = *Urocystis* fide Vánky (*in litt.*) Anamorph name only.
- Tucahus** Raf. (1830) = *Gemmularia*.
- tuckahoe** (or Indian bread), the sclerotia (*Pachyma cocos*) of *Poria cocos* (Weber, *Mycol.* 21: 113, 1929), USA. **Canadian** -, see stone-fungus.
- Tuckerman** (Edward; 1817-1886; USA). Student, Union College, Schenectady, New York (1834-1837), then Harvard University (1837-1840); visited Europe (1841-1842) [greatly influenced by E.M. Fries (q.v.)]; Curator of collections, Union College, Schenectady (1843-1844); Professor of Oriental History (1855) and Professor of Botany (1858-1886), Harvard University. Father of American lichenology. *Publs.* *Genera Lichenum* (1872); *Synopsis of the North American Lichens* 2 vols (1882, 1888). *Biogs, obits etc.* Culberson (*Collected Lichenological Papers of Edward Tuckerman* 2 vols, 1964); Grummann (1974: 197); Reid (*Mycotaxon* 26: 3, 1986); Stafleu & Cowan (*TL-2* 6: 523, 1986).
- Tuckermanella** Essl. (2003), Parmeliaceae (L). 6, Mexico; USA. See Esslinger (*Mycotaxon* 85: 135, 2003), Thell *et al.* (*Mycol. Progr.* 4: 303, 2005).
- Tuckermanopsis** Gyeln. (1933), Parmeliaceae (L). c. 28, widespread. See Kärnefelt *et al.* (*Pl. Syst. Evol.* 183: 113, 1992), Kärnefelt *et al.* (*Bryologist* 96: 394, 1993), Thell (*Folia Cryptog. Estonica* 32: 113, 1998), Kärnefelt & Thell (*Bibliotheca Lichenol.* 78: 193, 2001), Thell *et al.* (*Mycol. Progr.* 1: 335, 2002; phylogeny), Thell *et al.* (*Symb. bot. upsal.* 34 no. 1: 429, 2004; Scandinavia), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny).
- Tuckneraria** Randlane & A. Thell (1994), Parmeliaceae (L). 5, Asia. See Ando (*TMSJ* 33: 223, 1992; phylogeny), Randlane *et al.* (*Acta Bot. Fenn.* 150: 144, 1994), Thell *et al.* (*J. Hattori bot. Lab.* 78: 237, 1995).
- Tulasne** (Charles, 1816-1884; France). Student of medicine, Paris (1840); practising doctor (1840-1865); retired to Hyères (1865-1884). Collaborated with his brother, L.R. Tulasne (q.v.), particularly by illustrating their joint major works; these illustrations set a standard rarely matched by later mycologists. *Publs.* (with L.R. Tulasne) *Selecta Fungorum Carpologia* 3 vols (1861-1865) [English translation Grove, 1931; biographical notes in vol. 1]. *Biogs, obits etc.* Stafleu & Cowan (*TL-2* 6: 529, 1986).
- Tulasne** (Louis René, 1815-1885; France). Student of law; public notary (1835-1839); private scientists, Paris (1839-1865); Research Associate, Muséum d'Histoire Naturelle, Paris (1842-1865); retired to Hyères (1865-1885). The 'reconstructor of mycology'; in more than 50 papers he made additions to the knowledge of ergots, lichen-forming fungi, pyrenomycetes, rusts, smuts and subterranean fungi; some work with brother C. Tulasne (q.v.) who prepared the illustrations (their joint works explicitly promoted their respect for a divine creator); an important new concept introduced in the *Selecta Fungorum Carpologia*, a work which has had a great effect on mycology, was that of pleomorphism in fungi. *Publs.* *Fungi Hypogaei. Histoire et Monographie des Champignons Hypogés* (1851); *Mémoire pour servir à l'histoire organographique et physiologique des lichens. Annales des Sciences Naturelles Botanique, Série 3* (1852); (with C. Tulasne) *Selecta Fungorum Carpologia* 3 vols (1861-1865) [English translation Grove, 1931; biographical notes in vol. 1]. *Biogs, obits etc.* Stafleu & Cowan (*TL-2* 6: 530, 1986).
- Tulasneinia** Zobel ex Corda (1854) = *Terfezia*.
- Tulasnella** J. Schröt. (1888), Tulasnellaceae. Anamorph *Epulorhiza*. c. 50, widespread. See Jülich & Jülich (*Persoonia* 9: 49, 1976), Currah & Zelmer (*Rep. Tottori mycol. Inst.* 30: 43, 1992; 6 spp. with orchids), Roberts (*MR* 98: 1431, 1994; key Eur. spp.).
- Tulasnellaceae** Juel (1897), Cantharellales. 3 gen. (+ 4 syn.), 54 spp.
- Lit.*: Roberts (*MR* 98: 1235, 1994), Stalpers & Andersen in Sneh *et al.* (Eds) (*Rhizoctonia Species Taxonomy, Molecular Biology, Ecology, Pathology and Disease Control*: 58, 1996), Ginns (*Mycol.* 90: 19, 1998), Greslebin & Rajchenberg (*MR* 105: 1149, 2001), Gleason & McGee (*Australasian Mycologist* 21: 12, 2002), Kottke *et al.* (*MR* 107: 957, 2003), Ma *et al.* (*MR* 107: 1041, 2003), Kristiansen *et al.* (*Mol. Phylogen. Evol.* 33: 251, 2004), Larsson *et al.* (*MR* 108: 983, 2004), McCormick *et al.* (*New Phytol.* 163: 425, 2004).
- Tulasnellales** Gäum. (1926) = Cantharellales.
- Tulasnia** Lesp. [not traced] = *Terfezia* fide Saccardo (*Syll. fung.* 8: 902, 1889).
- Tulasnodea** Fr. (1849) = *Tulostoma*.
- Tulostoma** Pers. (1794), Agaricaceae. c. 80, widespread (esp. dry regions). See Long (*Mycol.* 36: 320, 1944; orthogr.), Wright (*Pap. Mich. Acad. Sci.* 40:

- 79, 1955; sp. characters), Maas Geesteranus (*Gorteria* 5: 189, 1971; Netherlands), Wright (*The genus Tulostoma (Gasteromycetes)* [Bibl. Mycol. 113], 1987), Calonge & Wright (*Boln Soc. Micol. Madrid* 13: 119, 1989; Spain), Moncalvo *et al.* (*Mol. Phylogen. Evol.* 23: 357, 2002), Sarasini (*Rivista di Micologia* 46: 7, 2003; mediterranean), Esqueda *et al.* (*Mycotaxon* 90: 409, 2004), Masuya & Asai (*Bull. natn. Sci. Mus. Tokyo*, B 30: 9, 2004), Fan *et al.* (*Mycosystema* 24: 340, 2005; China).
- Tulostomataceae** E. Fisch. (1900) = Agaricaceae.
- Tulostomatales** = Agaricales.
- tumid**, swollen; inflated.
- Tumidapexus** D.A. Crawford (1954), Aphelariaceae. 1, New Zealand. See Crawford (*Trans. & Proc. Roy. Soc. New Zealand* 82: 626, 1954).
- Tumularia** Descals & Marvanová (1987), anamorphic *Pezizomycotina*, Hso.1 = eH.21. 2 (aquatic), Europe. See Marvanová & Descals (*TBMS* 89: 506, 1987), Bussaban *et al.* (*Mycol.* 97: 1002, 2005; phylogeny).
- Tunbridge ware**, Ornaments made from coloured wood, usually using marquetry techniques; the green wood used is that of deciduous trees attacked by *Chlorociboria aeruginascens*.
- tunic**, see exospore.
- tunica**, a coat, esp. a thin white membrane round the peridiole in most species of the *Nidulariaceae*. See also spore wall (2) and basidiospore.
- Tunicago** B. Sutton & Pollack (1977), anamorphic *Pezizomycotina*, Cpd.1eP.15. 2, USA; Australia. See Sutton & Pollack (*CJB* 55: 326, 1977), Alcorn & Sutton (*Aust. Syst. Bot.* 12: 169, 1999; Australia).
- Tunicatispora** K.D. Hyde (1990), Halosphaeriaceae. 1 (marine), Australia. See Hyde (*Aust. Syst. Bot.* 3: 711, 1990), McKeown *et al.* (*MR* 100: 1247, 1996; ultrastr.), Pang *et al.* (*Nova Hedwigia* 77: 1, 2003).
- Tunicopsora** Suj. Singh & P.C. Pandey (1971) = *Kweilingia* fide Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi rev. edit.*, 1983).
- Tunstallia** Agnihothr. (1961), ? Sydowiellaceae. 1, India. *T. aculeata* (thorny stem blight of tea, *Camellia*). fide Vasilyeva (*Mycoscience* 42: 401, 2001).
- Tupia** L. Marchand (1830) nom. rej. = *Icmadophila* fide Gierl & Kalb (*Herzogia* 9: 593, 1993).
- turbid**, not clear; cloudy.
- turbinate**, like a top in form (Fig. 23.21). - organ or cell (of *Cladochytriaceae*), a swelling on the vegetative thallus (see Karling, *Am. J. Bot.* 18: 528, 1931); spindle-organ.
- Turbinellus** Earle (1909) = *Gomphus* Pers. fide Donk (*Beih. Nova Hedwigia* 6: 291, 1962).
- Tureenia** J.G. Hall (1915) = *Arthrimum* fide Höhnelt (*Mitt. bot. Inst. tech. Hochsch. Wien* ser. 2 2: 9, 1925).
- turgid**, tightly swollen.
- Turgidosculum** Kohlm. & E. Kohlm. (1972), Mastodiaceae. 2 (on algae), widespread. See Kohlmeyer & Kohlmeyer (*Marine Mycology*, 1979), Schatz (*Mycol.* 72: 110, 1980), Kohlmeyer & Volkmann-Kohlmeyer (*Bot. Mar.* 46: 285, 2003).
- turgor pressure**, of mycelium, see Adebayo *et al.* (*TBMS* 57: 145, 1971).
- Turturconchata** J.L. Chen, T.L. Huang & Tzean (1999), anamorphic *Pezizomycotina*, Hso.?.?. 2, Taiwan. See Chen *et al.* (*MR* 103: 830, 1999).
- Tuzetia** Maurand, Fize, Fenwick & Michel (1971), Microsporidia. 4.
- TWA**, see Media.
- twist**, a disease of cereals and grasses (*Dilophospora alopecuri*).
- Tylochytrium** Karling (1939) = *Phlyctidium* (A. Braun) Rabenh.
- Tylodon** Banker (1902) = *Radulum* fide Donk (*Taxon* 12: 155, 1963).
- Tylomyces** Cortini (1921), anamorphic *Pezizomycotina*. 1, Italy.
- Tylophoma** Kleb. (1933) = *Dothichiza* fide Petrak (*Sydowia* 10: 201, 1957).
- Tylophorella** Vain. (1890), Arthoniales (L). 1, tropical. See Egea & Tibell (*Nordic J. Bot.* 13: 207, 1993), Aptroot & Tibell (*Mycotaxon* 65: 339, 1997), Grube (*Bryologist* 101: 377, 1998; phylogeny).
- Tylophorellomyces** Cif. & Tomas. (1953) = *Tylophorella*.
- Tylophoron** Nyl. ex Stizenb. (1862), Lecanorales (L). 3, widespread (tropical). See Tibell (*Lichenologist* 14: 219, 1982), Tibell (*Beih. Nova Hedwigia* 79: 597, 1984), Tibell (*Symb. bot. ups. 27* no. 1, 1987), Tibell (*MR* 95: 290, 1991; anamorph), Tibell (*MR* 107: 1403, 2003), Aptroot *et al.* (*Bibliotheca Lichenol.* 97, 2008; Costa Rica).
- Tylophoropsis** Sambo (1938) nom. dub., ? Caliciaceae. 1, Africa.
- Tylopilus** P. Karst. (1881), Boletaceae. c. 75, widespread. See Smith (*Mycol.* 60: 954, 1968), Wolfe (*Bibliotheca Mycol.* 69, 1979; N. Am.), Henkel (*Mycol.* 91: 655, 1999; Guyana), Chen *et al.* (*Taiwania* 49: 109, 2004; Taiwan), Fu *et al.* (*Mycotaxon* 96: 41, 2006; China).
- Tylosperma** Donk (1957) [non *Tylosperma* Botsch. 1952, *Rosaceae*] = *Tylospora*.
- Tylospora** Donk (1960), Atheliaceae. 2, widespread. See Donk (*Taxon* 9: 220, 1960).
- Tylosporaceae** Jülich (1982) = Atheliaceae.
- Tylostoma**, see *Tulostoma*.
- Tylothallia** P. James & H. Kiliass (1981), ? Ramalinaeae (L). 1, Europe. See James & Kiliass (*Herzogia* 5: 409, 1981), Ekman (*MR* 105: 783, 2001).
- Tympanella** E. Horak (1971), Bolbitiaceae. 1, New Zealand. Basidioma gasteroid. See Horak (*N.Z. J. Bot.* 9: 485, 1971), Soop (*Cortinarioid Fungi of New Zealand, An Iconography and Key*: 80 pp., 2003; key).
- Tympanicysta** Malme (1980), Fossil Fungi. 2 (late Permian – early Triassic), widespread.
- Tympanis** Tode (1790), Helotiaceae. Anamorph *Sirodothis*. 29, widespread (temperate). See Groves (*CJB* 30: 571, 1952; monogr.), Ouellette & Pirozynski (*CJB* 52: 1889, 1974; key), Yao & Spooner (*Kew Bull.* 51: 187, 1996; Brit. spp.).
- Tympanopsis** Starbäck (1894) = *Nitschkia* fide Nannfeldt (*Svensk bot. Tidskr.* 66: 49, 1975), Huhndorf *et al.* (*MR* 108: 1384, 2004).
- Tympanosporium** W. Gams (1974), anamorphic *Pezizomycotina*, Hso.0eH.19. 1 (on *Tubercularia*), Netherlands. See Gams (*Antonie van Leeuwenhoek Ned. Tijdschr. Hyg.* 40: 478, 1974).
- Type** (in nomenclature). The element on which the descriptive matter fulfilling the conditions of valid publication of a scientific name is based, or is considered to have been based, and which fixes the application of the name; e.g. a family name on a genus, a generic name on a species (a - **species**; see also nomen species), a specific name generally a - **specimen**, which may be a slide, sometimes on a - **culture** (incorrectly for fungi if still metabolically

active), a Figure, or a description. Numerous terms with the suffix '-type' have been used in nomenclature, both formally and informally (see Hawksworth, *A draft glossary of terms used in bionomenclature*, [IUBS Monogr. 9], 1994), and only a selection of those most used by mycologists are included here: **epi-** a specimen or illustration used to serve as an interpretive type where the existing type material is inadequate for the precise application of the name; **ex-type**, out of the type, used especially for living cultures where the holotype is a dried culture or one preserved in a metabolically inactive state; **holo-**, the single element on which the describing author based a name; **iso-**, a duplicate or part of the type collection (other than the holotype) [(in immunology), part of the immunoglobulin molecule from the mouse used in the characterization of sera]; [**histo-**, a reaction between different types of cells]; **lecto-**, an element selected in a later work from the original material where no holotype was designated; **mono-**, the only species included in a genus when first described; **neo-**, specimen or other material designated as nomenclatural type when all the original material is missing; **para-**, any specimen other than the holotype on which the first account of a species or other group is based; **patho-**, see pathovar; **phyco-**, each of the morphologically distinct structures derived by symbiosis between a single mycobiont and different photobionts (Swinscow, *Lichenologist* 9: 89, 1977; see Lichens); **syn-** one of several elements cited by an author when originally proposing a name but where no holotype was selected; **topo-**, a later collection from the original locality; **typo-**, the specimen used to prepare an illustration where the latter is the type. See Nomenclature, wild type.

Type culture collections, see Genetic resource collections.

Typhella L. Léger & M. Gauthier (1935) nom. nud. ? = *Smittium* fide Manier & Lichtwardt (*Annls Sci. Nat. Bot.*, sér. 12 9: 519, 1968).

Typhoderma Gray (1821) nom. dub., ? Fungi.

Typhodium Link [not traced] = *Epichloë* fide Tulasne & Tulasne (*Select. fung. carpol.* 3: 23, 1865).

Typhula (Pers.) Fr. (1818), Typhulaceae. 68, widespread (temperate). *T. incarnata* injures cereals under snow. See Berthier (*Bull. mens. Soc. linn. Lyon Num. Spéc.* 45, 1976), Siepe (*Beitr. Kenntn. Pilze Mitteleur.* 13: 47, 2000).

Typhulaceae Jülich (1982), Agaricales. 6 gen. (+ 11 syn.), 229 spp.

Lit.: Brodie (*Lejeunia* n.s. 112: 1, 1984), Metzler (*CJB* 66: 1321, 1988), Villarreal & Pérez-Moreno (*Micol. Neotrop. Aplic.* 4: 119, 1991), Matsumoto *et al.* (*Eur. J. Pl. Path.* 102: 431, 1996), Hsiang *et al.* (*Pl. Dis.* 83: 788, 1999), Pine *et al.* (*Mycol.* 91: 944, 1999), Hsiang & Wu (*MR* 104: 16, 2000), Larsson *et al.* (*MR* 108: 983, 2004), Vergara *et al.* (*MR* 108: 1283, 2004).

Typhulochaeta S. Ito & Hara (1915), Erysiphaceae. 4, Asia; N. America. See Solheim *et al.* (*J. Elisha Mitchell scient. Soc.* 84: 236, 1968), Braun (*Beih. Nova Hedwigia* 98, 1987; key), Mori *et al.* (*Mycol.* 92: 74, 2000; phylogeny), Takamatsu (*Mycoscience* 45: 147, 2004; phylogeny).

typonym, a name having the same type as another name which is neither its basionym nor synonym (Donk, *Persoonia* 1: 175, 1960).

Tyrannosorus Unter. & Malloch (1995), Dothideomy-

cetes. Anamorph *Helicodendron*. 1 (on wood), Canada; Pakistan. See Untereiner *et al.* (*MR* 99: 897, 1995), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).

Tyridiomyces W.A. Wheeler (1907), ? Saccharomycetales. 1 (from ants). See Schultz *et al.* (*Insect-Fungal Associations Ecology and Evolution*: 149, 2005).

Tyrodon P. Karst. (1881) ≡ *Hydnum*.

Tyromyces P. Karst. (1881), Polyporaceae. c. 30, widespread. See David (*Bull. Soc. linn. Lyon* 49: 596, 1980; key 16 Afr. spp.), Gilbertson & Ryvarden (*N. Amer. Polyp.* 2: 781, 1987; key N. Am. spp.), Spirin (*Mycena* 1: 64, 2001), Hattori (*Mycoscience* 44: 453, 2003; type studies Corner spp.), Ipulet & Ryvarden (*Syn. Fung.* 20: 79, 2005; tropical Afr.).

UAMH, University of Alberta Microfungus Collection and Herbarium (Edmonton, Alberta, Canada); founded 1960; see Sigler (*J. Ind. Microbiol.* 13: 191, 1994).

Uberispora Piroz. & Hodges (1973), anamorphic *Pezizomycotina*, Hso.0bP.1. 3, widespread. See Castañeda Ruíz *et al.* (*Nova Hedwigia* 64: 473, 1997).

ubiquinones, a class of terpenoid lipids involved in electron transport and of potential use in fungal systematics due to variation in the isoprenoid side chain in some taxa. See Kuraishi *et al.* (*MR* 95: 705, 1991).

Ubrizsya Negru (1965), anamorphic *Pezizomycotina*, St.0eH.?. 1, Rumania. See Negru (*Acta Bot. Hung.* 11: 217, 1965).

Ucographa A. Massal. (1860) = *Pragmopora* fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).

Udeniomyces Nakase & Takem. (1992), anamorphic *Cystofilobasidiaceae*. 4, Japan; Europe. See Nakase *et al.* (*Stud. Mycol.* 38: 163, 1995; mol. phylogeny), Suh *et al.* (*Microbiology* 141: 901, 1995; mol. phylogeny), Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 1351, 2000; mol. phylogeny), Niwata *et al.* (*International Journal of Systematic and Evolutionary Microbiology* 52: 1887, 2002; n.sp. Hungary).

Ugola Adans. (1763), anamorphic *Asterophora*. 3. See Stalpers (*Stud. Mycol.* 24: 80, 1984; anamorph name), Redhead & Seifert (*Taxon* 50: 243, 2001).

ulcerose, ulcer-like.

Ulea J. Schröt. (1892) nom. inval. = *Uleiella*.

Uleiella J. Schröt. (1894), Uleiellaceae. 2 (on *Araucaria*), S. America. See Thirumalachar (*Bull. Torrey bot. Club* 76: 339, 1949), Thirumalachar (*Indian Phytopath.* 3: 4, 1950), Vánky (*MR* 102: 513, 1998), Vánky (*Fungal Diversity* 6: 131, 2001).

Uleiellaceae Vánky (2001), Ustilaginales. 1 gen. (+ 1 syn.), 2 spp.

Lit.: Butin & Peredo (*Bibliotheca Mycol.* 101: 100 pp., 1986), Vánky (*MR* 102: 513, 1998), Vánky (*Fungal Diversity* 6: 131, 2001).

Uleodothella Syd. & P. Syd. (1921) = *Tomasellia* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).

Uleodothis Theiss. & Syd. (1915), Venturiaceae. 4, S. America.

Uleomyces Henn. (1895), Cookellaceae. 10 (on rusts and ascomycetes), widespread. See Eriksson & Yue (*Mycotaxon* 38: 201, 1990).

Uleomycina Petr. (1954) = *Elsinoë* fide von Arx (*Persoonia* 2: 421, 1963).

Uleopeltis Henn. (1904) = *Mendogia* fide Clements & Shear (*Gen. Fung.*, 1931).

- Uleoporthe** Petr. (1941), Diaporthales. 1 (from leaves), America (tropical). See Barr (*Mycol. Mem.* 7, 1978), Cannon (*Fungal Diversity* 7: 17, 2001).
- Uleothyrium** Petr. (1929), Asterinaceae. Anamorph *Septothyrella*. 1, Brazil.
- Uljanishchev** (Valery Ivanovich; 1898-1996; Russia, later Azerbaijan). Laboratory assistant, Institute of Plant Protection, Leningrad (1924-1927); Lecturer, Azerbaijan Agricultural Institute (1927-1931); founder then head, Station of Plant Protection, Azerbaijan SSR (1927-1938); Head of Department of Lower Plants, Institute of Botany, Azerbaijan SSR Academy of Sciences (1938-1993); Order of Lenin and Lenin Prize (1964). Pioneer work on epidemiology and control of smut fungi, particularly on cereals, in the Caucasus; also on the mycota of Azerbaijan. *Publs.* [*Mycoflora of Azerbaijan*] vols 1-4 (1952-1967) [in Russian]; [*Guide to the Identification of Smut Fungi of the USSR*] (1968) [in Russian]; (with collaborators) [*Guide for Identification of Fungi of Transcaucasia* vol. 1 (1985) [in Russian]. *Biogs, obits etc.* Anon. ([*Mikologiya i Fitopatologiya*] 13: 439, 1976, portrait [in Russian]); Guseinov ([*Mikologiya i Fitopatologiya*] 31: 92, 1997, portrait [in Russian]).
- Ulocladium** Preuss (1851), anamorphic *Pleosporaceae*, Hso.#eP.26. 15, widespread. See Simmons (*Mycol.* 59: 77, 1967; key), Bottalico & Logrieco in Sinha & Bhatnagar (Eds) (*Mycotoxins in Agriculture and Food Safety*: 65, 1998; mycotoxins), Simmons (*CJB* 76: 1533, 1998), Pryor & Gilbertson (*MR* 104: 1312, 2000; phylogeny), Câmara *et al.* (*Mycol.* 94: 660, 2002; phylogeny), Hoog & Horré (*Mycoses* 45: 259, 2002; from humans), Pryor & Bigelow (*Mycol.* 95: 1141, 2003; phylogeny), Hong *et al.* (*Fungal Genetics Biol.* 42: 119, 2005; allergens, phylogeny), Zhang & Zhang (*Mycosystema* 25: 516, 2006; China), Xue & Zhang (*Sydowia* 59: 161, 2007).
- Ulocodium** A. Massal. (1855) = *Catillaria* fide Zahlbruckner (*Catalogus Lichenum Universalis* 4, 1926).
- Ulocolla** Bref. (1888) = *Exidia* fide Donk (*Persoonia* 4: 166, 1966).
- Ulocoryphus** Michaelides, L. Hunter & W.B. Kendr. (1982), anamorphic *Pezizomycotina*, Hsy.0fH.19. 1, New Zealand. See Michaelides *et al.* (*Mycotaxon* 14: 61, 1982).
- Uloploca** Kleb. (1933) nom. dub., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Uloporus** Quél. (1886) = *Gyrodon* fide Patouillard (*Essai taxonomique sur les familles et les genres des Hyménomycètes*, 1900).
- Uloseia** Bat. (1963) ? = *Chaetothyrium* fide Hughes (*Mycol.* 68: 693, 1976).
- Ulospora** D. Hawksw., Malloch & Sivan. (1979), Testudinaceae. 1, India. See Hawksworth *et al.* (*CJB* 57: 96, 1979), Hoog *et al.* (*Mycoses* 47: 121, 2004), Kruys *et al.* (*MR* 110: 527, 2006; phylogeny), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Ultrastructure**. Studies with the electron microscope have shown fungi to have a typical eukaryotic structure but the nuclei of some show unusual features. Transmission electron microscopy is usually used for studying fungal ultrastructure, but the scanning electron microscope may also sometimes be applicable (Tsuchiya *et al.*, *Mycol.* 92: 208, 2004). See Hawker (*Rev. Biol.* 40: 52, 1965), Bracker (*Ann. Rev. Phytopath.* 5: 343, 1967; reviews), Beckett *et al.* (*An atlas of fungal ultrastructure*, 1975), Cole & Samson (*Patterns of development in conidial fungi*, 1979), Hess (*Shokubutsu Byogai Kenkyi* 8: 71, 1973; of germination), Littlefield & Heath (*Ultrastructure of rust fungi*, 1979), Mimms (*Mycol.* 83: 1, 1991; plant pathogens). For some organelles of which the structure has been elucidated by electron microscopy see: apical granule, concentric bodies, dictyosome, dolipore septum, flagellum, parenthesome, Spitzenkörper. Lichen ultrastructure, see Jacobs & Ahmadjian (*J. Phycol.* 5: 227, 1969; review), Hale (*in Brown et al.*, *Lichenology: progress and problems*: 1, 1976; scanning electron microscope).
- See also ascus, Microscopy, Scanning electron microscopy.
- Uluguria** Vězda (2004), Gomphillaceae (L.). 1, Tanzania. See Vězda (*Czech Mycol.* 56: 150, 2004).
- Ulva** L. (1753), Algae. Ssensu Agardh p.p. = *Phycomyces* (Mucor.) fide Fries (1832).
- Ulvella** (Nyl.) Trevis. (1880) nom. dub., *Pezizomycotina*. See Santesson (*Symb. bot. upsala.* 12 no. 1: 1, 1952).
- Umbellidion** B. Sutton & Hodges (1975), anamorphic *Pezizomycotina*, Hso.0eH.10. 1, Brazil. See Sutton & Hodges (*Nova Hedwigia* 26: 529, 1975).
- Umbellula** E.F. Morris (1955) = *Pseudobotrytis* fide Subramanian (*Proc. Indian natn Sci. Acad. Part B. Biol. Sci.* 43: 277, 1956).
- Umbelopsidaceae** W. Gams & W. Mey. (2003), *Mucorales*. 1 gen. (+ 2 syn.), 13 spp.
Lit.: O'Donnell *et al.* (*Mycol.* 93: 286, 2001), Meyer & Gams (*MR* 107: 339, 2003), Sugiyama *et al.* (*Mycoscience* 44: 217, 2003), Mahoney *et al.* (*MR* 108: 107, 2004), Tanabe *et al.* (*Mol. Phylogen. Evol.* 30: 438, 2004), Kwasna *et al.* (*MR* 110: 501, 2006).
- Umbelopsis** Amos & H.L. Barnett (1966), *Umbelopsidaceae*. 13 (in soil), widespread. See von Arx (*Sydowia* 35: 10, 1982), Yip (*TBMS* 86: 334, 1986), Yip (*TBMS* 87: 243, 1986), Kendrick *et al.* (*Mycotaxon* 51: 15, 1994), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny), Meyer & Gams (*MR* 107: 339, 2003; delimitation), Sugiyama *et al.* (*Mycoscience* 44: 217, 2003; n.sp.), Tanabe *et al.* (*J. gen. appl. Microbiol.* Tokyo 51: 267, 2005; phylogeny), James *et al.* (*Nature* 443: 818, 2006; phylogeny), Kwasna *et al.* (*MR* 110: 501, 2006; phylogeny soil isolates).
- Umbilicaria** Hoffm. (1789) nom. cons., *Umbilicariaceae* (L.). c. 97, widespread (esp. temperate and arctic). See Frey (*Ber. schweiz. bot. Ges.* 59: 427, 1949), Llano (*A monograph of the lichen family Umbilicariaceae in the Western Hemisphere*, 1950), Hakulinen (*Ann. bot. Soc. Zool.-Bot. Fenn. Vanamo* 32 no. 6, 1962), Llano (*Hvalråd. Skr.* 48: 112, 1965), Henssen (*Vortr. bot. Ges. n.f.* 4: 103, 1970; ontogeny), Crespo & Sancho (*An. Inst. bot. A.J. Cavanilles* 35: 79, 1978; Spain, adaptation, convergence), Krog & Swinscow (*Nordic Jl Bot.* 6: 75, 1986; E. Africa), Filson (*Muelleria* 6: 335, 1987; key 5 spp. Antarctica), Wei & Jiang (*Mycosystema* 2: 135, 1989; key 29 spp. China, 1993; key 50 spp. Asia), Hestmark (*Lichenologist* 23: 361, 1991; anamorph-teleomorph relationships), Hestmark (*Lichenologist* 23: 343, 1991; anamorph-teleomorph relationships), Hestmark (*MR* 96: 1033, 1992; conidiogenesis), Sipman & Totham (*Nova Hedwigia* 54: 63, 1992; key 6 spp., Colombia), Wei (*Mycosystema* 5: 1, 1993), Ivanova *et al.* (*Lichenologist* 31: 477, 1999; phylogeny), Ramstad & Hestmark (*Mycol.* 93: 453, 2001; population structure), Peterson (*Bull. Calif. Lichen Soc.* 10: 10, 2003; USA), Krzewicka (*Polish Bot. Stud.* 17, 2004;

- Poland), Krzewicka & Smykla (*Polar Biol.* **28**: 15, 2004; Antarctica), Lumbsch *et al.* (*Mol. Phylogen. Evol.* **31**: 822, 2004; phylogeny), Ott *et al.* (*Lichenologist* **36**: 227, 2004; Antarctica), Galloway & Sancho (*Australasian Lichenology* **56**: 16, 2005; New Zealand), Miadlikowska *et al.* (*Mycol.* **98**: 1088, 2006; phylogeny), Hestmark *et al.* (*Mycol.* **99**: 207, 2007; colonization).
- Umbilicariaceae** Chevall. (1826), Umbilicariales (L). 2 gen. (+ 14 syn.), 109 spp.
- Lit.*: Wei & Jiang (*Mycosystema* **2**: 135, 1989; cluster analysis), Hestmark (*Nordic Jl Bot.* **9**: 547, 1990), Hestmark (*Somerfeltia* Suppl. **3**, 1991; sexual strategies), Ascaso *et al.* (*Cryptog. Bryol.-Lichénol.* **13**: 335, 1992), Hageman & Fahselt (*Lichenologist* **24**: 91, 1992), Hestmark (*MR* **96**: 1033, 1992), Wei & Jiang (*The Asian Umbilicariaceae (Ascomycota)* [*Mycosystema*, Monogr. **1**], 1993; keys, descr. 60 spp. Asia), Fahselt & Hageman (*Symbiosis* **16**: 95, 1994), Codogno (*Nova Hedwigia* **60**: 479, 1995; distr.), Fahselt *et al.* (*Bryologist* **98**: 118, 1995), Narui *et al.* (*Bryologist* **99**: 199, 1996), Hestmark (*Biblthca Lichenol.* **68**: 195, 1997), Ivanova *et al.* (*Lichenologist* **31**: 477, 1999; phylogeny), Narui *et al.* (*Bryologist* **102**: 80, 1999; chemistry), Sancho (*Clementeana* **4**: 42, 1999; key), Romeike *et al.* (*Mol. Biol. Evol.* **19**: 1209, 2002), Ott *et al.* (*Lichenologist* **36**: 227, 2004), Reeb *et al.* (*Mol. Phylogen. Evol.* **32**: 1036, 2004), Wedin *et al.* (*MR* **109**: 159, 2005), Miadlikowska *et al.* (*Mycol.* **98**: 1088, 2006; phylogeny), Hofstetter *et al.* (*Mol. Phylogen. Evol.* **44**: 412, 2007; phylogeny), Lumbsch *et al.* (*MR* **111**: 257, 2007; phylogeny).
- Umbilicariales** J.C. Wei & Q.M. Zhou (2007). Lecanoromycetes. 5 fam., 13 gen., 191 spp. Fams:
- (1) **Elixiaaceae**
 - (2) **Fuscideaceae**
 - (3) **Ophioparmaceae**
 - (4) **Rhizoplacopsidaceae**
 - (5) **Umbilicariaceae**
- For *Lit.* see under fam.
- Umbilicariomyces** Cif. & Tomas. (1953) ≡ *Lasallia*.
- umbilicate**, having a small hollow; esp. of a pileus having a hollow on the top above the stipe (Fig. 19M).
- umbilicus** (1) the central hold-fast occurring in some foliose lichens (e.g. *Umbilicaria*), navel, umbo; (2) the pore in the perispore of an ascospore (Eriksson, *Opera bot.* **60**, 1981).
- umbo**, a central swelling like the boss at the centre of a shield; esp. one on top of a pileus above the stipe; see also umbilicus; **-nate**, having an umbo (Fig. 19L).
- Umbrinosphaeria** Réblová (1999), Chaetosphaeriaceae. Anamorph *Sporidesmium*-like. 1 (from wood), widespread (temperate). See Réblová (*Mycotaxon* **71**: 13, 1999), Shenoy *et al.* (*MR* **110**: 916, 2006; phylogeny).
- Unamunoa** Urries (1942) = *Rechingeriella* fide Petrak (*Sydowia* **23**: 265, 1970).
- Uncigera** Sacc. (1885) = *Cylindrotrichum* fide Réblová & Gams (*Czech Mycol.* **51**: 1, 1999).
- uncinate** (**uncate**), (1) hooked (Fig. 23.35); (2) of gill insertion, near sinuate (q.v.).
- Uncinia** Velen. (1934) [non *Uncinia* Pers. 1807, *Cyperaceae*] ≡ *Hamatocanthoscypha*.
- Unciniella** K. Holm & L. Holm (1977) ≡ *Hamatocanthoscypha*.
- Uncinocarpus** Sigler & G.F. Orr (1976), ? *Onygenaceae*. Anamorph *Malbranchea*. 3, USA. The human pathogen *Coccidioides immitis* may be closely related. See Currah (*Mycotaxon* **24**: 1, 1985), Pan *et al.* (*Microbiol. Reading* **140**: 1481, 1994), Sigler *et al.* (*CJB* **76**: 1624, 1999), Koufopanou *et al.* (*Mol. Biol. Evol.* **18**: 1246, 2001), Guarro & Cano (*Stud. Mycol.* **47**: 1, 2002; phylogeny), Sugiyama *et al.* (*Stud. Mycol.* **47**: 5, 2002; phylogeny).
- Uncinula** Lév. (1851) = *Erysiphe* fide Braun & Takamatsu (*Schlechtendalia* **4**: 3, 2000), Mori *et al.* (*Mycoscience* **41**: 437, 2000; phylogeny), Takamatsu (*Mycoscience* **45**: 147, 2004; phylogeny), Takamatsu *et al.* (*Mycoscience* **46**: 9, 2005).
- Uncinulella** Hara (1936) = *Erysiphe* fide Braun & Takamatsu (*Schlechtendalia* **4**: 3, 2000).
- Uncinuliella** R.Y. Zheng & G.Q. Chen (1979) = *Erysiphe* fide Braun & Takamatsu (*Schlechtendalia* **4**: 3, 2000), Takamatsu (*Mycoscience* **45**: 147, 2004; phylogeny).
- Uncinulites** Pampal. (1902), Fossil Fungi ? Fungi. 1 (Miocene), Italy. See Salmon (*J. Bot., Lond.* **41**: 127, 1903).
- Uncinulopsis** Sawada (1916) = *Pleochaeta* fide Kimbrough & Korf (*Mycol.* **55**: 619, 1963).
- Uncispora** R.C. Sinclair & Morgan-Jones (1979), anamorphic *Pezizomycotina*, Hso.≡ eP.1. 1, USA. See Sinclair & Morgan-Jones (*Mycotaxon* **8**: 140, 1979).
- Uncobasidium** Hjortstam & Ryvarden (1978), Meruliaceae. 1, Norway. See Hjortstam & Ryvarden (*Mycotaxon* **7**: 407, 1978).
- Uncol** Buriticá & Rodríguez (2000), Uncolaceae. 1 (on *Pteridophyta*), S. America. See Buriticá & Rodríguez (*Revta Acad. colomb. cienc. exact. fis. nat.* **24**: 112, 2000), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003; excluded from *Pucciniales*).
- Uncolaceae** Buriticá (2000), Pucciniales. 2 gen., 3 spp.
- Lit.*: Rodríguez & Buriticá (*ASCOLFI Informa* **28**: 12, 2002), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003).
- under cortex**, lower cortex in foliose lichens.
- Underwoodia** Peck (1890), Pezizales. 3 (from soil), widespread. See Harmaja (*Karstenia* **14**: 102, 1974), O'Donnell *et al.* (*Mycol.* **89**: 48, 1997; phylogeny), Landvik *et al.* (*Mycol.* **91**: 278, 1999), Hansen & Pfister (*Mycol.* **98**: 1029, 2006; phylogeny).
- Underwoodina** Kuntze (1891) ≡ *Aschersonia* Mont.
- undulate**, wavy.
- Unger** (Franz; 1800-1870; Austria). Medic, Stockerau (1828-1830); forensic physician, Kitzbühel; Professor of Botany & Zoology, Graz (1835-1849); Professor of Plant Anatomy & Physiology, Vienna (1849-1866). Contributed to the development of ideas in plant pathology, although still regarding fungi as the result rather than the cause of disease. *Publs. Die Exantheme der Pflanzen* (1833). *Biogs, obits etc.* Anon. (*Journal of Botany* London **8**: 192, 1870); Stafleu & Cowan (*TL-2* **6**: 594, 1986).
- Unguicularia** Höhn. (1905), Hyaloscyphaceae. 7, Europe. See Raschle (*Sydowia* **29**: 170, 1977; key), Korf & Kohn (*Mycotaxon* **10**: 503, 1980), Inman *et al.* (*Pl. Path.* **41**: 646, 1992; on *Brassica*), Baral (*SA* **13**: 113, 1994; posn), Raitviir (*Scripta Mycologica Tartu* **20**, 2004).
- Unguiculariella** K.S. Thind & R. Sharma (1990), Hyaloscyphaceae. 1, Bhutan. See Thind & Sharma (*Proc. Indian Acad. Sci. Pl. Sci.* **100**: 279, 1990),

- Raitviir (*Scripta Mycol.* 20, 2004).
- Unguiculariopsis** Rehm (1909), Helotiaceae. Anamorph *Deltosperma*. 20 (on lichens and other fungi), widespread. See Spooner (*Bibliotheca Mycol.* 116, 1987), Zhuang (*Mycotaxon* 32: 1, 1988; key), Alstrup & Hawksworth (*Meddr Grønland Biosc.* 31: 3, 1990), Kondrateva *et al.* (*Acta Bot. Fenn.* 150: 93, 1994), Kondrateva & Galloway (*Bibliotheca Lichenol.* 58: 235, 1995), Etayo & Diederich (*Bull. Soc. Nat. Luxemb.* 97: 93, 1996), Zhuang (*MR* 104: 507, 2000; 2 spp. China).
- Ungiculella** Höhn. (1906), Hyaloscyphaceae. c. 17, Europe. See Dennis (*Mycol. Pap.* 32, 1949), Raitviir (*Mikol. Fitopatol.* 21: 200, 1987), Huhtinen (*Karstenia* 29: 45, 1990), Raitviir (*Scripta Mycol.* 20, 2004), Huhtinen & Spooner (*Mycologist* 19: 59, 2005; UK).
- Ungularia** Lázaro Ibiza (1916) ≡ *Piptoporus*.
- ungulate**, shaped like a horse's hoof.
- Ungulina** Pat. (1900) ≡ *Fomes*.
- unialgal** (of cultures of lichen photobionts), ones in which a single algal species is present but which may also contain bacteria, fungi, or other organisms.
- Unicellomycetales**, yeasts (Kudriavtsev, 1954).
- Unikaryon** E.U. Canning, P.F. Lai & J.K. Lie (1974), Microsporidia. 8. See Canning *et al.* (*J. Protozool.* 21: 19, 1974).
- union**, see Phytosociology.
- unipolar**, at one end only (esp. of a bacterial cell).
- uniseriate**, in one row.
- Uniseta** Ciccar. (1948), anamorphic *Cryptodiaporthe*, St.1eP.19. 1, USA.
- Unisetosphaeria** Pinnoi, E.B.G. Jones, McKenzie & K.D. Hyde (2003), Trichosphaeriaceae. 1, Thailand. See Pinnoi *et al.* (*Mycoscience* 44: 377, 2003).
- universal veil** (of agarics and gasteromycetes), a layer of tissue covering the basidioma while development takes place; teleblem; blematogen; cf. volva; **primary** - - = protoblem.
- unorientated**, not arranged in any particular direction.
- unstratified** (of lichen thalli), not layered; homoiomerous (q.v.).
- Uperhiza** Bosc (1811) = *Melanogaster* fide Stalpers (*in litt.*).
- UPS**, Botanical Museum, University of Uppsala (Uppsala, Sweden); founded 1785; genetic resource collection UPSC.
- Uraecium** Arthur (1933), anamorphic *Pucciniales*. 12, widespread (esp. tropical). Anamorph name for (I). See Berndt (*Nova Hedwigia* 75: 415, 2002) Established for uredium-like aecia.
- Urceola** Quéf. (1886), Helotiales. 1, Europe.
- Urceolaria** Ach. (1803) [non *Urceolaria* Molina ex Brandis 1786, *Gesneriaceae*] nom. rej. = *Diplo-schistes* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Urceolaria** Bonord. (1851), Pezizales. 100, Europe.
- Urceolaria** Hook. (1821) [non *Urceolaria* Molina ex Brandis 1786, *Gesneriaceae*] = *Aspicilia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Urceolariaceae** Chevall. (1826) = *Thelotrema*aceae.
- Urceolariomyces** Cif. & Tomas. (1953) ≡ *Diplo-schistes* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- urceolate**, pitcher-like in form.
- Urceolella** Boud. (1885), Hyaloscyphaceae. 23, widespread. See Raschle (*Sydowia* 29: 170, 1977; key), Korf & Kohn (*Mycotaxon* 10: 503, 1980), Huhtinen (*Karstenia* 27: 8, 1988), Raitviir & Galán (*Sydowia* 45: 34, 1993), Huhtinen & Raitviir (*Mycotaxon* 62: 453, 1997), Raitviir (*Scripta Mycologica Tartu* 20, 2004).
- Urceolina** Tuck. (1875) [non *Urceolina* Rchb. 1828, nom. cons., *Amaryllidaceae*] ≡ *Orceolina*.
- Urceolus** Velen. (1939) [non *Urceolus* Mereschk. 1879, *Algae*] = *Resupinatus* fide Stalpers (*in litt.*).
- Uredendo** Buriticá & J.F. Hennen (1994), anamorphic *Phakopsoraceae*. 1 (on *Tripsacum* (*Poaceae*)), America (tropical). Anamorph name for (II).
- Uredinales** G. Winter (1880) = *Pucciniales*.
- Uredinaria** Chevall. (1826) nom. conf., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- Uredinella** Couch (1937), *Septobasidiaceae*. 2 (on *Insecta*), widespread. See Couch (*Mycol.* 33: 405, 1941).
- Urediniomycetes** D. Hawksw., B. Sutton & Ainsw. (1983) = *Pucciniomycetes*.
- urediniospore** (**uredinospore**, **urediospore**), see *Pucciniomycetes*.
- Uredinites** Velen. (1889), Fossil Fungi ? *Pucciniales*. 1 (Cretaceous), former Czechoslovakia.
- uredinium** (**uredium**, **uredosorus**), see *Uredinales*.
- Uredinophila** Rossman (1987), *Tubeufiaceae*. 2 (on rusts), widespread. See Rossman (*Mycol. Pap.* 157, 1987), Kodsueb *et al.* (*Fungal Diversity* 21: 105, 2006; phylogeny).
- Uredinopsis** Magnus (1893), *Pucciniastraceae*. c. 25 (on *Abies* (0, I; where known) (*Pinaceae*); *Pteridophyta* (II, III)), widespread (esp. north temperate). See Faull (*J. Arnold Arbor.* 19: 402, 1938), Faull (*Contr. Arnold Arbor.* 11: 1, 1938), Hiratsuka (*Revision of taxonomy of the Pucciniastreae*, 1958).
- Uredinula** Speg. (1880) = *Tuberculina* fide Spegazzini (*Anal. Soc. cient. argent.* 10: 64, 1880).
- Uredites** Babajan & Tasl. (1970), Fossil Fungi. 1 (Tertiary), former USSR.
- Uredo** Pers. (1801), anamorphic *Pucciniales*. c. 500, widespread (esp. tropical). Anamorph name for (II).
- uredoconidium** (of *Cumminsia*), see Kuhnholz-Lordat (*RAM* 26: 469, 1947).
- Uredopeltis** Henn. (1908), *Phakopsoraceae*. 5 (on *Bignoniaceae*, *Burseraceae*, *Euphorbiaceae*), Africa, Australia, India; America (tropical). See Laundon (*TBMS* 46: 503, 1963), Walker & Shivas (*Australas. Pl. Path.* 33: 41, 2004; nomencl. sp. on *Grewia*).
- Uredostilbe** Buriticá & J.F. Hennen (1994), anamorphic *Phakopsoraceae*. 1 (on *Annona* (*Annonaceae*)), Honduras. Anamorph name for (II).
- Urnobasidium** Parmasto (1968) = *Sistotrema* Fr. fide Eriksson *et al.* (*Cortic. N. Europ.* 7, 1984).
- Urnula** Fr. (1849), *Sarcosomataceae*. Anamorph *Strumella*. 6, Europe; N. America. See Dissing (*Mycol.* 73: 272, 1981; key), Bellemère *et al.* (*Cryptog. Mycol.* 11: 203, 1990; ultrastr.), Landvik *et al.* (*Nordic Jl Bot.* 17: 403, 1997; DNA), Brunelli (*Bres. Nuova Ser.* 40: 199, 1998), Harrington *et al.* (*Mycol.* 91: 41, 1999; phylogeny), Köpcke *et al.* (*Phytochem.* 60: 709, 2002; chemistry), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny).
- Urnularia** P. Karst. (1866) nom. rej. prop. = *Chaetosphaeria* fide Kohnmeyer & Kohnmeyer (*Marine Mycology*, 1979).
- Urobasidium** Giesenh. (1893) = *Zygosporium* fide Mason (*Mycol. Pap.* 5: 134, 1941).
- Uroconis** Clem. (1909) ≡ *Urohendersonia*.
- Urocystidaceae** Begerow, R. Bauer & Oberw. (1998),

- Urocystidales** 7 gen. (+ 8 syn.), 185 spp.
Lit.: Vánky (*MR* 94: 269, 1990), Bauer *et al.* (*CJB* 75: 1273, 1997), Begerow *et al.* (*CJB* 75: 2045, 1998), Piepenbring *et al.* (*Protoplasma* 204: 202, 1998), Ershad (*Rostaniha* 1: 151, 2000), Vánky (*Aust. Syst. Bot.* 14: 385, 2001), Denchev (*Mycotaxon* 87: 475, 2003), Vánky (*Mycol. Balcanica* 1: 175, 2004).
- Urocystidales** R. Bauer & Oberw. (1997). Ustilaginomycetidae. 4 fam., 1 gen., 4 spp. Fams:
 (1) **Doassansiopsidaceae**
 (2) **Glomosporiaceae**
 (3) **Melanotaeniaceae**
 (4) **Urocystidaceae**
 For *Lit.* see under fam.
- Urocystis** Rabenh. ex Fuckel (1870) nom. cons., Urocystidaceae. Anamorph *Paepalopsis*. c. 170, widespread. Spore balls comprising spores completely or incompletely covered by sterile cells. Pathogens of anemone (*U. anemones*), cabbage (*Brassica*); *U. brassicae*, onion (*Allium*; *U. magica*, syn. *U. cepulae*), autumn crocus (*Colchicum*; *U. colchici*), gladioli (*Gladiolus*; *U. gladiolicola*), rye (*Secale*; *U. occulta*), *Ranunculus* (*U. ranunculi*), *Trientalis* (*U. trientalis*), violet (*Viola*; *U. violae*), wheat (*Triticum*; *U. agropyri* (syn. *U. tritici*), flag smut). See Liro (*Ann. Univ. Åbo. A* 1 no. 1, 1922; monograph, as *Tubercinia*), Vánky (*Europ. Smut Fungi*: 570 pp., 1994), Piepenbring (*Caldasia* 24: 103, 2002; Colombia, key), Vánky & McKenzie (*Fungal Diversity Res. Ser.* 8: 259 pp., 2002; New Zealand), Wang & Piepenbring (*Mycol. Progr.* 1: 399, 2002; China), Wolczanska & Rozwalka (*Polish Botanical Journal* 50: 93, 2005; Poland).
- Urocystites** Babajan & Tasl. (1970), Fossil Fungi. 1 (Tertiary), former USSR.
- Urohendersonia** Speg. (1902), anamorphic *Pezizomycotina*, Cpd.≡ eP.19. 5, S. America; India. See Nag Raj & Kendrick (*CJB* 49: 1853, 1971; key), Roux & Warmelo (*MR* 92: 223, 1989; ontogeny), Masilamani & Muthumary (*Acta Bot. Indica* 23: 157, 1995; ultrastr.).
- Urohendersoniella** Petr. (1955), anamorphic *Pezizomycotina*, Cpd.#eP.19. 1, Australia. See Nag Raj (*CJB* 67: 3169, 1989; revision).
- Uromyces** (Link) Unger (1832) nom. cons., Pucciniaceae. c. 800 (on angiosperms, esp. species-rich on *Leguminosae*: *Faboideae*), widespread. *U. appendiculatus* (*Phaseolus*), *U. fabae* (*Vicia*), *U. trifolii* (*Trifolium*), *U. striatus* (*Medicago*). See Tranzschel (*Annl. mycol.* 8: 1, 1910), Guyot (*Les Urédinées. Genre Uromyces*, 1938), Guyot (*Les Urédinées. Genre Uromyces*, 1951), Guyot (*Les Urédinées. Genre Uromyces*, 1957), Hiratsuka (*Rep. Tottori Mycol. Inst.* 10, 1973), El-Gazzar in Polhill & Raven (Eds) (*Advances in Legume Systematics* 1(ii): 979, 1981) Probably not separable from *Puccinia*.
- Uromycetites** Braun (1840), Fossil Fungi ? Pucciniales. 1 (Triassic), Germany.
- Uromycladium** McAlpine (1905), Pileolariaceae. 7 (on *Acacia*, *Albizia* (*Leguminosae*)), Australasia (and spread with cultivated hosts). See Burges (*Proc. Linn. Soc. N. S. W.* 59: 212, 1934; morphology).
- Uromycodes** Clem. (1909) ≡ *Schroeteriaster*.
- Uromycopsis** Arthur (1906) = *Uromyces* fide Arthur (*N. Amer. Fl.* 7: 440, 1921).
- Urophiala** Vuill. (1910) = *Zygosporium* fide Mason (*Mycol. Pap.* 5: 134, 1941).
- Urophlyctis** J. Schröt. (1886) = *Physoderma* fide Karling (*Chytriomyc. Iconogr.*, 1977).
- Urophlyctites** Magnus (1903), Fossil Fungi. 1 (Carboniferous), Europe. See Weiss (*New Phytol.* 3: 68, 1904).
- Urophora** Sommerf. ex Arnold (1899) = *Bacidia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Uropolystigma** Maubl. (1920), Phyllachorales. 1 (in living leaves), Brazil.
- Uropyxidaceae** Cummins & Y. Hirats. (1983), Pucciniales. 15 gen. (+ 9 syn.), 143 spp.
Lit.: Eriksson (*Systematic Botany*: 560, 1981), Ferreira & Hennen (*Mycol.* 78: 795, 1986), Ono (*CJB* 72: 1178, 1994), Barreto *et al.* (*MR* 99: 779, 1995), Hennen & Sotão (*Sida* 17: 173, 1996), Cummins & Hiratsuka (*Illustr. Gen. Rust Fungi* edn 3: 225 pp., 2003), Maier *et al.* (*CJB* 81: 12, 2003), Wingfield *et al.* (*Australas. Pl. Path.* 33: 327, 2004), Aime (*Mycoscience* 47: 112, 2006).
- Uropyxis** J. Schröt. (1875), Uropyxidaceae. c. 15 (mostly on *Faboideae* (autoecious) (*Leguminosae*)), America; Africa; Taiwan. See Baxter (*Mycol.* 51: 210, 1959; key).
- Urospora** Fabre (1879) [non *Urospora* Aresch. 1866, nom. cons., *Algae*] ≡ *Urosporella*.
- Urospora** Fayod (1889) = *Panellus* fide Singer (*Agaric. mod. Tax.* edn 3, 1975).
- Urosporella** G.F. Atk. (1897), Xylariales. 1 or 2 (from stems), Europe; N. America. Possibly close to *Ceriospora*. See Barr (*Mycol.* 58: 690, 1966), Kang *et al.* (*Mycoscience* 40: 151, 1999).
- Urosporellina** E. Horak (1968) = *Panellus* fide Pegler (*in litt.*).
- Urosporellopsis** W.H. Hsieh, Chi Y. Chen & Sivan. (1994), Xylariales. 1 (from wood), Taiwan. See Cannon (*in litt.*), Hsieh *et al.* (*MR* 98: 101, 1994).
- Urosporium** Fingerh. (1836) nom. dub., anamorphic *Pezizomycotina*.
- Ursicollum** Gryzenh. & M.J. Wingf. (2006), anamorphic *Cryphonectriaceae*. 1, USA. See Gryzenhout & Wingfield (*Stud. Mycol.* 55: 44, 2006).
- Urupe** Viégas (1944), Meliolaceae. 1 (from leaves), Brazil.
- US**, US National Herbarium (Washington, DC, USA); founded 1868; a part of the Smithsonian Institution.
- Uslaria** Nieuwl. (1916) ≡ *Gautieria*.
- Usnea** Dill. ex Adans. (1763), Parmeliaceae (L.). c. 338, widespread. See Asahina (*Lichens of Japan* 3, 1956), Swinscow & Krog (*Norw. J. Bot.* 25: 221, 1978), Swinscow & Krog (*Lichenologist* 11: 207, 1979; E. Afr., keys), Walker (*Bull. Br. Mus. nat. hist. Bot.* 13: 1, 1985; *Neuropogon*, key 15 spp.), Awasthi (*J. Hattori Bot. Lab.* 61: 333, 1986; key 54 spp. India), Tavares (*Mycotaxon* 30: 39, 1987; *U. strigosa*, N. Am., key), Clerc (*Lichenologist* 29: 209, 1997), Clerc & Herrera-Campos (*Bryologist* 100: 281, 1997; saxicolous N. Am. spp.), Clerc (*Lichenologist* 30: 321, 1998; species concepts), Halonen *et al.* (*Bryologist* 101: 36, 1998; British Columbia), Herrera-Campos *et al.* (*Bryologist* 10: 303, 1998; Mexico), Tavares & Sanders in Glenn *et al.* (Eds) (*Lichenogr. Thomsoniana*: 171, 1998; USA), Heibel *et al.* (*Am. J. Bot.* 86: 753, 1999; genetic diversity), Stevens (*Bibliotheca Lichenol.* 72: 128, 1999; Australia), Halonen (*Bryologist* 103: 38, 2000; Pacific NW), Ohmura & Kashiwadani (*J. Jap. Bot.* 75: 164, 2000; E Asia), Herrera-Campos *et al.* (*Bryologist* 104: 235, 2001;

Mexico), Ohmura (*J. Hattori bot. Lab.* **90**: 1, 2001; Japan, Taiwan), Articus *et al.* (*MR* **106**: 412, 2002; phylogeny), Ohmura (*J. Hattori bot. Lab.* **92**: 231, 2002; phylogeny), Tavares (*Constancea* **83**, 2002; nomencl.), Articus (*Taxon* **53**: 925, 2004; phylogeny), Mallavadhani *et al.* (*Biochemical Systematics and Ecology* **32**: 95, 2003; chemistry), Ohmura & Kanda (*Lichenologist* **36**: 217, 2004), Clerc (*Lichenologist* **38**: 191, 2006; Azores), Miadlikowska *et al.* (*Mycol.* **98**: 1088, 2006; phylogeny), Wirtz *et al.* (*Taxon* **55**: 367, 2006; phylogeny), Torra & Randlane (*Lichenologist* **39**: 415, 2007; Baltic region), Wirtz *et al.* (*MR* **112**: 472, 2008; phylogeny, biogeography).

Usneaceae Fée ex Zenker (1827) = Parmeliaceae.

Usneomyces E.A. Thomas ex Cif. & Tomas. (1953) = *Usnea* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

usnic acid, yellow dibenzofuran derivative occurring in lichens (e.g. some spp. of *Cladonia*, *Usnea*) which has some antibiotic properties (anti-Gram + bacterial; antifungal). Usually occurs in lichen cortices. See antibiotics, Lichen products, Pigments.

Ussurithyrites Krassilov (1967), Fossil Fungi, Ascomycota. 1 (Cretaceous), former USSR. See Krassilov (*Rannemelovaya Flora Yuzhnogo Primor'ya i Ee Znachenie Dlya Stratigrafii*: 90, 1967).

Ustacystis Zundel (1945), Urocystidaceae. 2 (on *Rosaceae*), N. America; Europe. See Bauer *et al.* (*Mycol.* **87**: 18, 1995; ultrastr.).

Ustalia Fr. (1825) = *Pyrochroa*.

Ustanciosporium Vánky (1999), ? Anthracoideaceae. 22 (on *Cyperaceae*), widespread. See Piepenbring (*Nova Hedwigia* **70**: 289, 2000; monogr.), Pérez & Minter (*IMI Descr. Fungi Bact.* **164**, 2005).

Usteria Bat. & H. Maia (1962) [non *Usteria* Willd. 1790, *Loganiaceae*] = *Mycousteria*.

ustic acid (1) a hydroxyquinol from *Aspergillus ustus* (*Biochem. J.* **48**: 53, 1951); (2) an antimycobacterial product from *Ustilago maydis* (Haskins *et al.*, *Can. J. Microbiol.* **1**: 749, 1955).

ustilagic acids, metabolic products from *Ustilago maydis*; antifungal and antibacterial (Haskins & Thorn, *CJB* **29**: 585, 1951).

Ustilagidium Herzberg (1895) = *Ustilago* fide Dietel (*Nat. Pflanzenfam.* **6**, 1928).

Ustilaginaceae Tul. & C. Tul. (1847), Ustilaginales. 17 gen. (+ 12 syn.), 607 spp.

Lit.: Spooner (*TBMS* **85**: 540, 1985), Vánky & Oberwinkler (*Nova Hedwigia Beih.* **107**: 96 pp., 1994), Bauer *et al.* (*CJB* **75**: 1273, 1997), Begerow *et al.* (*CJB* **75**: 2045, 1998), Vánky (*Aust. Syst. Bot.* **14**: 385, 2001), Piepenbring *et al.* (*Mycol. Progr.* **1**: 71, 2002), Menzies *et al.* (*Phytopathology* **93**: 167, 2003), Stoll *et al.* (*CJB* **81**: 976, 2003), Austin *et al.* (*Functional & Integrative Genomics* **4**: 207, 2004), Begerow *et al.* (*MR* **108**: 1257, 2004), Jackson (*Evolution* Lancaster, Pa. **58**: 1909, 2004), Vánky (*Mycol. Balcanica* **1**: 175, 2004), Vánky (*Mycol. Balcanica* **1**: 175, 2004), Stoll *et al.* (*MR* **109**: 342, 2005).

Ustilaginales G. Winter (1880). Ustilaginomycetidae. 8 fam., 49 gen., 851 spp. Fams:

- (1) **Anthracoideaceae**
- (2) **Cintractiaceae**
- (3) **Clintramraceae**
- (4) **Geminaginaceae**
- (5) **Melanopsichiaceae**
- (6) **Uleiellaceae**
- (7) **Ustilaginaceae**

(8) Websdaneaceae

The *Ustilaginales*, which have long been regarded as a distinct group, have a mycelial parasitic phase and are yeast-like when cultured *in vitro*. Their taxonomic status has always been uncertain. Brefeld (*Unters. Gesamtgeb. Mykol.* **12**, 1895) introduced *Hemibasidiomycetes* (*Hemibasidii*) for them (the rusts being assigned to the *Protobasidiomycetes*) and although *Hemibasidiomycetes* was subsequently used in wider senses to include the rusts, Donk (see *Basidiomycota*) again restricted it to the smuts. Von Arx (1967) classified the smuts and the associated saprobic yeasts together with other yeasts in a class *Endomycetes* and in this he was followed by Kreisel (1969) who restricted the *Ustilaginales* to the *Ustilaginaceae*. Moore (*Ant. v. Leeuwenh.* **38**: 567, 1972) on the basis of ultrastructural studies and other considerations treated the group as two classes, *Ustomycetes* and *Sporidiomycetes*, of a division (*Ustomycota*) intermediate between ascomycetes and the basidiomycetes with which smuts have been traditionally associated. The current concept of *Ustomycetes* (q.v.) is broad and includes 7 orders, with the smuts divided into 2 families. Characters of the promycelium in these families are sufficiently distinct to indicate possible ordinal rank, but elevation requires additional support from molecular and ultrastructural data at present available for few species. In many species ustilospore germination (metabasidium development) has never been observed (or is mycelial) and some investigators (e.g. Vánky, 1994) therefore prefer not to emphasize the family division.

The smut fungi occur typically as host-specific endophytes which, but for 2 spp. of *Melanotaenium* on *Selaginella*, are parasitic on flowering plants, esp. *Gramineae* and *Cyperaceae*. Sori are commonly limited to the ovary, anthers, inflorescence, or leaves (*Entyloma*) and stem of the host, though the root is attacked by *Entorrhiza*. The mycelium of delicate hyaline hyphae made up of 1-, 2-, or multinucleate cells which may be throughout the plant or only at the points of infection; it is commonly annual but sometimes, as in *Ustilago segetum* var. *avenae* on *Arrhenatherum*, perennial. The hyphae are generally intercellular (in *U. maydis*) and frequently with haustoria and sometimes clamp connexions; dolipore septa lacking (Moore, *Ant. v. Leeuwenh.* **38**: 567, 1972); conidia may be formed on the surface of the host (esp. in *Entyloma*) although in most genera only the smut spores (chlamydospores, brand spores, resting spores, pseudospores, teliospores, ustospores, ustilospores) and basidiospores. Ustilospores (the preferred term, introduced by Donk, 1972), when mature, are generally exposed as a dark powder (sometimes as in *Anthracoidea* and *Cintractia* they are compacted); less frequently they are enclosed within host tissue or are unpigmented. The spores may be in ones (*Ustilago*, *Tilletia*) or twos (*Mycosyrinx*, *Schizonella*), or in balls made up of fertile spores only (*Sorosporium*, *Tolyposporium*, *Thecaphora*), a sterile layer covering fertile spores (*Urocystis*, *Doassansia*), or fertile spores covering sterile tissue (*Tetricalaria*, *Doassansiopsis*). Every mature spore has one diploid nucleus (Sampson, *TBMS* **23**: 1, 1939), and limited by a thin endospore and a thicker smooth or ornamented exospore (Zogg & Schwinn, *TBMS* **57**: 403, 1971; Mordue, *TBMS* **87**: 407, 1986). At germination meiosis takes place and a promycelium

(basidium, hemi-, or metabasidium, germ tube) having 4 or more basidiospores (sporidia (q.v.), sporidiola, 'conidia', promycelial spores) is produced.

Smuts are facultative saprobes after ustilospore development when their growth on culture media is mycelial or yeast-like (and composed of budding cells variously known as sporidia or sprout cells). Completion of the life cycle in culture is infrequent. There is segregation for sex in the promycelium and conjugation between two basidiospores, a basidiospore and a promycelial cell, two cells of one promycelium, or infrequently, two promycelia (Durán, *Ustilaginales of Mexico*, 1987; Ingold, *Nova Hedw.* 55: 153, 1992). Many physiologic races are on record. Hybridization of smuts takes place and methods for its experimental study have been perfected. See Whitehouse (*TBMS* 34: 340, 1951; heterothallism), Carris & Gray (*Mycol.* 86: 157, 1994), Bakkuren & Kronstad (*Plant Cell* 5: 123, 1993).

Species have frequently been based on physiologic races and a number of these become conspecific if morphological characters are used for the differentiation of species.

The three chief types of infection are: (1) seedling infection from ustilospores on the seed; (2) seedling infection by mycelium in the seed as a result of ustilospore germination on the stigma at flowering time; (3) infection by wind-borne sporidia from promycelia among decaying plant material (as for *Ustilago maydis*, *Entyloma*). Dusting seed with a fungicide is of use against (1), hot water seed treatment against (2), and spraying and dusting susceptible plants is a possible control for (3). Resistant varieties are used whenever possible.

Lit.: General: Bauer *et al.* (*CJB* 75: 1273, 1997; ultrastr., classific.), Bauer *et al.* (in McLaughlin *et al.* (Eds), *Mycota* 7(2): 57, 2000; *Ustilaginomycetes*), Begerow *et al.* (*CJB* 75: 2045, 1997; LS rDNA analyses, classific.), Dietel (*Nat. Pflanzenfam.* 2 Aufl. 6, 1928), Fischer (*The smut fungi: a guide to the literature with bibliography*, 1951; 3,300 ref.), Zundel (*The Ustilaginales of the World*, 1953; descript., syn.), Fischer & Holton (*Biology and control of smut fungi*, 1957; general account), Fischer & Shaw (*Phytopath.* 43: 181, 1953; speciation), Savulescu (*Sydowia Beih.* 1: 64, 1957; gen. key), Holm (*Svensk. bot. Tidskr.* 55: 585, 1961; phylogeny), Savile (*Rep. Tottori mycol. Inst.* 28: 15, 1990; coevolution), Thirumalachar (*Indian Phytopath.* 19: 3, 1966; gen. rev.), Vánky (*Illustrated genera of smut fungi*, 1987; 2nd ed., in press; *Trans. Mycol. Soc. Japan* 32: 281, 1991; spore morphology in the taxonomy; *MR* 102: 513, 1998; spore-ball-forming smut fungi; *Mycotaxon* 70: 35, 1999; *Fungal Diversity* 6: 131, 2001; classific.), Zambettakis (*Rev. Mycol. Paris* 34: 399, 1970, gen. key; *Bot. Rev.* 6: 389, 19: 187, 31: 114, 1940-65; *Ann. Rev. Phytopath.* 6: 213, 1968, specialization, genetics, variation).

Regional: **Africa**, Zambettakis (*BSMF* 86: 305, 1971; c. 300 spp., key gen., host index [also as reprint, *Les Ustilaginales des plantes d'Afrique*; suppl., *BSMF* 95: 393, 1979). **Argentina**, Hirschhorn (*Las Ustilaginales de la flora Argentina*, 1985). **Azerbaijan**, Uljanishchev ([*Fungal flora of Azerbaijan. I, Smut fungi*], 1952; Russ.). **Australia**, McAlpine (*The smuts of Australia*, 1910). **Baltic Region**, Ignatavičiute ([*Smuts of the Baltic Region*],

1975). **Brazil**, Viégas (*Bragantia* 4: 739, 1944). **Carpathians**, Vánky (*Carpathian Ustilaginales*, 1985). **China**, Lee Ling (*Mycol. Pap.* 11, 1945; *Mycol.* 41: 252, 1949), Wang ([*Ustilaginales of China*], 1963; Chin.), Guo (*Ustilaginaceae, in Flora Fungorum Sinicorum* 12, 2001). **Colombia**, Molina-Valero (*Caldesia* 13: 49, 1980). **Costa Rica**, Piepenbring (*Nova Hedwigia*, Beiheft 113, 1996). **Cuba**, Piepenbring & Hernández (*Revista Jard. Bot. Nac.* 19: 121, 1998). **Former Czechoslovakia**, Bubák (*Die Pilze Böhmens* 2, 1916). **Denmark**, Rostrup (*Ustilagineae Daniae*, 1890). **Europe**, Vánky (*European smut fungi*, 1994). **Finland**, Liro (*Die Ustilagineen Finnlands*, 2 vols, 1924-38). **France**, Viennot-Bourgin (*Encyclopédie Mycologique* 25, 2 vols, 1956). **Germany**, Scholz & Scholz (*Englera* 8, 1988; *Verh. Bot. Vereins Berlin Brandenburg* 133: 343, 2000). **Great Britain**, Ainsworth & Sampson (*The British smut fungi*, 1950), Mordue & Ainsworth (*Mycol. Pap.* 154, 1984); see also Plowright. **Hungary**, Moesz (*A Kárpát-Medence Üszöggombái. Les Ustilaginales du bassin du Carpathes*, 1950; Hung., Fr. summ.), Vánky, Gönczöl & Tóth (*Acta Bot. Acad. Sci. Hungar.* 28: 255, 1982). **India**, Mundkur & Thirumalachar (*Ustilaginales of India*, 1952). **Italy**, Ciferri (*Flora Italica* 7 (17), 1938). **Japan**, Ito (*Mycological flora of Japan. 2. Basidiomycetes. 1. Ustilaginales*, 1936), Kakishima (*Mem. Inst. Agr. For. Univ. Tsukuba* 1, 1982). **Kazakhstan**, Schvarzman ([*Flora of the sporing plants of Kazakhstan. 2. Smut fungi*], 1960; Russ.). **Mexico**, Durán (*Ustilaginales of Mexico*, 1987). **New Zealand**, Cunningham (*Trans. N.Z. Inst.* 55: 397, 1924; suppl. *Trans. N.Z. Inst.* 57, 59, 61), Vánky & McKenzie (*Smut fungi of New Zealand*, in press). **N. America**, Clinton (*Proc. Boston Soc. Nat. Hist.* 31: 329, 1904; *North American Flora* 7, 1906), Fischer (*Manual of North American smut fungi*, 1953). **Norway**, Jørstad (*Nytt Mag. Bot.* 10: 85, 1963; excl. *Anthracoidea*). **Pakistan**, Ahmad (*Mycol. Pap.* 64, 1956). **Poland**, Kochman (*Planta Polonica* 4, 1936), Kochman & Majewski (*Flora Polska, Mycota* 5, 1973). **Romania**, Săvulescu (*Ustilaginele*, 2 vols, 1957). **S. Africa**, Zundel (*Bothalia* 3: 283, 1938). **Sweden**, Lindeberg (*Symb. bot. upsal.* 16 (2), 1959; excl. *Anthracoidea*). **Switzerland**, Schellenber (*Die Brandpilze der Schweiz*, 1911), Zogg (*Cryptog. Helv.* 16: 277, 1985]). **former USSR**, Gutner (*Golovnevye griby*, 1941), Ul'yanischev ([*Key to the smut fungi of the USSR*, 1968; Russ.]), Ramazanov *et al.* (*Flora gribov Uzbekistana*. 4. Golonevye griby, 1987), Karatygin & Azbukina (*Definitorium fungorum URSS, Ustilaginales*, Fasc. 1, 1989), Azbukina & Karatygin Azbukina (*Definitorium fungorum Rossiae, Ustilaginales*, Fasc. 2, 1995). **former Yugoslavia**, Lindtner (*Bull. Mus. Hist. nat. Pays Serbe ser. B* 304: 1, 1950).

Ustilaginoidea Bref. (1895), anamorphic *Hypocreales*, Hso.0eP.1. 6 (on *Poaceae*), widespread (subtropical). See Wang & Bai (*Mycosystema* 16: 257, 1997), Bischoff *et al.* (*Mycol.* 96: 1088, 2004; phylogeny), Zhou *et al.* (*Acta phytopath. sin.* 34: 442, 2004; population structure), Yokoyama *et al.* (*FEMS Microbiol. Lett.* 264: 182, 2006; mating types).

Ustilaginoidella Essed (1911) = *Fusarium* fide Brandes (*Phytopathology* 9: 373, 1919).

Ustilaginomycetes R. Bauer, Oberw. & Vánky (1997), Basidiomycota. 3 ord., 12 fam., 62 gen., 1113 spp. smut fungi. Ords:

(1) Urocystidiales

(2) Ustilaginales

Usually plant parasites, with very few exceptions on angiosperms. The soma of the smut fungi consists of saprobic haploid cells and parasitic dikaryotic hyphae. Host-parasite interactions with deposits of specific fungal vesicles. Basidiospores in sori. The hyphae are septate, branched, usually intercellular, in some groups also intracellular, in some taxa emitting haustoria into the host cells. In many cases hyphae are perennial, and usually giving little if any evidence of their presence before spore formation sets in. At spore formation karyogamy takes place and diploid spores are produced. The smut spores or teliospores (ustilospores, ustospores, chlamydospores, probasidia) are the organs of dispersion and of resistance. They are formed in the sori which consist of host tissues, of the spore mass, and in several genera also of modified fungal cells or tissues. Sori may be produced in the roots, stems, leaves, inflorescence, flowers, anthers, ovaries, etc. The spores may be single, in pairs, or aggregated in more or less persistent spore balls. The spore balls may be composed entirely of fertile spores, or of a combination of fertile spores, sterile cells, and/or hyphae. At germination of the diploid spore a basidium (promycelium, ustidium) is formed and meiosis takes place. The basidia give rise to haploid basidiospores (sporidia), or more rarely to haploid hyphae. These, or sometimes compatible basidial cells fuse in pairs to restore the parasitic dikaryophase. Frequently, the haploid basidiospores are capable of prolonged reproduction on non-living substrata as yeast-like cells or also as hyphal anamorphs developed from basidiospores, capable to produce forcibly discharged ballistoconidia. The limits toward pure saprobic fungi is not as sharp as was thought earlier and there is even a pure saprobic smut fungus, *Tilletiaria*, known only from culture. The infection may be localized, restricted to a certain organ or part of it, or generalized (systemic). Several species within a few genera may possess anamorphs (conidial states). Ultrastructural and molecular biological investigations showed that there are groups of microfungi closely related with the smut fungi which do not have teliospores (*Microstromatales*, *Malesseziales*, *Exobasidiales*). On the other hand, the *Microbotryales*, with teliospores and life cycle as all other smut fungi, are more closely related with the rust fungi than with other smut fungi. There are even human pathogens belonging to the *Ustilaginomycetes* (*Malessezia*). The number of 'true smut fungus species' (possessing teliospores) is about 1450, distributed in 77 genera. The taxonomic status of the smuts has often changed. Brefeld (*Unters. Gesammtgeb. Mykol.*: 12, 1895) introduced *Hemibasidiomycetes* (*Hemibasidii*) for the smuts (the rusts being assigned to the *Protobasidiomycetes*) and although *Hemibasidiomycetes* was subsequently used in wider senses to include the rusts, Donk (see *Basidiomycota*) again restricted this taxon to the smuts. Von Arx (1967) classified the smuts and the associated saprobic yeasts together with other yeasts in a class *Endomycetes* and in this he was followed by Kreisel (1969) who restricted the *Ustilaginales* to the *Ustilaginaceae*. Moore (*Ant. v. Leeuwenhoek* 38: 567, 1972) on the basis of ultrastructural studies and other considerations treated the group as two classes, *Ustomycetes* and *Sporidiomycetes*, of a new phylum

(*Ustomycota*) intermediate between ascomycetes and the basidiomycetes with which smuts have been traditionally associated. 5S rRNA analyses (Blanz & Gottschalk, 1984), supported also by biochemical analyses (Prillinger *et al.*, 1991) demonstrated an isolated position of some smut fungi, classified today into the *Microbotryales* within the *Pucciniomycetes*. Bauer *et al.* (1997) elaborated a new classification, based on ultrastructural characters. This was slightly modified and perfected by Begerow *et al.* (1997/1998), Piepenbring *et al.* (1999), Begerow *et al.* (2000), Vánky (2001), Bauer *et al.* (2001), based on molecular and classical morphological studies.

Ustilaginomycetidae Jülich (1981), see *Ustilaginomycetes*.

Ustilaginomycotina Doweld (2001), see *Ustilaginomycetes*.

Ustilaginula Clem. (1909) = *Ustilagopsis*.

Ustilagites Babajan & Tasl. (1970), Fossil Fungi. 1 (Tertiary), former USSR.

Ustilago (Pers.) Roussel (1806), *Ustilaginaceae*. c. 200 (on *Poaceae*), widespread. Important diseases of cereals, the causal organisms biologically distinct but morphologically close and variously treated as species, varieties or even physiologic races: *U. segetum* (covered smut of barley (*Hordeum*; *U. hordei*) and oats (*Avena*; *U. kolleri*, *U. levis*)); *U. segetum* var. *avenae* (loose smut of oats; *U. avenae*); *U. segetum* var. *tritici* (loose smut of wheat; *U. nuda*, and barley); *U. scitaminea* (sugarcane); *U. maydis* (syn. *U. zaeae*, maize (*Zea*)); pathogens of various grasses: *U. bromivora* (esp. on *Bromus*), *U. hypodytes*, *U. striiformis* (stripe smut); foxtail millet (*Setaria italica*), *U. crameri*; bermuda grass (*Cynodon dactylon*), *U. cynodontis*; mannagrass (*Glyceria*), *U. filiformis*; reed (*Phragmites*), *U. grandis*; pampagrass (*Cortaderia*), *U. quitensis* (*U. cortaderiae*), crabgrass (*Digitaria*), *U. syntherismae*; barnyard grass (*Echinochloa crusgalli*), *U. trichophora*. *U. esculenta* on *Zizania* and *U. maydis* are edible. See Osner (*Bull. Cornell agric. exp. Stn.*: 381, 1916; *U. striiformis*), Ingold (*MR* 93: 405, 1989; *Ustilospore* germination), Trione (*MR* 94: 489, 1990; *U. scitaminea*), Mordue (*Mycopath.* 16: 227, 1991; *U. esculenta*).

Ustilagopsis Speg. (1880) = *Sphacelia* fide Langdon (*TBMS* 36: 74, 1953).

Ustilentyloma Savile (1964), *Ustilentylomataceae*. 4 (on *Poaceae*), Europe; N. America; Greenland. See Vánky (*Mycotaxon* 78: 319, 2001; key), Aime *et al.* (*Mycol.* 98: 896, 2006; phylogeny).

Ustilentylomataceae R. Bauer & Oberw. (1997), *Microbotryales*. 3 gen., 9 spp.

Lit.: Denchev (*Mycotaxon* 55: 243, 1995), Piepenbring *et al.* (*Pl. Syst. Evol.* 199: 62, 1996), Bauer *et al.* (*CJB* 75: 1273, 1997), Begerow *et al.* (*CJB* 75: 2045, 1998), Piepenbring (*Revta Biol. trop.* 49: 411, 2001), Vánky (*Aust. Syst. Bot.* 14: 385, 2001), Vánky (*Mycol. Balcanica* 1: 175, 2004), Kemler *et al.* (*BMC Evol. Biol.* 6: 35, 2006).

ustilospore, Donk's (*K. ned. Akad. Wet. C* 76: 111, 1973) name for a smut spore; **ustospore** (Moore, *Ant. v. Leeuwenhoek* 38: 579, 1972).

Ustomycetes, see *Ustilaginomycetes*.

Ustomycota R.T. Moore (1972). Phylum for *Septomycetes* rather like *Saccharomycetales* and *Pucciniales* but not satisfactorily either (Moore, *Ant. v. Leeuwenhoek* 38: 567, 1972); assimilative phase often yeast-

- like. See *Ustilaginomycetes*.
- ustospore**, see *ustilospore*.
- Ustulina** Tul. & C. Tul. (1863) = *Kretzschmaria* fide Martin (*J S. Afr. Bot.* 36: 73, 1970), Læssøe (*SA* 13: 43, 1994), Rogers & Ju (*Mycotaxon* 68: 345, 1998).
- Ustulinites** Kirschst. (1925), Fossil Fungi. 1, Germany.
- Utharomyces** Boedijn (1959), Pilobolaceae. 1 (esp. coprophilous), widespread (subtropical). See Kirk & Benny (*TBMS* 75: 123, 1980), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny), Delgado Ávila *et al.* (*Revista Científica* 15: 159, 2005; Venezuela).
- Uthatabasidium** Donk (1956) = *Thanatephorus* fide Roberts (*Rhizoctonia-forming fungi*, 1999).
- Utraria** Qué. (1873) = *Lycoperdon* Pers. fide Demoulin (*Persoonia* 7: 152, 1973).
- Utriascus** Réblová (2003), Sordariales. 1, Czech Republic. Possibly related to the *Coryneliaceae*. See Réblová (*Mycol.* 95: 128, 2003).
- utricule**, the bladder-like covering of certain fungi, e.g. *Dendrogaster*.
- utriform**, bag-like.
- Uvarispora** Goos & Piroz. (1975), anamorphic *Pezizomycotina*, Hso.1bH.1. 1, Panama. See Goos & Pirozynski (*CJB* 53: 2930, 1975).
- Uvasporina** Beneš (1956), Fossil Fungi. 1 (Carboniferous), former Czechoslovakia.
- Uwebraunia** Crous & M.J. Wingf. (1996) = *Dissoconium* fide Crous *et al.* (*Sydowia* 51: 155, 1999; cf. *Dissoconium*), Crous *et al.* (*MR* 105: 425, 2001; phylogeny), Crous *et al.* (*Mycol.* 93: 1081, 2001; phylogeny), Crous *et al.* (*Stud. Mycol.* 50: 195, 2004; phylogeny), Crous (*in litt.*, 2008).
- Uyucamyces** H.C. Evans & Minter (1985), anamorphic *Ocotomyces*, Ccu.0eH.1. 1, Honduras. See Evans & Minter (*TBMS* 84: 68, 1985).
- V8A**, see *Media*.
- VA, VAM** (of mycorrhizas), vesicular-arbuscular; see *Mycorrhiza*.
- vagant** (of lichens), see *vagrant*.
- Vaginaria** (Forq.) Sacc. (1887) [non *Vaginaria* Rich. ex Pers. 1805, *Cyperaceae*] = *Amanitopsis* fide Kuyper (*in litt.*).
- Vaginarium** Roussel (1806) nom. rej. = *Amanitopsis*.
- Vaginata** Nees ex Gray (1821) nom. rej. = *Amanita* Pers. fide Kuyper (*in litt.*).
- Vaginatipora** K.D. Hyde (1995), Lophiostomataceae. 1, Australia. See Hyde (*Nova Hedwigia* 61: 234, 1995), Liew *et al.* (*Mycol.* 94: 803, 2002; phylogeny).
- Vagnia** D. Hawksw. & Miadl. (1997), anamorphic *Pezizomycotina*, Cpd.???. 1, Poland. See Hawksworth & Miadlikowska (*Lichenologist* 29: 45, 1997).
- vagrant** (of lichens), unattached; erratic; vagant. See Rosentreter (*Bryologist* 96: 333, 1993; N. Am.).
- Vainio** ['Wainio'] (Edvard August; 1853-1929; Finland). PhD (188), then academic staff (1880-1922), Helsinki University; Turku (1922 onwards). Acquired an uncontested position as the 'Grand Old Man of lichenology' (Lynge). Collections of over 33,000 specimens now in Turku (TUR). *Publs.* *Monographia Cladoniarum universalis*, I-III. *Acta Societatis pro Fauna et Flora Fennica* 4 (1887), 10 (1894), 14 (1897) [reprint 1978]; *Lichenes Insularum Philippinarum*, I-IV. *Philippine Journal of Science* Section C 4 (1909), 8 (1913), *Annales Academiæ Scientiarum Fennicæ* Section A 15 (1921), 19 (1923); *Lichens du Brésil*, I-II. *Acta Societatis pro Fauna et Flora Fennica* 7 (1890); *Lichenographia Fennica* I-IV. *Acta Societatis pro Fauna et Flora Fennica* 49 (1921), 53 (1922), 57 (1927), 57 (1934); also produced papers on lichens of central Africa, east Asia, Siberia, etc. *Biogs, obits etc.* Alava (*Publications from the Herbarium. University of Turku* 1, 1986) [journey to Brazil]; Alava (*Publications from the Herbarium. University of Turku* 2, 1988) [types in TUR]; Grumann (1974: 612); Linkola (*Acta Societatis pro Fauna et Flora Fennica* 57 (3), 1934) [bibliography, portrait]; Magnusson (*Annales de Cryptogamie Exotique* 3: 5, 1930) [bibliography, portrait]; Stafleu & Cowan (*TL-2* 6: 636, 1986).
- Vainiocora**, see *Wainiocora*.
- Vainiona** Werner (1943) = *Neonorrinia*.
- Vainionia** Räsänen (1943) nom. inval. = *Calicium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Vainionora** Kalb (1991), Lecanoraceae (L). 5, S. America. See Lumbsch *et al.* (*Bryologist* 99: 269, 1996), Kalb (*Bibltica Lichenol.* 88: 301, 2004).
- Vairimorpha** Pilley (1976), Microsporidia. 11.
- Vakrabeeja** Subram. (1957) = *Nakataea* fide Ellis (*Dematiaceous Hyphomycetes*, 1971).
- Valdensia** Peyronel (1923), anamorphic *Valdensinia*, Hso.0fP.1. 1, Italy. See Redhead & Perrin (*CJB* 50: 409, 1972), Redhead & Perrin (*CJB* 50: 2083, 1972).
- Valdensinia** Peyronel (1953), Sclerotiniaceae. Anamorph *Valdensia*. 1, Europe; N. America. See Norvell & Redhead (*Can. J. For. Res.* 24: 1981, 1994), Holst-Jensen *et al.* (*Mycol.* 89: 885, 1997; phylogeny).
- Valentinia** Velen. (1939) = *Xeromphalina* fide Kuyper (*in litt.*).
- Valetoniella** Höhn. (1909), Niessliaceae. 3 (dead wood or fungicolous), widespread (esp. tropics). See Samuels & Barr (*CJB* 75: 2165, 1998).
- Valetoniellopsis** Samuels & M.E. Barr (1998), Niessliaceae. Anamorph *Acremonium*-like. 1 (dead *Palmae*), N. America. See Samuels & Barr (*CJB* 75: 2165, 1998), Zhang & Blackwell (*MR* 106: 148, 2002; phylogeny).
- valid** (of names), published in accord with the Code Arts 29-45; such names may be illegitimate or legitimate; **pre-** (of names or authors), published before 1753, the starting point for the nomenclature of fungi under the Code; devaluated; cf. *Nomenclature*.
- Valsa** Adans. (1763) nom. rej. = *Diatrype* fide Cannon & Hawksworth (*Taxon* 32: 478, 1983), Læssøe (*SA* 13: 43, 1994).
- Valsa** Fr. (1849) nom. cons., Valsaceae. Anamorph *Cytospora*. 70 (from bark), widespread. See Défago (*Phytopath. Z.* 14: 103, 1944), Barr (*Mycol. Mem.* 7, 1978), Spielman (*CJB* 63: 1355, 1985; N. Am.), Dargan & Sharma (*Kavaka* 19: 27, 1, 1994; Indian spp.), Farr *et al.* (*Sydowia* 53: 185, 2001; phylogeny), Adams *et al.* (*Australas. Pl. Path.* 35: 521, 2006; Australia), Kalkanci *et al.* (*Medical Mycology* 44: 531, 2006; from human), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Valsaceae** Tul. & C. Tul. (1861), Diaporthales. 16 gen. (+ 23 syn.), 217 spp.
Lit.: Barr (*Iranian Journal of Plant Pathology*, 1978), Monod (*Beih. Sydowia* 9: 1, 1983), Spielman (*CJB* 63: 1355, 1985), Gille (*Arch. phytopath. Pflanz.* 26: 237, 1990), Vasil'eva (*Pyrenomycetes of the Russian Far East* 1, 1993; keys), Vasil'eva (*Pyrenomycetes of the Russian Far East* 2, 1994; keys), Wang *et al.* (*Phytopathology* 88: 376, 1998), Adams *et al.*

- (*Mycol.* 94: 947, 2002), Castlebury *et al.* (*Mycol.* 94: 1017, 2002), Adams *et al.* (*Stud. Mycol.* 52: 146 pp., 2005), Rossman *et al.* (*Mycoscience* 48: 135, 2007; phylogeny).
- Valsales** = Diaporthales.
- Valsaria** Ces. & De Not. (1863), Diaporthales. 41, widespread. See Petrak (*Sydowia* 15: 299, 1962), Glawe (*Mycol.* 77: 62, 1985; anamorphs), Ju *et al.* (*Mycotaxon* 58: 419, 1996), Waldner (*Rheinl.-Pfälz. Pilzj.* 5-6: 119, 1995).
- Valsarioxylon** Höhn. (1929) nom. nud., *Pezizomycotina*.
- Valsella** Fuckel (1870), Valsaceae. Anamorph *Cytospora*. 2 (on *Salix*), Europe. See Barr (*Mycol. Mem.* 7, 1978), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Valseutypella** Höhn. (1919), Valsaceae. Anamorph *Cytospora*. 2, Europe; N. America. See Hubbes (*Phytopath. Z.* 39: 389, 1960), Checa *et al.* (*Mycotaxon* 25: 323, 1988), Checa & Martínez (*Mycotaxon* 36: 43, 1989; anamorph).
- valsoïd**, having groups of perithecia with their beaks pointing inward (convergent), or even parallel to the surface, as in *Valsa*. Cf. eutypoid.
- Valsonectria** Speg. (1881), Hypocreales. 6 (living and dead plant tissues), widespread. See Huhndorf (*Mycol.* 84: 642, 1992), Seifert & Samuels (*Mycol.* 89: 512, 1997), Huhndorf *et al.* (*Mycol.* 96: 368, 2004; phylogeny).
- VAM fungi**, vesicular-arbuscular mycorrhizal fungi; VA fungi; see Mycorrhiza.
- Vamsapriya** Gawas & Bhat (2006), anamorphic *Pezizomycotina*. 1, Karnataka. See Gawas & Bhat (*Mycotaxon* 94: 150, 2006).
- van Tieghem cell**, a ring of glass or other material, fixed to a glass slide, over which is placed a coverglass with a 'hanging drop' of the microorganism under investigation. See Duggar (*Fungous diseases of plants*, 1909).
- Vanakripa** Bhat, W.B. Kendr. & Nag Raj (1993), anamorphic *Pezizomycotina*, Hsp.0-1eP.1. 2, India. See Bhat & Kendrick (*Mycotaxon* 49: 76, 1993), Pinnoi *et al.* (*Nova Hedwigia* 77: 213, 2003), Tsui *et al.* (*Mycol.* 95: 124, 2003), Castañeda Ruiz *et al.* (*Mycotaxon* 91: 339, 2005).
- Vanbeverwijkia** Agnihothr. (1961), anamorphic *Pezizomycotina*, Hsp.0= hH.15. 1, Assam; USA. See Agnihothrudu (*TBMS* 44: 51, 1961), Shearer & Crane (*Mycol.* 63: 249, 1971).
- Vanbreuseghemia** Balab. (1965) = *Keratinomyces*.
- Vandasias** Velen. (1922) nom. dub., ? Phallales.
- Vanderbylia** D.A. Reid (1973), Polyporaceae. 5, widespread. See Sikombwa & Pearce (*Bull. BMS* 19: 124, 1985; medicinal use *V. unguolata*), Corner (*Beih. Nova Hedwigia* 86: 241, 1987; key), Decock & Ryvarden (*Mycol.* 91: 386, 1999), Decock (*Mycol.* 93: 774, 2001; S.E. Asia), Decock & Masuka (*Systematics and Geography of Plants* 73: 161, 2003; Africa).
- Vanderwaltia** E.K. Novák & Zsolt (1961) = *Kloeckeraspora* fide Batra in Subramanian (Ed.) (*Taxonomy of fungi* 1: 187, 1978), von Arx (*Gen. Fungi Sporul. Cult.* Edn 3, 1981).
- Vanderwaltozyma** Kurtzman (2003), Saccharomycetaceae. 2, Europe; S. Africa. See Kurtzman (*FEMS Yeast Res.* 4: 242, 2003), Lopandic *et al.* (*Mycol. Progr.* 4: 205, 2005), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Vanderystiella** Henn. (1908), anamorphic *Pezizomycotina*, Cac.0eP.15. 1, Africa.
- Vanhallia** L. Marchand (1828) = *Chaetomium* fide Mussat (*Syll. fung.* 15: 449, 1901).
- Vanibandha** Manohar., N.K. Rao, Kunwar & D.K. Agarwal (2006), anamorphic *Pezizomycotina*. 1, India. See Manoharachary *et al.* (*Indian Phytopath.* 59: 212, 2006).
- Vankya** D. Ershad (2000), Urocystidaceae. 2 (on *Liliaceae*), widespread. See Bacigálová *et al.* (*Polish Botanical Journal* 50: 145, 2005).
- Vanrija** R.T. Moore (1980) = *Apiotrichum* fide Moore (*MR* 95: 639, 1991).
- Vanrija** R.T. Moore (1980) = *Cryptococcus* Vuill.
- Vanromburghia** Holterm. (1898) ? = *Marasmius* fide Singer (*Agaric. mod. Tax.* edn 2: 808, 1962).
- Vanterpoolia** A. Funk (1982), anamorphic *Pezizomycotina*, Hsp.1bH.3. 1, Canada. See Funk (*CJB* 60: 973, 1982).
- Vantieghemia** Kuntze (1891) = *Syncephalis*.
- Vanudenia** Bat. & H. Maia (1963) = *Schizothyrium* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Vararia** P. Karst. (1898), Lachnocladiaceae. 54, widespread. See Boidin & Lanquetin (*BSMF* 91: 457, 1975), Boidin & Lanquetin (*BSMF* 92: 247, 1976), Boidin & Lanquetin (*Mycotaxon* 6: 277, 1977), Pascoe *et al.* (*TBMS* 82: 723, 1984; white rot of *Rubus*), Stalpers (*Stud. Mycol.* 40: 103, 1996; key), Larsson & Larsson (*Mycol.* 95: 1037, 2003; phylogeny).
- Vargamyces** Tóth (1980), anamorphic *Pezizomycotina*, Hso.= eP.1/10. 1 (aquatic). See Gönczöl *et al.* (*Mycotaxon* 39: 301, 1990; growth and development in culture).
- Variation in fungi**, The text of this entry is unrevised and remains the same as for the ninth edition. Variation in fungi may be the result of environment and not heritable (modifications, Bauer) or may be heritable and (1) determined by the coming together or separating of heritable factors (as in combinations) or (2) not so determined (mutations). Modifications ('temporary' or 'reversible' variations, such as changes in mycelial growth and pathogenicity) frequently take place in culture, sometimes in association with non-reversible (discontinuous) variations of a mutation (saltation, dissociation) type. The composition of the medium may have an effect on frequency of saltation; *Fusarium*, for example, saltating less readily on a poor medium, *Aspergillus* more readily in a mannitol-nitrite solution.
- The polymorphic variation (Snyder & Hansen) in a species in nature may be so great that the forms are put in three, four or more genera. The existence of the 'dual phenomenon' (Hansen) in anamorphic fungi, has the effect of giving two kinds of culture.
- Lit.*: Brierley (*Proc. Int. Congr. Pl. Sci.* 2, 1929), Snyder & Hansen (*Proc. 6th Pacific Sci. Congr.* 4, 1940), Hansen (*Mycol.* 30: 242, 1938), Day (*Ann. Rev. Microbiol.* 14: 1, 1960; plant pathogenic fungi), Sugiyama (Ed.) (*Pleomorphic fungi*, 1987).
- Varicellaria** Nyl. (1858), Ochrolechiaceae (L). 3, widespread. See Erichsen (*Rabenh. Krypt.-Fl.* 9 2.2: 687, 1935; Eur.), Oshio (*J. Sci. Hiroshima Univ.* B(2) 12: 81, 1968; Japan), Schmitt *et al.* (*Bibliotheca Lichenol.* 86: 147, 2003; phylogeny), Schmitt & Lumbsch (*Mol. Phylogen. Evol.* 33: 43, 2004; chemistry, phylogeny), Lumbsch *et al.* (*Biol. J. Linn. Soc.* 89: 615, 2006), Schmitt *et al.* (*J. Hattori bot. Lab.* 100: 753, 2006; phylogeny).
- Varicellariomyces** Cif. & Tomas. (1953) = *Varicel-*

- laria fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Varicosporina** Meyers & Kohlm. (1965), anamorphic *Corollospora*, Hso.1bH.10. 2 (marine), widespread (tropical to subtropical). See Nakagiri (*TBMS* 90: 265, 1988; conidia form and function), Spatafora *et al.* (*Am. J. Bot.* 85: 1569, 1998; phylogeny), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny).
- Varicosporium** W. Kegel (1906), anamorphic *Hymenoscyphus*, Hso.1bH.1. 5, widespread. See Tubaki (*TBMS* 49: 345, 1966; teleomorph), Nawawi (*TBMS* 63: 27, 1974), Baschien *et al.* (*Nova Hedwigia* 83: 311, 2006).
- variecolin**, an anti-tubercle bacillus antibiotic from *Aspergillus variecolor* (teleomorph, *Emericella variecolor*) (Gupta & Viswanathan, *Antibiot. & Chemother* 5: 496, 1955).
- variety**, see Classification.
- Variocladium** Descals & Marvanová (1999), anamorphic *Pezizomycotina*, Hso.?.?. 1, British Isles. See Descals *et al.* (*CJB* 76: 1658, 1998).
- Variolaria** Bull. [not traced] nom. dub., ? Fungi.
- Variolaria** Gray (1821) nom. dub., Fungi.
- Variolaria** Pers. (1794) nom. rej. = *Pertusaria*.
- variolarioid**, having powdery or granular tubercles.
- Varisulcosporites** Rouse & Mustard (1997), Fossil Fungi. 1, British Columbia. See Rouse & Mustard (*Palynology* 21: 208, 1997).
- Varmasporites** Kalgutkar & Janson. (2000), Fossil Fungi, anamorphic *Ascomycota*. 1, India. See Kalgutkar & Jansonius (*AASP Contributions Series* 39: 309, 2000).
- Vascellum** F. Smarda (1958) = *Lycoperdon* Pers. See Ponce de Leon (*Fieldiana, Bot.* 32: 109, 1970; key), Smith (*Bull. Soc. linn. Lyon* num. spéc. 43: 407, 1974; N America), Homrich & Wright (*CJB* 66: 1285, 1988; S America), Kreisel (*Blyttia* 51: 125, 1993; key), Larsson & Jeppson (*MR* 112: 4, 2008; synonym of *Lycoperdon*).
- Vasculomyces** S.F. Ashby (1913), anamorphic *Pezizomycotina*, Hso.-.-. 1, West Indies. See Ciferri (*Sydowia* 8: 258, 1954).
- Vasudevella** Chona, Munjal & Bajaj (1957), anamorphic *Pezizomycotina*, Cpd.1eH.19. 1, India. See Nag Raj (*CJB* 51: 1337, 1973).
- Vavraia** J. Weiser (1977), *Microsporidia*. 6.
- vector**, an organism that carries and transmits a pathogen to the host which it attacks, such as an insect carrying fungal mycelium or spores (e.g. *Scolytus* spp. beetles transmitting *Ophiostoma novo-ulmi* to *Ulmus* trees). A **fungus** - carries a virus infection with it when moving from its existing host to a new host; some plant viruses are transmitted to new host plants by association with root-infecting fungi; the vector phase is the motile zoospores in *Olpidium* sp. transmitting *Tombusvirus* and *Necrovirus* spp. and the lettuce big vein and tobacco stunt viruses; *Polymyxa graminis*, *P. betae* and *Spongospora subterranea* transmit viruses in the genus *Furovirus*, and *P. graminis* transmit viruses in the genus *Bymovirus* (see Viruses); **plasmid** -, a plasmid constructed to include a particular gene sequence, and inserted into another fungus where its properties are expressed (see Genetic engineering).
- vegetable caterpillar**, a mummified lepidopteran larva from which arise teleomorph stromata of *Cordyceps* spp.
- vegetative**, see assimilative.
- vegetative compatibility**, the ability of vegetative hyphae to anastomose and form a stable heterokaryon. This ability is restricted genetically by the vegetative incompatibility system such that hyphae differing at one or more loci, termed 'vegetative compatibility' (vc) or 'heterokaryon compatibility' (het) loci, are unable to form a stable heterokaryon. Mycelia sharing the same vc loci belong to the same vegetative compatibility group (vcg). Vcg's have been used to determine genetic structures of fungal populations. In most fungi, the vegetative compatibility system is independent of the mating system, which controls sexual compatibility (see sex).
- Lit.*: Anagnostakis (*Exp. Mycol.* 1: 306, 1977), Beadle & Coonradt (*Genetics* 29: 291, 1944), Brayford (*MR* 94: 745, 1990), Carlisle (*in* Rayner *et al.* (Eds), *Evolutionary biology of the fungi*, 1987), Caten (*J. Gen. Microbiol.* 72: 221, 1972), Coates *et al.* (*TBMS* 76: 41, 1981), Leslie (*Ann. Rev. Phytopath.* 31: 127, 1993), Mylyk (*Genetics* 83: 275, 1976), Puhalla (*CJB* 63: 179, 1985), Todd & Rayner (*Sci. Progress Oxford* 66: 331, 1980).
- veil**, see annulus (apical -, hymenial -), cortina, marginal -, partial - (inner -), pellicular -, protoblem (primordial -), universal -.
- veins** (of lichens), strands of tissue on the lower surface of foliose lichens, esp. *Peltigera* where they may replace a lower cortex. Gyelnik (*Bot. Közlemén.* 24: 122, 1927) distinguished 2 types: **caninoid** - where the strands are separated to the tips of the lobes; **polydactyloid** - where the strands are confluent towards the tips of the lobes. Maas Geesteranus also recognized **malaceoid** -, where the undersurface has a few whitish interstices faintly indicating venation.
- velar**, pertaining to a veil.
- Velenovský** (Josef; 1858-1949; Czech). Extraordinary Professor of Phytopathology (1892) then Professor of Phytopathology & Plant Systematics (1898-1927) and Director of Botanic Garden of Charles University (1900-1927), Charles University, Prague. Expert on discomycetes. *Publs. České Houby*. 5 parts (1920-1922); *Monographia Discomycetum Bohemiae* 2 vols (1934). Work. *Biogs, obits etc.* Lloyd (*Mycological Notes by C.G. Lloyd* 75: 1349, 1925); Pilát (*Česká Mykologie* 3: 65, 1949, portrait) [in Czech]; Kotlaba & Skalický (*Preslia* 30: 327, 1938).
- Veligaster** Guzmán (1970) = *Scleroderma* fide Demoulin & Dring (*Bull. Jard. bot. nat. Belg.* 45: 343, 1975).
- Vellosiella** Rangel (1915) [non *Vellosiella* Baill. 1887, *Scrophulariaceae*] ≡ *Mycovellosiella*.
- Velolentinus** Overeem (1927) nom. nud. = *Panus* fide Pegler (*Kew Bull. Addit. Ser.* 10, 1983).
- Velomycena** Pilát (1953) = *Galerina* fide Singer (*Agaric. mod. Tax.* edn 3, 1975).
- Veloporphyrellus** L.D. Gómez & Singer (1984), *Boletaceae*. 1, C America. See Gómez & Singer (*Brenesia* 22: 293, 1984), Watling & Turnbull (*Edinb. J. Bot.* 49: 343, 1993; South and East Central Africa).
- Veloporus** Qué. (1888) = *Boletus* Fr. fide Killermann *in* Engler & Prantl (*Naturl. Pflanzenfam.* 2, 1928).
- velum**, see veil.
- Velutaria** Fuckel (1870), *Hyaloscyphaceae*. 1, Europe. See Korf (*Mycol.* 45: 298, 1953).
- Velutarina** Korf ex Korf (1971), *Helotiaceae*. 2, widespread. See Korf ex Korf (*Phytologia* 21: 201, 1971), Zhuang *et al.* (*Mycosystema* 19: 478, 2000; phylogeny).

- Veluticeps** (Cooke) Pat. (1894), Gloeophyllaceae. 9, widespread. *V. berkeleyi* (wood rot of *Pinus*). See Gilbertson *et al.* (*Mycol.* 60: 29, 1968), Hjortstam & Telleria (*Mycotaxon* 37: 53, 1990), Nakasone (*Mycol.* 82: 622, 1990; key), Nakasone (*Sydowia* 56: 258, 2004).
- velutinate** (velutinous), thickly covered with delicate hairs; like velvet; see phalacrogenous.
- Velutipila** D. Hawksw. (1987), anamorphic *Pezizomycotina*, Hso.0fH.10. 1 (on *Algae*), Austria. See Hawksworth (*Notes R. bot. Gdn Edinb.* 44: 555, 1987).
- Venenarius** Earle (1909) = *Amanita* Pers.
- venose**, having veins.
- ventral**, front, or lower surface; the surface facing the axis, cf. dorsal; frequently used for the lower surface of foliose lichens.
- ventricose**, swelling out in the middle or at one side; inflated (Fig. 23.38).
- Ventrographium** H.P. Upadhyay, Cavalc. & A.A. Silva (1986), anamorphic *Pezizomycotina*, Hsy.0fH.15. 1, Brazil. See Upadhyay *et al.* (*Mycol.* 78: 494, 1986).
- Venturia** De Not. (1844) nom. rej. = *Protoventuria*.
- Venturia** Sacc. (1882) nom. cons., Venturiaceae. Anamorph *Fusicladium*. 57, widespread. *V. cerasi* (cherry scab), *V. chlorospora* (willow (*Salix*) scab and canker), *V. inaequalis* (apple scab), *V. pirina* (pear scab) (see *Fusicladium*). See Sivanesan (*Bibliotheca Mycol.* 59, 1977; key), Morelet (*Cryptog. Mycol.* 6: 101, 1985; key 10 spp. on *Populus*), Barr (*Sydowia* 41: 25, 1989; key 39 N. Am. spp.), Schnabel *et al.* (*Phytopathology* 89: 100, 1999; DNA), Tenzer & Gessler (*Eur. J. Pl. Path.* 105: 545, 1999; mol. var.), Ishii & Yanase (*MR* 104: 755, 2000; spp. on pears), Kasanen *et al.* (*MR* 105: 338, 2001; on *Populus*), Stehmann *et al.* (*Phytopathology* 91: 633, 2001; genetics), Ahlholm *et al.* (*Evolution* Lancaster, Pa. 56: 1566, 2002; genetic diversity), Newcombe (*MR* 107: 108, 2003; on *Populus*), Beck *et al.* (*Mycol. Progr.* 4: 111, 2005; phylogeny), Spatafora *et al.* (*Mycol.* 98: 1018, 2006; phylogeny), Crous *et al.* (*Stud. Mycol.* 58: 185, 2007; phylogeny), Winton *et al.* (*Mycol.* 99: 240, 2007; phylogeny).
- Venturiaceae** E. Müll. & Arx ex M.E. Barr (1979), Pleosporales. 36 gen. (+ 48 syn.), 306 spp.
Lit.: Fischer (*Rabenh. Krypt.-Fl.* 4 2.1: 25, 1892), Barr (*CJB* 46: 799, 1968; N. Am.), Sivanesan (*Bitunicate Ascomycetes and their Anamorphs*, 1984), Sivanesan (*Bitunicate Ascomycetes and their Anamorphs*: 700 pp., 1984), Barr (*Prodr. Cl. Loculoasc.*, 1987), Samuels *et al.* (*Brittonia* 40: 392, 1988), Barr (*Sydowia* 41: 25, 1989; keys 12 gen. N. Am.), Hughes & Arnold (*Mem. N. Y. bot. Gdn* 49: 198, 1989), Pascoe & Sutton (*Aust. Syst. Bot.* 3: 281, 1990), Carris & Poole (*Mycol.* 85: 93, 1993), Hughes & Seifert (*Sydowia* 50: 192, 1998), Schnabel *et al.* (*Phytopathology* 89: 100, 1999), Tenzer & Gessler (*Eur. J. Pl. Path.* 105: 545, 1999), Untereiner & Naveau (*Mycol.* 91: 67, 1999), Ishii & Yanase (*MR* 104: 755, 2000), Braun *et al.* (*Mycol. Progr.* 2: 8, 2003), Newcombe (*MR* 107: 108, 2003), Crous *et al.* (*Stud. Mycol.* 58: 185, 2007; phylogeny).
- Venturiella** Speg. (1909) [non *Venturiella* Müll. Hal. 1875, *Musci*] = *Neoventuria*.
- Venturiocistella** Raitv. (1978), Hyaloscyphaceae. 7, widespread. See Baral (*Z. Mykol.* 59: 3, 1993; key), Hosoya & Harada (*Mycoscience* 40: 401, 1999), Raitviir (*Scripta Mycologica Tartu* 20, 2004; key).
- Venturiola**.
- Venularia** Pers. (1822) nom. nud., ? Fungi.
- Venustisporium** R.F. Castañeda & Iturr. (1999), anamorphic *Pezizomycotina*, Hso.???. 1, Venezuela. See Castañeda-Ruiz & Iturriaga (*Mycotaxon* 72: 455, 1999).
- Venustocephala** Matsush. (1995), anamorphic *Pezizomycotina*, Hso.0eH.9. 1, Ecuador. See Matsushima (*Matsush. Mycol. Mem.* 8: 41, 1995).
- Venustosynnema** R.F. Castañeda & W.B. Kendr. (1990), anamorphic *Pezizomycotina*, Hsy.0eH.15. 1, Cuba. See Castañeda & Kendrick (*Univ. Waterloo Biol. Ser.* 32: 45, 1990).
- Veracruzomyces** Mercado, Guarro, Heredia & J. Mena (2002), anamorphic *Pezizomycotina*. 1, Mexico. See Mercado-Sierra *et al.* (*Nova Hedwigia* 75: 534, 2002).
- Veralucia** D.R. Reynolds & P.H. Dunn (1982) = *Cephaleuros* fide Reynolds & Dunn (*Mycol.* 76: 719, 1984).
- Veramyces** Matsush. (1993), anamorphic *Pezizomycotina*, Hso. = eP.3/10. 1, Peru. See Matsushima (*Matsush. Mycol. Mem.* 7: 71, 1993).
- Veramyces** Subram. (1993) [non *Veramyces* Matsush. 1993, anamorphic Ascomycota] nom. inval. = *Veramycina* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Veramycina** Subram. (1995), anamorphic *Chaetosphaerella*, Hso.0eH.15. 1, Himalaya. See Subramanian (*Kavaka* 20/21: 58, 1992/1993), Réblová (*Mycotaxon* 70: 387, 1999).
- Verdipulvinus** A.W. Ramaley (1999), anamorphic *Pezizomycotina*, Hso.???. 1, USA. See Ramaley (*Mycol.* 91: 132, 1999).
- Verlandea** Bat. & Cif. (1957) = *Stomiopeltis* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Verlotia** Fabre (1879) = *Heptameria* fide Lucas & Sutton (*TBMS* 57: 283, 1971).
- Vermicularia** Tode (1790) [non *Vermicularia* Moench 1802, *Verbenaceae*] = *Colletotrichum* fide Duke (*TBMS* 13: 156, 1928), Sutton in Bailey & Jeger (Eds) (*Colletotrichum: biology, pathology and control*, 1992).
- Vermiculariella** Oudem. (1898) nom. conf., Fungi. See Petrak (*Annls mycol.* 42: 58, 1944).
- Vermiculariopsiella** Bender (1932), anamorphic *Echinospaeria*, Hsp.0eH.15. 10, widespread. See Nawawi *et al.* (*Mycotaxon* 37: 173, 1990; key), Mel'nik (*Mikol. Fitopatol.* 33: 169, 1999), Puja *et al.* (*Cryptog. Mycol.* 27: 11, 2006; teleomorph).
- Vermiculariopsis** Höhn. (1918) = *Vermiculariopsiella*.
- Vermiculariopsis** Torrend (1912) nom. conf., anamorphic *Pezizomycotina*. See Sutton (*Mycol. Pap.* 141, 1977).
- vermiform**, worm-like.
- Vermilacinia** Spjut & Hale (1995) ? = *Ramalina* fide Aptroot (*in litt.*).
- Vermispora** Deighton & Piroz. (1972), anamorphic *Pezizomycotina*, Hso. = eH.10. 4 (on *Irenopsis*), widespread. See Deighton & Pirozynski (*Mycol. Pap.* 128: 87, 1972), Burghouts & Gams (*Mem. N. Y. bot. Gdn* 49: 57, 1989), Rajashekhar *et al.* (*Mycol.* 83: 230, 1991).
- Vermisporium** H.J. Swart & M.A. Will. (1983), anamorphic *Pezizomycotina*, Cac.0fH.19. 14, widespread. See Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993).

- Veronaea** Cif. & Montemart. (1957), anamorphic *Pezizomycotina*, Hso.1eP.10. 24 (parasitic on plants, also from humans), widespread. See Ellis (*More Dermatiaceous Hyphomycetes*, 1976; key), de Hoog *et al.* (*TBMS* 81: 485, 1983; relationship to *Ramichloridium*), Wang *et al.* (*Acta Mycol. Sin.* 10: 159, 1991; *V. botryosa* from humans), Matsushita *et al.* (*J. Clin. Microbiol.* 41: 2219, 2003; China), Sutton *et al.* (*J. Clin. Microbiol.* 42: 2843, 2004; USA).
- Veronaella** Subram. & K.R.C. Reddy (1975), anamorphic *Pezizomycotina*, Cpt.1bH.10. 1, India. See Subramanian & Reddy (*Kavaka* 2: 27, 1974).
- Veronaopsis** Arzanlou & Crous (2007), anamorphic *Venturiaceae*. 1, S. Africa. See Arzanlou *et al.* (*Stud. Mycol.* 58: 57, 2007), Crous *et al.* (*Stud. Mycol.* 58: 185, 2007; phylogeny).
- Veronaia** Benedek (1961), Eurotiales. 3, widespread. See Benedek (*Mycopathologia* 14: 115, 1961).
- Veronidia** Negru (1964), anamorphic *Pezizomycotina*, Cpd.0eH.?. 1, Rumania. See Negru (*Mycopath. Mycol. appl.* 23: 241, 1964).
- Verpa** Sw. (1815), Morchellaceae. c. 5, widespread (north temperate). See O'Donnell *et al.* (*Mycol.* 89: 48, 1997; phylogeny), Wipf *et al.* (*Can. J. Microbiol.* 45: 769, 1999; ITS diversity), Hansen *et al.* (*Mycol.* 93: 958, 2001; phylogeny).
- Verpatinia** Whetzel & Drayton (1945) = *Scleromitrlula* fide Schumacher & Holst-Jensen (*Mycoscience* 38: 55, 1997).
- verruca** (pl. *verrucae*), a wart-like swelling.
- Verrucaria** Weber ex F.H. Wigg. (1780) = *Lecanora* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Verrucaria** Schrad. (1794) nom. cons., Verrucariaceae (L). c. 387 (some on lichens), widespread (esp. north temperate). See Swinscow (*Lichenologist* 4: 34, 1968; freshwater spp.), Fletcher (*Lichenologist* 7: 1, 1975; coastal spp.), Zehetleitner (*Nova Hedwigia* 29: 683, 1978; spp. on lichen spp.), Navarro-Rosinés & Roux (*Bull. Soc. linn. Provence* 39: 129, 1988; key 8 spp. on lichens), Hawksworth (*Lichenologist* 21: 23, 1989; Brit., aquatic), McCarthy (*Lichenologist* 27: 105, 1995; aquatic, Australia), Breuss (*Linzer biol. Beitr.* 30: 831, 1998; key corticolous & lichenicolous spp.), Bermúdez (*Clementeana* 4: 52, 1999; key Galician spp.), Hoffmann & Hafellner (*Biblthca Lichenol.* 77: 1, 2000), McCarthy (*Lichenologist* 34: 207, 2002; Australia), Aragón & Sarrión (*Nova Hedwigia* 77: 169, 2003; Spain), Halda (*Acta Musei Richnoviensis* Sect. Natur. 10, 2003; calcicolous spp.), Orange (*Lichenologist* 36: 173, 2004; GB, Ireland), Sparrius (*Biblthca Lichenol.* 89: 141 pp., 2004), Schmitt *et al.* (*Mycol.* 97: 362, 2005; phylogeny), Geiser *et al.* (*Mycol.* 98: 1053, 2006; phylogeny), Gueidan *et al.* (*MR* 111: 1145, 2007; phylogeny).
- Verrucaria** Scop. (1777) nom. rej. = *Dibaeis* fide Gierl & Kalb (*Herzogia* 9: 593, 1993).
- Verrucariaceae** Zenker (1827), Verrucariales (±L). 46 gen. (+ 98 syn.), 931 spp.
Lit.: Thomson (*Bryologist* 90: 27, 1987), Aptroot (*Willdenowia* Beih. 21: 263, 1991), Thomson (*Bryologist* 94: 351, 1991), Ménard & Roux (*Mycotaxon* 53: 129, 1995), Breuss (*Annln naturh. Mus. Wien* Ser. B, Bot. Zool. 98: 35, 1996), Breuss (*Öst. Z. Pilzk.* 5: 65, 1996), Harada (*Hikobia* 12: 133, 1996), Breuss (*Annln naturh. Mus. Wien* Ser. B, Bot. Zool. 100: 671, 1998), Grube (*Nova Hedwigia* 68: 241, 1999), Hyde & Wong (*MR* 103: 347, 1999), Heiðmarsson (*MR* 107: 459, 2003), Andjic *et al.* (*MR* 111: 1184, 2007; phylogeny).
- Verrucariales** Mattick ex D. Hawksw. & O.E. Erikss. (1986), (±L). Chaetothyriomycetidae. 2 fam., 54 gen., c. 1032 spp. Thallus usually crustose, rarely squamulose or umbilicate, rarely absent. Ascomata perithecial, ± globose, sometimes strongly aggregated, ± superficial or immersed, usually black, thin-walled, sometimes clypeate. Interascal tissue of gelatinized pseudoparaphysis-like hyphae, often evanescent and sometimes altogether absent, the ostiole periphysate. Asci clavate, thin-walled, sometimes with two layers visible near the apex but these not separable, sometimes blueing in iodine, persistent or evanescent. Ascospores usually ellipsoidal, aseptate to muriform, hyaline or brown. Anamorphs pycnidial. Lichenized with green algae, a few lichenicolous or saprobic, cosmop. Fams:
- (1) **Adelococcaceae**
 - (2) **Verrucariaceae**
- The *Dermatocarpaceae* are sometimes treated as distinct (e.g. Wanger, *CJB* 65: 2441, 1987). Gen. concepts still largely based on ascospore colour and septation and in need of a modern revision taking into account ascomatal structure etc.
- Lit.*: Doppelbauer (*Planta* 53: 246, 1959; ontogeny), Geiser *et al.* (*Mycol* 98: 1051, 2006), Grube (*Nova Hedwigia* 68: 241, 1999; asci), Janex-Favre (1970), McCarthy (*Muelleria* 7: 317, 1991; Australia), Servít (*Československé lišejníky čelidi Verrucariaceae*, 1954), Swinscow (*Lichenologist* 1-5, 1960-71; many papers, UK).
- Verrucariella** S. Ahmad (1967), anamorphic *Pezizomycotina*, Cpd.1eP.?. 1, Pakistan. See Ahmad (*Biologia Lahore* 13: 41, 1967).
- Verrucarina** (Hue) Zahlbr. (1931) = *Coccotrema* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- verrucarioid** (of asci), see ascus.
- Verrucariomyces** E.A. Thomas ex Cif. & Tomas. (1953) = *Verrucaria* Schrad. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Verrucarites** Göpp. (1845), Fossil Fungi, Ascomycota (?L). 2 (Tertiary), Europe. See Watelet (*Descr. Pl. Foss.*, 1866).
- Verrucaster** Tobler (1912) nom. dub., anamorphic *Pezizomycotina*. See Hawksworth (*Bull. Br. Mus. nat. hist. Bot.* 9: 88, 1981).
- Verrucispora** D.E. Shaw & Alcorn (1967) [non *Verrucospora* E. Horak, 3 Aug. 1967] ≡ *Verrucisporota*.
- Verrucisporota** D.E. Shaw & Alcorn (1993), anamorphic *Mycosphaerellaceae*, Hso.≡ eP.10. 2, Australia; Papua New Guinea. See Shaw & Alcorn (*Aust. Syst. Bot.* 6: 273, 1993), Beilharz & Pascoe (*Mycotaxon* 82: 357, 2002), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003).
- Verrucobotrys** Hennebert (1973), anamorphic *Seaverinia*, Hso.0eP.7. 1, N. America. See Hennebert (*Persoonia* 7: 193, 1973).
- Verrucocladosporium** K. Schub., Aptroot & Crous (2007), anamorphic *Capnodiales*. 1 (lichenicolous), British Isles. See Crous *et al.* (*Stud. Mycol.* 58: 33, 2007).
- Verrucophragmia** Crous, M.J. Wingf. & W.B. Kendr. (1994), anamorphic *Pezizomycotina*, Hso.≡ eP.10. 1, S. Africa. See Crous *et al.* (*Mycol.* 86: 448, 1994).
- verrucose**, having small rounded processes or 'warts'

- (Fig. 20.7).
- Verrucospora** E. Horak (1967), Agaricaceae. 2, Africa (tropical). See Horak (*Ber. schweiz. bot. Ges.* 77: 363, 1967), Pegler (*Kew Bull. Addit. Ser.* 6: 384, 1977).
- Verrucosporaceae** Jülich (1982) = Agaricaceae.
- Verrucula** J. Steiner (1896), Verrucariaceae (L). 20 (lichenicolous). See Gueidan *et al.* (*MR* 111: 1145, 2007; phylogeny), Navarro-Rosinés *et al.* (*Bull. Soc. linn. Provence* 38: 133, 2007; key).
- Verruculina** Kohlm. & Volkm.-Kohlm. (1990), Testudinaceae. 1 (marine), Liberia. See Kohlmeyer & Volkmann-Kohlmeyer (*MR* 94: 685, 1990), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Verruculopsis** Gueidan, Nav.-Ros. & Cl. Roux (2007), Verrucariaceae ($\pm$ L). 3 (sometimes lichenicolous), Europe. See Navarro-Rosinés *et al.* (*Bull. Soc. linn. Provence* 38: 133, 2007).
- verruculose**, delicately verrucose (Fig. 20.6).
- verruculotoxin**, a tremorgenic toxin from *Penicillium verruculosum* (Cole *et al.*, *Toxicol. appl. Pharmacol.* 31: 465, 1975).
- Versicolorisporium** Sat. Hatak., Kaz. Tanaka & Y. Harada (2008), anamorphic *Pezizomycotina*. 1, Japan. See Hatakeyama *et al.* (*Mycoscience* 49: 211, 2008).
- versiform**, of different forms; changing form with age.
- Versiomyces** Whalley & Watling (1989) = *Daldinia* fide Læssøe (*SA* 13: 43, 1994).
- Versipellis** Qué. (1886) nom. rej. $\equiv$ *Boletus* Fr.
- vertex** (1) the top of an organ; (2) pileus (obsol.).
- Verteicicola** K.D. Hyde, V.M. Ranghoo & S.W. Wong (2000), Annulatascaceae. 1, Philippines; Hong Kong. See Hyde *et al.* (*Mycol.* 92: 1019, 2000).
- Verticicliadiella** S. Hughes (1953) = *Leptographium* fide Kendrick (*CJB* 40: 771, 1962), Wingfield (*TBMS* 85: 81, 1985), Harrington (*Leptographium Root Diseases on Conifers*: 1, 1988).
- Verticicladium** Preuss (1851), anamorphic *Desmazierella*, Hso.0eP.10. 1, Europe. See Hughes (*Mycol. Pap.* 43, 1951).
- Verticicladus** Matsush. (1993), anamorphic *Pezizomycotina*, Hso. $\equiv$ eP.1. 1, Peru. See Matsushima (*Matsush. Mycol. Mem.* 7: 71, 1993).
- verticillate**, having parts in rings (**verticils**); whorled.
- Verticilliacae** Nann. (1934) = *Plectosphaerellaceae*.
- Verticilliastrum** Dasz. (1912) ? = *Trichoderma* Pers. (1794) fide Sutton (*in litt.*).
- Verticilliodochium** Bubák (1914) = *Clonostachys* fide Schroers *et al.* (*Mycol.* 91: 365, 1999).
- Verticilliosis** Costantin (1892) nom. dub., anamorphic *Pezizomycotina*. See Gams (*Cephalosporium-artige Schimmelpilze*: 18, 1971).
- Verticillis** Clem. & Shear (1931) $\equiv$ *Verticilliodochium*.
- Verticillium** Nees (1816), anamorphic *Plectosphaerellaceae*, Hso.0eH.15. 51, widespread. *V. alboatrum* and *V. dahliae* cause wilt disease (hadromycosis) in many plants. See also *Lecanicillium*. See Rudolph (*Hilgardia* 5: 197, 1931; host list), Isaac (*TBMS* 32: 137, 1949), Rudolph (*Plant Dis. Reprtr Suppl.* 244, 1957), Rudolph (*Plant Dis. Reprtr Suppl.* 255, 1959; deciduous fruit trees), Isaac (*Ann. Rev. Phytopath.* 5: 201, 1967; speciation), Isaac (*IMI Descr. Fungi Bact.* 255-256, 1970), Anon. (*IMI Descr. Fungi Bact.* 498, 1976), Gams & van Zaayen (*Neth. JI Pl. Path.* 88: 57, 1982; fungicolous spp., keys sects., 9 spp.), Evans & Samson (*Fundamental and Applied Aspects of Invertebrate Pathology*: 186, 1986; spp. taxonomy on invertebrate hosts), Gams (*Neth. JI Pl. Path.* 94: 123, 1988; key to 9 nematophagous spp.), Heale *in* Ingram & Williams (Eds) (*Advances in Plant Pathology* 6: 291, 1988; vascular wilt spp.), Carder (*MR* 92: 297, 1989; cellulase isoenzyme patterns of 5 spp.), Chen & Fu (*Acta Mycol. Sin.* 8: 123, 1989), Carder & Barbara (*MR* 95: 935, 1991; RFLPs in 6 spp.), Jun *et al.* (*J. Gen. Microbiol.* 137: 1437, 1991; integrated taxonomic approaches), Typas *et al.* (*FEMS Microbiol. Lett.* 95: 157, 1992; RFLP analysis), Williams *et al.* (*Mycopathologia* 119: 101, 1992; biochemical and physiological aids ident. sect. *Nigrescentia*), Okoli *et al.* (*Pl. Path.* 43: 33, 1994; RFLPs and host adaptation), Morton *et al.* (*MR* 99: 257, 1995; rRNA intergenic regions in *V. alboatrum* and *V. dahliae*), Rowe (*Phytoparasitica* 23: 31, 1995; relationships between spp. and subspp. groups), Elena & Paplomatas (*Pl. Path.* 47: 635, 1998; VCGs), Bidochka *et al.* (*Microbiology Reading* 145: 955, 1999; phylogeny), Koralev & Katan (*MR* 103: 65, 1999; VCGs), Zhu *et al.* (*Mycosystema* 18: 366, 1999; Australia), Pramateftaki *et al.* (*Fungal Genetics Biol.* 29: 19, 2000; DNA), Zare *et al.* (*Nova Hedwigia* 71: 465, 2000; phylogeny), Gams & Zare (*Nova Hedwigia* 72: 329, 2001), Korolev *et al.* (*Eur. J. Pl. Path.* 107: 443, 2001; genetic diversity), Sung *et al.* (*Nova Hedwigia* 72: 311, 2001; phylogeny), Mahuku & Platt (*Molecular Plant Pathology* 3: 71, 2002; genetic variation), Collins *et al.* (*Phytopathology* 93: 364, 2003; genetic diversity), Zare (*Rostaniha* 4: 37, 2003; review), Zare *et al.* (*MR* 108: 576, 2004), Collins *et al.* (*Pl. Path.* 54: 549, 2005; genetic diversity), Gams *et al.* (*Taxon* 54: 179, 2005; nomencl.), Pantou *et al.* (*Curr. Genet.* 50: 125, 2006; mitochondrial genome), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny), Zare *et al.* (*Nova Hedwigia* 85: 463, 2007).
- Verticimonosporium** Matsush. (1971), anamorphic *Pezizomycotina*, Hso.0eH.15. 2, E. & S.E. Asia. See Matsushima (*Microfungi of the Solomon Islands and Papua-New Guinea*: 68, 1971), Wang *et al.* (*Mycotaxon* 92: 197, 2005; China).
- Vertixore** V.A.M. Mill. & Bonar (1941) = *Aithaloderma* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Vesicliadiella** Crous & M.J. Wingf. (1994), anamorphic *Bionectriaceae*, Hsp.0eH.15. 1, Australia. See Crous *et al.* (*Mycotaxon* 50: 454, 1994).
- vesicle** (1) a bladder-like sac; (2) (of *Aspergillus*), the swollen apex of the conidiophore; (3) (of *Pythium*), the evanescent extra-sporangial structure in which zoospores are differentiated; **homohylic** -, sporangial vesicle, the wall of which is continuous with, and of the same material as the wall layer, or one of the wall layers of the sporangium; **vesiculose**, made from or full of vesicles.
- vesicular bodies**, thin-walled vesicles in the subhymenium of certain hymenomycetes (mostly *Thelephoraceae*) (Overholts); vesicular-arbuscular type of mycorrhiza, see Mycorrhiza.
- Vesicularia** I. Schmidt (1974) [non *Vesicularia* P. Micheli ex Targ. Tozz. 1826, *Algae*] = *Basramyces* fide Piaggio (*Cryptog. Mycol.* 10: 173, 1989), Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Vesiculomyces** E. Hagstr. (1977) = *Gloiothele* fide Ginns & Freeman (*Bibliotheca Mycol.* 157, 1994).
- Vestergrenia** (Sacc. & Syd.) Died. (1913) = *Phomopsis* (Sacc.) Bubák. fide Sutton (*Mycol. Pap.* 141, 1977).

- Vestergrenia** Rehm (1901), ? Dothideaceae. 10, widespread. See von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954), Pawar & Kapoor (*Indian Phytopath.* 40: 435, 1988; Indian spp.).
- Vestergrenopsis** Gyeln. (1940), Placynthiaceae (L). 2, widespread. See Henssen (*CJB* 41: 1359, 1963), Jørgensen (*J. Jap. Bot.* 76: 50, 2001; Japan).
- Vestigium** Piroz. & Shoemaker (1972), anamorphic *Pezizomycotina*, Cac.1bH.1. 1, USA. See Pirozynski & Shoemaker (*CJB* 50: 1163, 1972).
- Veterinary mycology**, see Medical mycology.
- Vezdaea** Tscherm.-Woess & Poelt (1976), Vezdaeaceae ($\pm$ L). 11, Europe. See Poelt & Döbbeler (*Bot. Jb.* 96: 328, 1975), Giralt *et al.* (*Herzogia* 9: 715, 1993; key 10 spp.), Scheidegger (*Cryptog. Bot.* 5: 163, 1995; reproductive strategy).
- Vezdaeaceae** Poelt & Vězda ex J.C. David & D. Hawksw. (1991), Lecanorales ($\pm$ L). 1 gen., 11 spp.
Lit.: Coppins (*Lichenologist* 19: 167, 1987), Hawksworth (*J. Linn. Soc. Bot.* 96: 3, 1988), Giralt *et al.* (*Herzogia* 9: 715, 1993), Scheidegger (*Cryptog. bot.* 5: 163, 1995).
- viable**, living; able to make growth.
- Vialaea** Sacc. (1896), Vialaeaceae. 2 (twigs etc.), widespread. See Redlin (*Sydowia* 41: 296, 1989), Cannon (*MR* 99: 367, 1995).
- Vialaeaceae** P.F. Cannon (1995), Sordariomycetes (inc. sed.). 1 gen. (+ 1 syn.), 2 spp.
Lit.: Redlin (*Sydowia* 41: 296, 1989), Cannon (*MR* 99: 367, 1995).
- Vialina** Curzi (1935) = *Phoma* Sacc. fide Sutton (*Mycol. Pap.* 141, 1977).
- Vibrissea** Fr. (1822), Vibrisseaceae. Anamorph *Anavirga*. c 30 (aquatic or semiaquatic), widespread. See Sánchez & Korf (*Mycol.* 58: 733, 1966; sects.), Sánchez (*J. Agric. Univ. Puerto Rico* 51: 79, 1967), Beaton & Weste (*TBMS* 69: 323, 1977; Australia), Sherwood (*Mycotaxon* 5: 1, 1977; posn), Korf (*Mycosystema* 3: 19, 1991; concept), Iturriaga (*Mycotaxon* 54: 1, 1995), Iturriaga (*Mycotaxon* 61: 215, 1997), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny, polyphyly), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006; phylogeny).
- Vibrisseaceae** Korf (1990), Helotiales. 6 gen. (+ 5 syn.), 59 spp.
Lit.: Baral (*Z. Mykol.* 53: 119, 1987), Hamad & Webster (*Sydowia* 40: 60, 1987), Kohn (*Mem. N. Y. bot. Gdn* 49: 112, 1989), Korf (*Mycosystema* 3: 19, 1991; concept), Iturriaga (*Mycotaxon* 61: 215, 1997), Wang *et al.* (*Am. J. Bot.* 92: 1565, 2005), Wang *et al.* (*Mycol.* 98: 1065, 2006; phylogeny), Wang *et al.* (*Mol. Phylogen. Evol.* 41: 295, 2006).
- victorin**, a toxin from *Drechslera victoriae* which induces symptoms of leaf blight of oats.
- victotoxinine**, a constituent of victorin (Pringle & Brown, *Nature* 181: 1205, 1958, *Phytopath.* 50: 324, 1960).
- Viégas** (Ahmés Pinto; 1906-1986; Brazil). Born in Piracicaba, São Paulo; graduated in agronomy, ESALQ-Piracicaba (1932); PhD, Cornell University, New York, USA (1938). Made important contributions to the study of fungi, particularly microfungi, from the Atlantic forests of Brazil, incl. 12 gen. nov.; also linguist. *Publs. Índice dos Fungos da América do Sul* (1961); *Dicionário de Fitopatologia e Micologia* (1979); also see papers in *Bragantia* 3-19 (1943-1960). *Biogs, obits etc.* Anon. (*Summa Phytopathologica* 13: iv, 1987); Grumann (1974: 772).
- Viegasella** Inácio & P.F. Cannon (2003), Parmulariaceae. 1, Brazil. See Inácio & Cannon (*MR* 107: 82, 2003).
- Viegasia** Bat. (1951), Asterinaceae. 4, America (tropical); Africa. See Batista (*Bol. Secr. Agric. (Pernambuco)* 18: 32, 1951).
- Viennotideia**, see *Viennotidia*.
- Viennotidia** Negru & Verona ex Rogerson (1970) = *Sphaeronaemella* fide Hawksworth & Cannon (*J. Linn. Soc. Bot.* 84: 115, 1982; key), Hutchinson & Reid (*N.Z. Jl Bot.* 26: 63, 1988), Dissing in Hawksworth (Ed.) (*Ascomycete Systematics. Problems and Perspectives in the Nineties* NATO ASI Series vol. 269 269: 375, 1994; status), Hausner & Reid (*CJB* 82: 752, 2004; phylogeny).
- Viennotiella** Negru (1964) ? = *Heteropatella* fide Sutton (*Mycol. Pap.* 141, 1977).
- villi** (sing. **villus**), long soft hairs.
- villose** (**villous**), covered with villi, which are not matted; cf. tomentose.
- Vinculum** R.Y. Roy, R.S. Dwivedi & P.K. Khanna (1965) = *Barnettella* fide Rao & Rao (*Indian Phytopath.* 26: 233, 1973).
- vinescent**, turning wine-red.
- violet root rot**, of a number of plants (*Helicobasidium purpureum*).
- virescent**, turning green.
- Virgaria** Nees (1816), anamorphic *Ascovirgaria*, Hso.0eP.10. 1, widespread. See Rogers & Ju (*CJB* 80: 478, 2002; teleomorph).
- Virgariella** S. Hughes (1953), anamorphic *Pezizomycotina*, Hso.0eP.10. 11, widespread. See Sutton (*Sydowia* 44: 321, 1993; related genera), Delgado-Rodríguez & Mena-Portales (*Cryptog. Mycol.* 24: 153, 2003; Cuba).
- Virgasporium** Cooke (1875) = *Cercospora* Fresen. fide Saccardo (*Syll. fung.* 4: 435, 1886).
- virgate**, banded; streaked.
- Virgatospora** Finley (1967), anamorphic *Pezizomycotina*, Hsy. $\equiv$ eP.?. 2, Panama. See Finley (*Mycol.* 59: 538, 1967).
- Virgella** Darker (1967), Rhytismataceae. 1, N. America. See Darker (*CJB* 45: 1419, 1967).
- Viridiannula** Etayo (2002), *Pezizomycotina*. 1.
- viridin**, an antibiotic from *Gliocladium virens*; antifungal (Brian *et al.*, *Ann. appl. Biol.* 33: 190, 1946).
- Viridispora** Samuels & Rossman (1999), Nectriaceae. Anamorph *Penicillifer*. 4 (bark, wood etc.), widespread (tropical). See Rehner & Samuels (*CJB* 73 Suppl. 1: S816, 1995; phylogeny), Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999), Rossman *et al.* (*Mycol.* 93: 100, 2001; phylogeny), Samuels *et al.* (*CBS Diversity Ser.* 4, 2006; USA).
- virose** (1) poisonous; (2) having a strong and unpleasant smell.
- virulence**, the degree or measure of pathogenicity; **virulent**, strongly pathogenic.
- Viruses in fungi** (mycoviruses). The text of this entry is unrevised and remains the same as for the ninth edition. Many fungi are infected by viruses which typically have double-stranded RNA genomes but 'mycoviruses' with DNA or single-stranded RNA genomes are also known. Those viruses so far classified are in the families *Barnaviridae* (gen. *Barnavirus*) and *Totiviridae* (gen. *Totivirus*) or the genus *Rhizidiovirus*. Unclassified viruses are known which infect fungi in the genera *Agaricus*, *Allomyces*, *Aspergillus*, *Colletotrichum*, *Gaeumannomyces*,

Helminthosporium, *Lentinus* and *Periconia*.

Most viruses of fungi induce only inapparent effects. However some notable effects are hypovirulence of chestnut blight fungus (see *Hypovirus*) and die-back of cultivated mushrooms.

Some fungi act as vectors in the transmission of plant viruses from plant to plant (see vectors).

The naming of viruses has undergone extensive revision in recent years, rendering much of the early literature difficult to interpret. The main viruses infecting fungi (see Murphy *et al.*, 1995) are:

Barnavirus (fam. *Barnaviridae*): bacilliform virions containing a single molecule of positive-sense single-stranded RNA, c. 4.4 kb in size; infecting *Agaricus* spp.

Chrysovirus (fam. *Partitiviridae*): isometric virions containing 1 of 3 molecules of linear 2-stranded RNA about 3 kbp in size; infecting *Penicillium* and probably *Helminthosporium*.

Hypovirus (fam. *Hypoviridae*): genomes of linear 2-stranded RNA of 10 to 13 kbp in size, no virions are formed by infected cells contain lipid vesicles which contain the genome RNA; infecting *Cryphonectria parasitica* and causing hypovirulence.

Partitivirus (fam. *Partitiviridae*): isometric particles and genomes which comprise 2 molecules of linear 2-stranded RNA, 1.4 to 2.2 kbp in size; infecting *Agaricus*, *Aspergillus*, *Gaeumannomyces*, *Penicillium*, *Rhizoctonia* and probably *Diplocarpon* and *Phialophora*; the infections are latent.

Rhizidiovirus (fam. uncertain): isometric virions which contain a single molecule of c. 25 kbp linear 2-stranded DNA; infecting *Rhizidiomyces*.

Totivirus (fam. *Totiviridae*): isometric virions which contain a single molecule of linear 2-stranded RNA, 4.6 to 6.7 kbp in size; infecting *Helminthosporium*, *Saccharomyces*, *Ustilago* and probably *Aspergillus*, *Gaeumannomyces* and *Mycogone*; the infections are often latent.

Lit.: Adams (*Ann. appl. biol.* 118: 479, 1991; transmission plant viruses by fungi), Buck (Ed.) (*Fungal virology*, 1986), Cooper & Asher (Eds) (*Viruses with fungal vectors*, 1985), Hillings & Stone (*Ann. Rev. Phytopath.* 9: 93, 1971), Koltin & Leibowitz (Eds) (*Viruses of fungi and simple procaryotes*, 1988), Lemke (*in* Molitoris *et al.* (Eds), *Fungal viruses*: 2, 1979; coevolution), Murphy *et al.* (*Virus taxonomy - The classification and nomenclature of viruses* [*Archives of Virology*, Suppl. 10], 1995; taxonomy).

Vischia C.W. Dodge (1971) = *Coccocarpia* fide Arvidsson (*Op. Bot.* 67, 1983).

viscid, slimy, sticky, glutinous, lubricous, mucilaginous, viscous. Cf. gelatinous, ixo-.

Viscipellis (Fr.) Quél. (1886) = *Suillus* Gray.

Viscomacula R. Sprague (1951), anamorphic *Pezizomycotina*, Hso.0eH.?. 1, USA. See Sprague (*Mycol.* 42: 758, 1950).

Visculus Earle (1909) = *Pholiota* fide Singer (*Agaric. mod. Tax.*, 1951).

Vismaya V.V. Sarma & K.D. Hyde (2001), Diaporthales. 1, Hong Kong. See Sarma & Hyde (*Nova Hedwigia* 73: 247, 2001).

Visvesvaria N.J. Pieniazek, T.J. Kurtti, A.J. da Silva, S.B. Slemenda, H. Moura, I.S. Moura, F.J. Bornay-Llinares, D.A. Schwartz & R.A. Wirtz (1997), Microsporidia. 2.

Vitalia Cif. & Bat. (1962) = *Dennisiella* fide Hughes

(*Mycol.* 68: 693, 1976).

viteline, yellow like egg yolk.

Vitreostroma P.F. Cannon (1991), Phyllachoraceae. 1 (living legume leaves), montane paleotropics. See Müller (*Trans. Bot. Soc. Edinb., Suppl.*: 69, 1986; as *Diachora*), Cannon (*Mycol. Pap.* 163, 1991).

Vittadinion Zobel (1854) = *Tuber* fide Fischer (*Nat. Pflanzenfam.* 5b: viii, 1938).

Vittadinula (Sacc.) Clem. & Shear (1931) = *Sphaerodes*.

Vittaforma Silveira & E.U. Canning (1994), Microsporidia. 1.

Vittalia Gawas & Bhat (2007), *Pezizomycotina*. 1, India. See Gawas & Bhatt (*Mycotaxon* 100: 295, 2007).

vittate, having longitudinal lines, bands, or ridges.

Vittatispora P. Chaudhary, J. Campb., D. Hawksw. & K.N. Sastry (2006), *Ceratostomataceae*. 1, India. See Chaudhary *et al.* (*Mycol.* 98: 461, 2006).

Vivantia J.D. Rogers, Y.M. Ju & Cand. (1996), *Xylariaceae*. Anamorph *Nodulisporium*-like. 1 (from wood), Guadeloupe. See Rogers *et al.* (*MR* 100: 669, 1996).

Vivianella (Sacc.) Sacc. (1898) = *Lophiostoma* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

vivotoxin, see toxin.

Vizella Sacc. (1883), *Vizellaceae*. Anamorph *Manginula*. 10, widespread (tropical). See Petrak (*Sydowia* 8: 294, 1954), Batista & Ciferri (*Beih. Sydowia* 1: 325, 1957), Swart (*TBMS* 57: 455, 1971), Selkirk (*Proc. Linn. Soc. N. S. W.* 97: 141, 1972; fossil taxa), Johnston (*N.Z. Jl Bot.* 38: 629, 2000; New Zealand), Cunningham (*Mycotaxon* 93: 135, 2005; Australia).

Vizellaceae H.J. Swart (1971), ? *Dothideomycetes* (inc. sed.). 3 gen. (+ 10 syn.), 12 spp.

Lit.: Swart (*TBMS* 57: 455, 1971), Sivanesan & Sutton (*TBMS* 85: 239, 1985), Farr (*Mycol.* 79: 97, 1987), Gadgil (*N.Z. Jl For. Sci.* 25: 107, 1995), Taylor & Crous (*IMI Descr. Fungi Bact.* 135: [26] pp., 1999), Cannon (*IMI Descr. Fungi Bact.* 141: [22] pp., 1999).

Vizellopsis Bat., J.L. Bezerra & T.T. Barros (1969), *Dothideomycetes*. 1, New Caledonia. See Batista *et al.* (*Publicações Inst. Micol. Recife* 637: 5, 1969).

Vladracula P.F. Cannon, Minter & Kamal (1986), *Rhytismataceae*. 1, Asia. See Cannon & Minter (*Mycol. Pap.* 155, 1986), Gupta & Fotedar (*Journal of Mycology and Plant Pathology* 34: 158, 2004).

Vleugelia J. Reid & C. Booth (1969), ? *Diaporthales*. 1, Sweden. See Reid & Booth (*CJB* 47: 1057, 1969).

Voeltzkowiella Henn. (1908) ? = *Bulgaria* fide Korf (*Mycol.* 49: 102, 1957).

Voglianoana Kuntze (1891) nom. dub., anamorphic *Pezizomycotina*. See Lindau (*Rabenh. Krypt.-Fl.* 1: 673, 1907; sub *Cystophora*), Hughes (*CJB* 36: 824, 1958).

Volkartia Maire (1909), *Protomycetaceae*. 1, Europe. See Reddy & Kramer (*Mycotaxon* 3: 1, 1975).

Volucrispora Haskins (1958), anamorphic *Pezizomycotina*, Hso.1bH.10. 3, widespread. See Petersen (*Bull. Torrey bot. Club* 89: 287, 1962), Hawksworth (*TBMS* 67: 51, 1976), Roldan (*Mycotaxon* 42: 297, 1991).

Volutella Fr. (1832) nom. cons., anamorphic *Pseudonectria*, Hsp.0eH.15. 20, widespread. See Samuels *et al.* (*CBS Diversity Ser.* 4, 2006).

Volutellaceae Nann. (1934) = *Nectriaceae*.

- Volutellaria** Sacc. (1886), anamorphic *Pezizomycotina*, Hsp.0eH.?. 1, N. America.
- Volutellis** Clem. & Shear (1931), anamorphic *Pezizomycotina*, Hso.0eH.?. 1, Congo.
- Volutellopsis** Speg. (1910), anamorphic *Pezizomycotina*, Ccu.≡ eH.?. 1, S. America.
- Volutellopsis** Torrend (1913) [non *Volutellopsis* Speg. 1910] ≡ *Volutellis*.
- Volutellospora** Thirum. & P.N. Mathur (1965) = *Chaetomella* fide Petrak (*Sydowia* 18: 373, 1965).
- volutin**, a reserve material of fungi, esp. yeasts, seen as electron-dense granules; metachromatic polymetaphosphate material. See Nagel (*Bot. Rev.* 14: 174, 1948).
- Volutina** Penz. & Sacc. (1901) ? = *Volutella*.
- Volva** Adans. (1763) = *Volvariella* fide Donk (*Beih. Nova Hedwigia* 5: 297, 1962) The name *Volva* has not yet been proposed for rejection against *Volvariella*.
- volva** (of agarics and gasteromycetes), the cup-like lower part of the universal veil round the base of the mature stipe or receptacle (Fig. 4E); sometimes = universal veil, which is the preferred usage, fide Bas (*Persoonia* 5: 304, 1969), who should be consulted for details of volva types and terminology.
- Volvaria** (Fr.) P. Kumm. (1871) ≡ *Volvariopsis*.
- Volvaria** DC. (1805) = *Gyalecta* Ach. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Volvariella** Speg. (1899), Pluteaceae. c. 50, widespread. *V. volvacea* and *V. diplasia*, the straw (or 'paddy straw') mushrooms (q.v.) are edible. See Shaffer (*Mycol.* 49: 545, 1957; N. Am.), Orton (*Bull. mens. Soc. linn. Lyon Num. Spéc.* 43: 313, 1974; Europ.), Heinemann (*Fl. Illustr. Champ. Afr. Centr.* 4: 75, 1975; C. Afr.), Pegler (*Kew Bull. Addit. Ser.* 6, 1977; E. Afr.), Heinemann (*Fl. Illustr. Champ. Afr. Centr.* 6: 119, 1978), Orton (*British Fungus Flora* 4: 61, 1986), Desjardin & Hemmes (*Harvard Pap. Bot.* 6: 85, 2001; Hawaii), Seok *et al.* (*Mycobiology* 30: 183, 2002; Korea).
- Volvariopsis** Murrill (1911) = *Volvariella* fide Singer (*Agaric. mod. Tax.*, 1951).
- Volvarius** Roussel (1806) = *Volvariella*. The name *Volvarius* has not yet been proposed for rejection against *Volvariella*. fide Donk (*Beih. Nova Hedwigia* 5, 1962).
- Volvella** E.-J. Gilbert & Beeli (1941) = *Amanita* Pers. fide Pegler (*in litt.*).
- Volvigerum** (E. Horak & M.M. Moser) R. Heim (1966) = *Cortinarius*. Basidioma gasteroid. fide Peintner *et al.* (*Mycotaxon* 81: 177, 2002; basidioma gasteroid).
- Volvoamanita** (Beck) E. Horak (1968) = *Amanita* Pers. fide Kuyper (*in litt.*).
- Volvoboletus** Henn. (1898) = *Amanita* Pers. fide Kuyper (*in litt.*) See, Ulbrich (*Ber. dt. bot. Ges.* 57: 389, 1939; status).
- Volvocisporiaceae** Begerow, R. Bauer & Oberw. (2001), Microstromatales. 1 gen., 1 spp.
Lit.: Begerow *et al.* (*MR* 105: 809, 2001), Beer *et al.* (*Stud. Mycol.* 55: 289, 2006).
- Volvocisporium** Begerow, R. Bauer & Oberw. (2001), *Volvocisporiaceae*. 1 (on leaves of *Triumfetta rhomboidea*), India. See Begerow *et al.* (*MR* 105: 809, 2001).
- Volvolepiota** Singer (1959) = *Macrolepiota* fide Vellinga & Yang (*Mycotaxon* 85: 183, 2003).
- Volvopolyporus** Lloyd ex Sacc. & Trotter (1912) = *Coltricia* fide Pilát (*Atlas Champ. Eur.* III *Polyporaceae* 2, 1942).
- Volvycium** Raf. (1808) nom. dub., *Agaricomycetes*. ? 'gasteromycetes'.
- Vonarxella** Bat., J.L. Bezerra & Peres (1965), *Saccardiaceae*. 1 or 2, Brazil. See Batista *et al.* (*Riv. Patol. veg.*, *Pavia Sér.* 4 1: 61, 1965).
- Vonarxia** Bat. (1960), anamorphic *Pezizomycotina*, Cpt.0fH.?. 1, Brazil. See Batista (*Publções Inst. Micol. Recife* 283: 5, 1960), Aa & von Arx (*Persoonia* 13: 127, 1986).
- Vorarlbergia** Grumann (1969) = *Epigloea* fide Döbeler (*Beih. Nova Hedwigia* 79: 203, 1984).
- Vossia** Thüm. (1879) [non *Vossia* Wall. & Griff. 1836, *Gramineae*] ≡ *Neovossia*.
- Vouauxiella** Petr. & Syd. (1927), anamorphic *Pezizomycotina*, Cpd.0-1eP.38. 5 (on lichens), Europe; S. America. See Sutton (*The Coelomycetes*, 1980), Hawksworth (*Bull. Br. Mus. nat. hist. Bot.* 9: 64, 1981).
- Vouauxiomyces** Dyko & D. Hawksw. (1979), anamorphic *Abrothallus*, Cpd.0eP.19. 5 (on *Lecanorales*), widespread. See Hawksworth (*Bull. Br. Mus. nat. hist. Bot.* 9: 67, 1981), Kondratyuk (*Muelleria* 9: 93, 1996; Australasia), Suija (*Ann. bot. fenn.* 43: 193, 2006).
- Vrikshopama** D. Rao & P. Rag. Rao (1964) ? = *Dematophora* fide Sutton (*in litt.*).
- Vuillemin** (Paul; 1861-1932; France). Student, University of Nancy (c. 1884-1889); Dr Sci., Sorbonne (1892); Professor in the Faculty of Medicine, Nancy (1895-1932). Noted for his innovative proposal to classify anamorphic fungi by their conidial development (he introduced the terms phialide and aleurio-spore); these ideas strongly influenced Mason (q.v.), Hughes and many other mycologists (see Conidial nomenclature). *Publs. Les bases actuelles de la systématique en mycologie* (1907); *Matériaux pour une classification rationnelle des Fungi Imperfecti. Comptes Rendu Hebdomadaire des Séances de l'Académie des Sciences* (1910); *Beauveria*, nouveau genre des Verticillariées. *Bulletin de la Société Botanique de France* (1912); *Les Champignons; Essai de Classification* (1912); also various papers on diseases of man, animals and plants. *Biogs, obits etc.* Grumann (1974: 356); Joyeux (*Mycopathologia et Mycologia Applicata* 3: 64, 1941) [bibliography]; Potron (*BSMF* 67: 42, 1951) [portrait]; Stafleu & Cowan (*TL-2* 6: 801, 1986).
- Vuilleminia** Maire (1902), *Corticaceae*. 10, widespread. See Boidin *et al.* (*BSMF* 110: 91, 1994; key).
- Vulpicida** Mattsson & M.J. Lai (1993), *Parmeliaceae* (L). 6, widespread (Arctic to northern temperate). See Mattsson (*Op. Bot.* 119, 1993; key), Thell & Miao (*Ann. bot. fenn.* 35: 275, 1998; phylogeny), Wedin *et al.* (*MR* 103: 1152, 1999; phylogeny), Thell *et al.* (*Mycol. Progr.* 1: 335, 2002; phylogeny), Thell *et al.* (*Mycol. Progr.* 3: 297, 2004; phylogeny), Randle & Saag (*Folia cryptog. Estonica* 41: 89, 2005; biogeography), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Binder & Ellis (*Lichenologist* 40: 63, 2008; conservation).
- W**, Naturhistorisches Museum, Wien (Vienna, Austria); founded 1748; formerly known as the Hofnaturalienkabinett und Naturhistorisches Hofmuseum; a state institution.
- Wadeana** Coppins & P. James (1978), *Catillariaceae* (L). 2, Europe. See Hertel & Rambold (*Biblthca*

- Lichenol.* **38**: 145, 1990; posn), Lumbsch (*J. Hattori bot. Lab.* **83**: 1, 1997).
- Wageria** F. Stevens & Dalbey (1918) = *Balladyna* fide Sivanesan (*Mycol. Pap.* **146**, 1981).
- Waihonghopes** Yanna & K.D. Hyde (2002), anamorphic *Pezizomycotina*, H??.?. 1, Queensland. See Yanna & Hyde (*Aust. Syst. Bot.* **15**: 763, 2002).
- Wainio**, see Vainio.
- Wainioa** Nieuwl. (1916) = *Pilocarpon*.
- Wainiocora** Tomas. (1950) = *Dictyonema* C. Agardh ex Kunth fide Parmasto (*Nova Hedwigia* **29**: 99, 1978).
- Waitea** Warcup & P.H.B. Talbot (1962), Corticiaceae. Anamorph *Chrysorhiza*. 2, Australia; Switzerland. See Roberts (*Rhizoctonia-forming fungi*, 1999), Toda *et al.* (*Pl. Dis.* **89**: 536, 2005; bentgrass disease), Larsson (*MR* **111**: 1040, 2007; phylogeny).
- Wakefield** (Elsie Maud; 1886-1972; England). Student, Somerville College, Oxford (ca 1904-1908, making her one of the earlier women graduates of this university); Assistant Cryptogamic Botanist (1910-1915) working with Masee (q.v.), then Cryptogamic Botanist (c. 1915-1951), Royal Botanic Gardens, Kew [the first graduate mycologist at Kew and a pioneer woman in the UK scientific civil service]. With Cotton she monographed *Clavaria* but her main interest was resupinate basidiomycetes. She was a skilful painter of watercolours and some of her publications included her artwork. She was Secretary of the British Mycological Society for 17 years and President in 1928, and was regarded as influential. *Publs.* Edible and poisonous fungi [6th edn] *Bulletin of the Ministry of Agriculture and Fisheries* (1945); *Observer's Book of Common Fungi* (1954); (with R.W.G. Dennis, q.v.) *Common British fungi* (1950). *Biogs, obits etc.* Anon. (*TBMS* **49**: 355, 1966) [portrait, 80th birthday]; Blackwell (*TBMS* **60**: 167, 1973) [bibliography, portrait]; Stafleu & Cowan (*TL-2* **7**: 24).
- Wakefieldia** Corner & Hawker (1953), Boletaceae. 2, Europe, Asia. See Corner & Hawker (*TBMS* **36**: 130, 1953), Gori (*Boll. Gruppo Micol. 'G. Bresadola'* **40**: 239, 1997).
- Wakefieldia** G. Arnaud (1954) = *Anaphysmene* fide Sutton (*TBMS* **59**: 285, 1972).
- Wakefieldiomyces** Kobayasi (1981) = *Podocrella* fide Rossman *et al.* (*Stud. Mycol.* **42**: 248 pp., 1999), Chaverri *et al.* (*Mycol.* **97**: 433, 2005).
- Waksmania** H. Lechev. & M.P. Lechev. (1957), Actinobacteria. q.v.
- Waldemaria** Bat., H. Maia & Cavalc. (1960) [non *Waldemaria* Klotzsch 1862, *Ericaceae*] = *Arachnion* fide Orr & Kuehn (*Mycol.* **63**: 191, 1971), Currah (*Mycotaxon* **24**: 1, 1985).
- Walkeromyces** Thaung (1976) = *Mycovellosiella* fide Deighton (*Mycol. Pap.* **144**, 1979).
- wall building**, descriptive of hyphal growth in which cell wall material is produced by certain ultrastructural secretory bodies in the cytoplasm. Three types of wall building may be distinguished (Fig. 26): **apical** - in which the bodies are concentrated at the hyphal tip, producing new wall by distal growth, forming a cylindrical hypha in which the youngest wall material is at the tip; **ring** -, in which the bodies are concentrated adjacent to the cell wall at some point below the tip, in the shape of an imaginary ring, producing new wall by proximal growth, forming a cylindrical hypha in which the youngest wall material is always at the base; **diffuse** -, in which the bodies occur throughout the cytoplasm at a low concentration, producing lateral growth (i.e. swelling of the cylindrical hypha) by alteration of pre-existing wall.
- The terms assume special significance in conidial development, where they have been used to clarify the concepts of thallic and blastic. Apical wall building occurs in *Geniculosporium*, *Cladosporium* and *Scopulariopsis*, and 'phialides' where conidia are produced in gummy masses (e.g. *Trichoderma*) or false chains (e.g. *Mariannaea*). Ring wall building occurs in 'phialides' with conidia in true chains (e.g. *Penicillium*, *Chalara*), in so-called meristem arthrospores (e.g. *Wallemia*) and in conidiogenous cells of basauxic fungi (e.g. *Arthrinium*). Diffuse wall building occurs simultaneously with or shortly after apical or ring wall building in most of the preceding examples, but its occurrence is much delayed or even absent in thallic development (e.g. *Geotrichum*). Wall building is a preferable term to meristem which implies growth by cell division rather than within a single cell. See Minter *et al.* (*TBMS* **79**: 75, 1982, **80**: 39, 1983, **81**: 109, 1983). Also see Anamorphic fungi.
- Wallemia** Johan-Olsen (1887), anamorphic *Wallemiaceae*, Hso.0eH.38. 2, widespread. *W. sebi* is osmophilic. See Cole & Samson (*Patterns of development in conidial fungi*: 103, 1979; conidiogenesis), Moore (*Antonie van Leeuwenhoek* **52**: 183, 1986; interpreted as a teleomycete), Moore in Sneh *et al.* (Eds) (*Rhizoctonia species Taxonomy, Molecular Biology, Ecology, Pathology and Disease Control*: 13, 1996; as fam. *Wallemiaceae*), Zalar *et al.* (*Antonie van Leeuwenhoek* **87**: 311, 2005; taxonomy and phylogeny).
- Wallemiaceae** R.T. Moore (1996), Wallemiales. 1 gen. (+ 2 syn.), 2 spp.
Lit.: Hashmi & Morgan-Jones (*CJB* **51**: 1669, 1973), Moore (*Antonie van Leeuwenhoek* **52**: 183, 1986), Moore in Sneh *et al.* (Eds) (*Rhizoctonia Species Taxonomy, Molecular Biology, Ecology, Pathology and Disease Control*: 25, 1996), Zalar *et al.* (*Antonie van Leeuwenhoek* **87**: 311, 2005).
- Wallemiales** Zalar, de Hoog & Schroers (2005). Wallemiomycetes. 1 fam., 1 gen., 2 spp. Fam.:
- Wallemiaceae**
For *Lit.* see under fam.
- Wallemiomycetes** Zalar, de Hoog & Schroers (2005), Basidiomycota. 1 ord., 1 fam., 1 gen., 2 spp. Ord.:
- Wallemiales**
For *Lit.* see fam.
- Wallrothiella** Sacc. (1882), ? Coniochaetales. Anamorph *Gliomastix*. 1, widespread. See Eriksson & Hawksworth (*SA* **10**: 59, 1991), Samuels & Barr (*CJB* **75**: 2165, 1998), Réblová & Winka (*Mycol.* **92**: 939, 2000), Réblová & Winka (*Mycol.* **93**: 478, 2001), Réblová & Seifert (*Mycol.* **96**: 343, 2004), García *et al.* (*MR* **110**: 1271, 2006).
- Waltiozyma** H.B. Mull. & Kock (1986) = *Lipomyces* fide Kurtzman & Liu (*Curr. Microbiol.* **21**: 287, 1991).

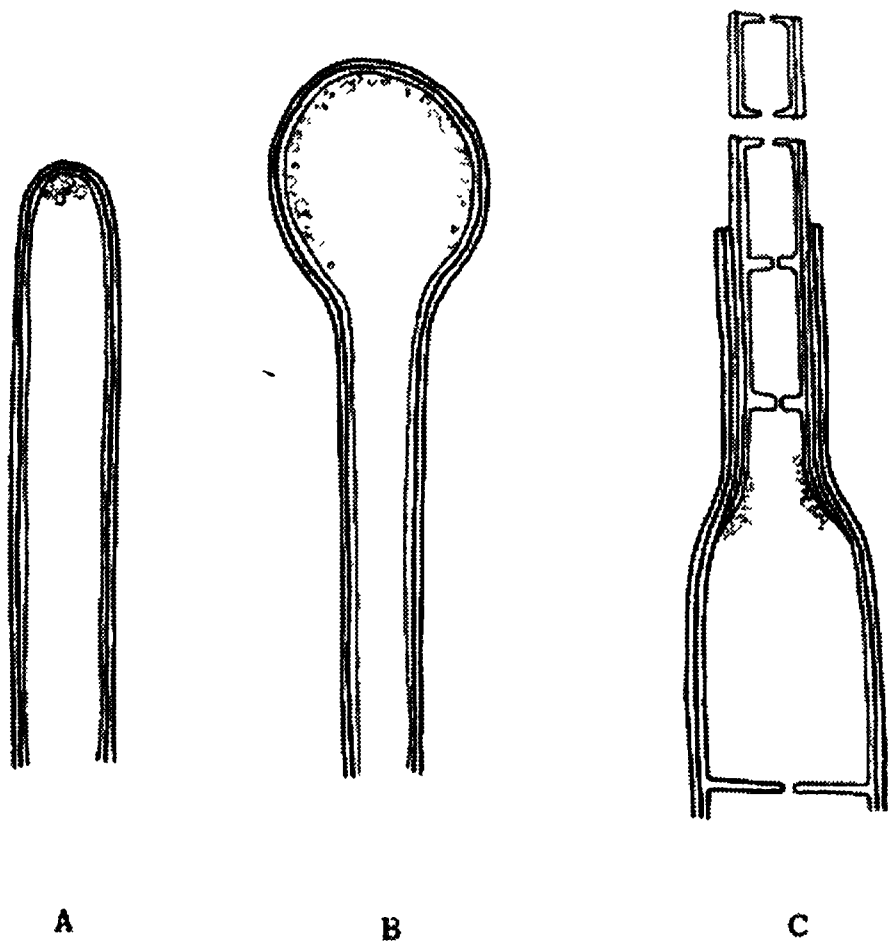


Fig. 26. Wall building in relation to conidiogenesis. A, apical; B, diffuse; C, ring. After Minter *et al.* (*TBMS* 80: 39, 1983).

- Waltomyces** Y. Yamada & Nakase (1985) = *Lipomyces* fide Gouliamova *et al.* (*Antonie van Leeuwenhoek* 74: 283, 1998), Smith in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 248, 1998), Kurtzman *et al.* (*FEMS Yeast Res.* 7: 1027, 2007; phylogeny).
- Waltonia** Saho (1970), Helotiales. Anamorph *Chondropodium*-like. 1, Japan. See Saho (*TMSJ* 11: 5, 1970).
- Walzia** Sorokīn (1871) ? = *Penicillium* Link fide Constantin (*Les mucédinées simples*: 201, 1888).
- wandering lichens**, lichens with an epigeic habit (e.g. *Parmelia afrorevoluta*; see Paulson & Hastings, *Knowledge* 37: 319, 1914). Cf. manna.
- Wangiella** McGinnis (1977) = *Exophiala* fide Matsumoto *et al.* (*J. Med. Vet. Mycol.* 28: 437, 1990), Hoog *et al.* (*Antonie van Leeuwenhoek* 65: 143, 1994; life cycle), Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995), Hoog *et al.* (*J. Med. Vet. Mycol.* 33: 355, 1995; synanamorph), Spatafora *et al.* (*J. Clin. Microbiol.* 33: 1322, 1995; DNA), Haase *et al.* (*Stud. Mycol.* 43: 80, 1999; phylogeny), McKemy *et al.* (*Mycol.* 91: 200, 1999; emend. genus), Méndez *et al.* (*Revta Iberoamer. Micol.* 16: 114, 1999; Argentina), Rogers *et al.* (*Stud. Mycol.* 43: 122, 1999; phylogeny).
- Warcupia** Paden & J.V. Cameron (1972), Pyronemataceae. 1, Canada. See Paden & Cameron (*CJB* 50: 999, 1972), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- Warcupiella** Subram. (1972), Trichocomaceae. Anamorph *Aspergillus*. 1, Brunei. See von Arx (*Mycotaxon* 26: 119, 1986; synonym of *Hamigera*), Chang *et al.* (*J. gen. appl. Microbiol.* Tokyo 37: 289, 1991; DNA), Tamura *et al.* (*Integration of Modern Taxonomic Methods for Penicillium and Aspergillus Classification*: 357, 2000; phylogeny).
- Ward** (Harry Marshall; 1854-1906; England). BA, Cambridge (1879); Government Cryptogamist, Ceylon (1880); Fellow, then Demonstrator, then Assistant Lecturer, University of Manchester (1881-1885); Chair of Botany, Royal Indian Engineering College (1885-1895); Chair of Botany, Cambridge (1895-1906); DSc (1892). Published classical studies on coffee rust which set new standards for tropical plant pathology; introduced ideas of de Bary (q.v.) to Britain; FRS (1888). *Publs.* *Researches on the life history of Hemileia vastatrix*, the fungus of 'coffee leaf disease'. *J. Linn. Soc. London* 19: 299 (1882); *Timber and Some of its Diseases* (1894). *Biogs, obits etc.* Ayres (*Harry Marshall Ward and the Fungal Thread of Death*, 2005).
- Wardia** J.F. Hennen & M.M. Hennen (2003) nom. inval. = *Hemileia* fide Ritschel (*Biblthca Mycol.* 200: 132 pp., 2005) Anamorph name for (II).
- Wardina** G. Arnaud (1918) = *Asterolibertia* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Wardinella** Bat. & Peres (1960), anamorphic *Pezizomycotina*, Cpt.1eP.?. 1, Brazil. See Batista & Peres (*Publções Inst. Micol. Recife* 221: 8, 1960).
- Wardomyces** F.T. Brooks & Hansf. (1923), anamorphic *Microascus*, Hso.0eP.13. 3, Europe; India. See Dickinson (*TBMS* 47: 321, 1964), Gams (*Beih. Sydowia* 10: 67, 1995), Issakainen *et al.* (*Medical Mycology* 41: 31, 2003; phylogeny).
- Wardomycopsis** Udagawa & Furuya (1978), anamorphic *Microascus*, Hso.0eP.19. 4, Thailand. See Udagawa & Furuya (*Mycotaxon* 7: 92, 1978).
- Warkallisporonites** Ramanujam & Rao (1979), Fossil Fungi. 1 (Miocene), India.
- wart disease**, of potatoes (*Synchytrium endobioticum*) See Curtis (*Phil. Trans. roy. Soc.* B210: 409, 1921; life history).
- Wasson** (R. Gordon; 1898-1986; USA). International banker, amateur mycologist and author. Wasson pioneered ethnomycology (q.v.), the study of traditions and traditional uses of fungi. He particularly investigated use of psychotropic fungi in religious rites in Greece, India and Mexico. *Publs.* (with Guercken) *Mushrooms, Russia and History* (1957); *Soma, Divine Mushroom of Immortality* (1968); *Maria Sabina and her Mazatec Mushroom Velada* (1976); (with Hoffmann & Ruck) *The Road to Eleusis, Unveiling the Secrets of the Mysteries* (1978). *Biogs, obits etc.* Anon. (*Mycologist* 1: 135, 1987).
- Waste utilization**, see Biodegradation, Bioremediation, Biotechnology, Industrial mycology.
- water activity**, some fungi can grow at extremely reduced levels of water activity, e.g. *Xeromyces bisporus* at 0.75 a_w ; see Hocking (*Microbiol. Sci.* 5: 280, 1988; review).
- water moulds**, see Aquatic fungi.
- Wawea** Henssen & Kantvilas (1985), Arctomiaceae (L). 1, New Zealand; Tasmania. See Henssen & Kantvilas (*Lichenologist* 17: 86, 1985), Miadlikowska & Lutzoni (*Am. J. Bot.* 91: 449, 2004; phylogeny), Lumbsch *et al.* (*Lichenologist* 37: 291, 2005; phylogeny).
- Wawelia** Namysl. (1908), Xylariaceae. 3 (coprophilous), Europe. *Chaenocarpus* is a possible earlier name. See Minter & Webster (*TBMS* 80: 370, 1983), Lundqvist (*Persoonia* 14: 417, 1992), Læssøe (*SA* 13: 43, 1994; ? synonym of *Xylaria*), Webster *et al.* (*MR* 103: 1604, 1999).
- Waydora** B. Sutton (1976), anamorphic *Pezizomycotina*, St.0eH.15. 1, widespread. See Sutton (*TBMS* 67: 248, 1976).

Waynea Moberg (1990), Ramalinaceae (L). 3, widespread. See Moberg (*Lichenologist* 22: 249, 1990), Roux & Clerc (*Bull. Soc. linn. Provence* 42: 123, 1991; Europe), Roux *et al.* (*Bibliotheca Lichenol.* 58: 383, 1995), Tretiach (*Nordic Jl Bot.* 18: 721, 1998; Siberia), Ekman (*MR* 105: 783, 2001; phylogeny), Llop (*Lichenologist* 38: 519, 2006; Mediterranean).

WDCM. World Data Center on Microorganisms (National Institute of Genetics, Nishima, Japan; formerly University of Queensland), administered jointly by the World Federation of Culture Collections and MIRCEN, this centre maintains records of over 475 culture collections (including fungal collections) in over 60 countries; website (www.wfcc.info/datacenter.html), see also Genetic resource collections, MIRCEN.

Weathering. Physical, chemical and biological processes can bring about the weathering of rocks. All these factors ultimately result in fragmentation of the rock into smaller particles which can then contribute to the mineral fraction of soils. The biological weathering of rocks and their constituent minerals involves biogeochemical and biogeophysical weathering processes, the former bringing about a change in the chemical stability and composition of rocks and their minerals through the action of living organisms and their metabolic activities and the latter resulting in a mechanical disruption of the rocks and their constituent minerals (Silverman, *in* Trudinger & Swaine, *Studies in environmental science* 3: 445, 1979).

One of the few detailed studies of life on rock surfaces was by Webley *et al.* (*J. Soil Sci.* 14: 102, 1963) who recorded the numbers of fungi (as well as of bacteria, actinomycetes and other microorganisms) in the interior of porous weathered stones (none were found in unweathered stones). Fungi, notably *Trichoderma* sp. were found growing directly on sandstone (Williams & Rudolph, *Mycol.* 66: 648, 1974). *Alternaria* sp., *Acremonium* sp. and various species of *Penicillium* were also noted by these authors. *Penicillium simplicissimum* has been isolated from the surface of weathered basalt (Silverman & Munoz, *Science* 169: 985, 1970). The biodegradation of basalt by *P. simplicissimum* was studied by Mehta *et al.* (*Biotechnol. & Bioengin.* 21: 875, 1979) who showed that organic acids were responsible for the decomposition processes although the organism was not isolated from the rock substratum. A range of fungi have been found from the interior of rock, mostly in deserts (including Antarctic dry deserts) but also from exposed rocks in other ecosystems, and even rocks of buildings and statues. These species, mostly black yeasts (see Yeasts: black) have been described as cryptoendolithic, and their biology has been extensively studied, particularly by Friedmann (q.v.), partly because of their importance in biodegradation but also, in the case of Antarctic fungi, as a model for possible life on Mars (Selbmann *et al.*, *Studies in Mycology* 51: 1, 2005).

A high proportion of the organisms isolated by Webley *et al.* (1963) rendered silicates soluble when tested in pure culture and the authors (Henderson & Duff, *J. Soil Sci.* 14: 236, 1963) concluded that fungi which produced citric and/or oxalic acid proved effective in decomposing certain natural silicates while an oxalic acid-producing strain also released metallic ions and silica from rocks and soils. Among the fungi studied were *Penicillium* spp. and species of *Tricho-*

derma, *Mucor* and *Spicaria*. Weathering of the edges of biotite flakes by *Aspergillus niger* was noted by Boyle & Voigt (*Science* 169: 193, 1967) in pure culture studies and the activity was attributed to oxalic and citric acids. Cromack *et al.* (*Soil Biol. Biochem.* 11: 463, 1979) have presented evidence for the accumulation of calcium oxalate in the fungal mats of the ectomycorrhizal fungus *Hysterangium crassum* associated with Douglas fir (*Pseudotsuga menziesii*) roots. This precipitation was brought about by oxalic acid secreted by the fungus and this was considered to be the reason for weathering of the igneous rock, andesite, in the root vicinity.

The weathering effects of crustose lichens on rock surfaces can manifest themselves as etch patterns on the rock minerals which can involve the transformation of certain minerals to siliceous relics and the formation of crystalline organic salts such as oxalates in the lichen thallus; the chemical composition of these oxalates is directly related to the substrate (Jones, *in* Galun (Ed.), *Handbook of lichenology* 3: 109, 1988; Wilson & Jones, *in* Wilson (Ed.), *Residual deposits*, Sp. Publ. 11: 5, 1983). See also Biodeterioration.

Websdanea Vánky (1997), Websdaneaceae. 1 (on *Restoniaceae*), Australia. See Vánky (*Mycol. Balcanica* 3: 19, 2006).

Websdaneaceae Vánky (2001), Ustilaginales. 2 gen., 22 spp.

Lit.: Vánky (*Mycotaxon* 65: 183, 1997), Piepenbring *et al.* (*Mycol.* 91: 485, 1999), Vánky (*Fungal Diversity* 6: 131, 2001), Vánky (*Aust. Syst. Bot.* 14: 385, 2001), Vánky (*Mycol. Balcanica* 1: 175, 2004).

Websteromyces W.A. Baker & Partridge (2000), anamorphic *Pezizomycotina*. 1, S. Africa. See Partridge *et al.* (*Mycotaxon* 74: 488, 2000), Crous *et al.* (*MR* 110: 264, 2006; key).

Weddellomyces D. Hawksw. (1986), Dacampiaceae. 8 (on lichens), Europe; Greenland. See Alstrup & Hawksworth (*Meddr Grønland Biosc.* 31, 1990), Navarro-Rosinés & Roux (*Mycotaxon* 53: 161, 1995), Calatayud & Navarro-Rosinés (*Mycotaxon* 69: 503, 1998), Navarro-Rosinés *et al.* (*C. r. Acad. Sc. Paris sér. III, Sci. Vie* 324: 443, 2001; ultrastr.), Halici *et al.* (*Mycotaxon* 94: 249, 2005; Turkey).

Weesea Höhn. (1920) nom. dub., *Pezizomycotina*. 1, Brazil. Type material is lost. See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).

Wegea Aptroot & Tibell (1997), Arthoniales (L). 1, New Guinea. See Aptroot & Tibell (*Mycotaxon* 65: 340, 1997), Grube (*Lichenologist* 33: 387, 2001).

Wegelina Berl. (1900), Calosphaeriales. 1 (rotten wood and other fungi), widespread (temperate). See Barr (*Cryptog. Bryol.-Lichénol.* 19: 169, 1998), Réblová *et al.* (*Stud. Mycol.* 50: 533, 2004), Kummer *et al.* (*Z. Mykol.* 71: 227, 2005), Mostert *et al.* (*Stud. Mycol.* 54: 115 pp., 2006; key).

Wehmeyera J. Reid & C. Booth (1989), Diaporthales. 1, USA. See Barr (*Mycotaxon* 41: 287, 1991).

Weinmannioscyphus Svrček (1977), Helotiaceae. 1, Europe. See Svrček (*Sb. nár. Mus. Praze* 40B: 129, 1985).

Weinmannodora Fr. (1849) nom. dub., Fungi. See Petrak & Sydow (*Beih. Rep. spec. nov. regn. veg.* 42, 1927).

Weinzettlia Velen. (1921) = *Cortinarius* fide Kuyper (*in litt.*).

Weiseria Doby & Saguez (1964), Microsporidia. 3.

- Weissia** Bat. & M.P. Herrera (1964), anamorphic *Pezizomycotina*, Cpt.1eH.?. 1, Brazil. See Batista & Herrera (*Anais Congr. Soc. Bot. Brasil* 13: 469, 1962).
- Weitenwebera** Körb. (1863) = *Chromatochlamys* fide Mayrhofer & Poelt (*Herzogia* 7: 13, 1985), Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Weitenwebera** Opiz (1857) [non *Weitenwebera* Opiz 1839, *Campanulaceae*] = *Mycobilimbia* fide Hafellner (*Beih. Nova Hedwigia* 79: 241, 1984), Mayrhofer & Poelt (*Herzogia* 7: 13, 1985).
- Wentiomyces** Koord. (1907), *Pseudoperisporiaceae*. c. 50, widespread (tropical). See Hansford (*Mycol. Pap.* 15, 1946; sub *Dimeriella*), Bose & Müller (*Indian Phytopath.* 17: 3, 1964), Farr (*Taxon* 14: 18, 1965; nom. dub.), Roux *et al.* (*Mycotaxon* 50: 459, 1994), Kondratyuk (*Muelleria* 9: 93, 1996; Australasia).
- Wenylingia** Zheng Wang & Pfister (2001), *Pyrone-mataceae*. 1, Sichuan. See Wang & Pfister (*Mycotaxon* 79: 397, 2001).
- Weraroa** Singer (1958), *Strophariaceae*. 8, New Zealand; S. America. Basidioma gasteroid. See Singer & Smith (*Bull. Torrey bot. Club* 85: 324, 1958; key), Bougher & Lebel (*Aust. Syst. Bot.* 14: 439, 2001).
- Werneria** Zschacke ex Werner (1934) = *Thrombium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Wernerella** Nav.-Ros., Cl. Roux & Giralt (1998), *Dothideomycetes*. 1, Morocco. See Navarro-Rosinés *et al.* (*Bull. Soc. linn. Provence* 47: 167, 1996), Navarro-Rosinés *et al.* (*Bull. Soc. linn. Provence* 49: 138, 1998).
- Werneromyces** Werner (1976) nom. inval. = *Werneria*.
- Westea** H.J. Swart (1988), *Dothideomycetes*. 1, Australia. See Swart (*TBMS* 91: 456, 1988).
- Westerdijk** (Johanna; 1883-1961; Netherlands). Student, University of Amsterdam, University of München and doctorate, University of Zürich (1906); Director, Phytopathological Laboratory 'Willie Commelin Scholten', Amsterdam (1906-1913); Director, Bureau pour la Distribution de Moisissures de l'Association Internationale des Botanistes (1907-1953) [this collection of 80 fungal species, formed in 1904, was the origin of and became the CBS (q.v.)]; collecting and travelling, Indonesia, Japan and the USA (1913-1915); Professor of Plant Pathology, Universities of Utrecht (1917-1930); Professor of Plant Pathology, University of Amsterdam (1930-1953). *Biogs, obits etc.* Beverwijk (*Mycopathologia et Mycologia Applicata* 17: 359, 1962) [portrait]; Lohnis (*Johanna Westerdijk een Markante Persoonlijkheid*, 1963); Stafleu & Cowan (*TL-2* 7: 210, 1988); Ten Houten (*Journal of General Microbiology* 32: 1, 1963) [bibliography, portrait].
- Westerdykella** Stolk (1955), *Sporormiaceae*. 2 (from soil), Mozambique. See also *Pycnidiophora*. See Cejp & Milko (*Česká Mykol.* 18: 82, 1964; key), von Arx & Storm (*Persoonia* 4: 407, 1967), Ito & Nakagiri (*Mycoscience* 36: 361, 1995), Lindemuth *et al.* (*MR* 105: 1176, 2001), Kruys *et al.* (*MR* 110: 527, 2006; phylogeny).
- Weston** (William Henry; 1890-1978; USA). Professor of Cryptogamic Botany, Harvard University (1928-1960). First President of the Mycological Society of America, and an influential teacher. *Biogs, obits etc.* Stafleu & Cowan (*TL-2* 7: 217, 1988); Wilson (*Mycol.* 71: 1103, 1980) [portrait].
- wet bubble**, a mushroom disease (*Mycogone pernicios*); white mould. See under Mushroom cultivation.
- Wettsteiniella** Kuntze (1891) = *Arthrobotryum* Ces.
- Wettsteinina** Höhn. (1907), *Pleosporales*. 29, Europe; N. America. See Barr (*Contr. Univ. Mich. Herb.* 9: 523, 1972), Shoemaker & Babcock (*CJB* 65: 373, 1987; key), Scheuer (*Mycotaxon* 54: 173, 1995; nomencl.), Kodsueb *et al.* (*Mycol.* 98: 571, 2006; phylogeny), Schoch *et al.* (*Mycol.* 98: 1041, 2006; phylogeny).
- Weufia** Bhat & B. Sutton (1985), anamorphic *Pezizomycotina*, Hso.0bP.27. 1, Ethiopia. See Bhat & Sutton (*TBMS* 85: 107, 1985).
- WFCC**, see Societies and organizations.
- Whalleya** J.D. Rogers, Y.M. Ju & F. San Martín (1997), *Xylariaceae*. 2, widespread (esp. tropical). See Rogers *et al.* (*Mycotaxon* 64: 48, 1997), Triebel *et al.* (*Nova Hedwigia* 80: 25, 2005; phylogeny), Ju *et al.* (*Mycol.* 99: 612, 2007; phylogeny).
- Whetstonia** Lloyd (1906) = *Dictyocephalos* fide Long & Plunkett (*Mycol.* 32: 637, 1940).
- Whetzel** (Herbert Hice; 1877-1944; USA). Student, Wabash College, Indiana (1897-1899); Postgraduate student (1902-1904) then Instructor (1904-1906); Assistant Professor of Botany (1906-1907) then Assistant Professor (1907) and later Professor of Plant Pathology, New York State College of Agriculture, Cornell University, New York. An influential plant pathologist and mycologist (especially expert in the *Sclerotiniaceae*), who in 1907 founded the first department of plant pathology in the USA. Contributed significantly to mycological explorations of the West Indies, with Chardón (q.v.), Seaver (q.v.) and others. *Publs. An Outline of the History of Plant Pathology* (1918); (with Hesler, Gregory & Rankin) *Laboratory Outlines in Plant Pathology* (1925) [revised edn]; also more than 200 other papers and books. *Biogs, obits etc.* Fitzpatrick (*Mycol.* 37: 393, 1945, portraits); Barrus & Stakman (*Phytopathology* 35: 659, 1945; bibliography); Stafleu & Cowan (*TL-2* 7: 245, 1988).
- Whetzelia** Chardón & Toro (1934) = *Vestergrenia* Rehm fide von Arx & Müller (*Beitr. Kryptfl. Schweiz* 11 no. 1, 1954).
- Whetzelia** Zundel (1945) = *Ustacystis*.
- Whetzelinia** Korf & Dumont (1972) nom. rej. prop. = *Sclerotinia* fide Kohn (*Mycotaxon* 9: 365, 1979).
- Whetzelomyces** Viégas (1945) = *Anhellia* fide von Arx (*Persoonia* 2: 421, 1963).
- whisky** (whiskey, Ir, US), see spirits.
- white blister** (white 'rust'), a disease of plants caused by *Albugo*, esp. *A. candida* on crucifers.
- white jelly fungus**, basidioma of the edible *Tremella fuciformis*.
- white piedraia**, infection of hair shaft by *Trichophyton*.
- whiteheads**, a cereal disease (*Gaeumannomyces graminis*).
- Whitfordia** Murrill (1908) [non *Whitfordia* Elmer 1910, *Leguminosae*] = *Amauroderma* Murrill fide Pegler (*The polypores* [Bull. BMS Suppl.], 1973).
- Wickerhamia** Soneda (1960), *Saccharomycetales*. 1, Japan. See Phaff & Miller in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 409, 1998), Suh *et al.* (*Mycol.* 98: 1006, 2006).
- Wickerhamiella** Van der Walt (1973), *Trichomonas-caceae*. 5, widespread. Perhaps allied to the *Dipodascaceae*. See Lachance *et al.* (*Can. J. Microbiol.* 46: 1145, 2000; biogeography), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny), Kurtzman & Robnett

- (*FEMS Yeast Res.* 7: 141, 2007).
- Wielandomyces** Raithelh. (1988), Bolbitiaceae. 1, Europe. See Raithelhuber (*Metrodiana* 16: 48, 1988).
- Wiesnerina** Höhn. (1907) = *Actiniceps* fide Boedijn (*Persoonia* 1: 11, 1959).
- Wiesneriomyces** Koord. (1907), anamorphic *Pezizomycotina*, Hsp.≡ eH.10. 2, widespread. See Maniotis & Strain (*Mycol.* 60: 203, 1968), Kirk (*TBMS* 82: 748, 1984; nomencl.).
- Wilcoxina** Chin S. Yang & Korf (1985), Pyronemataceae. Anamorph *Complexipes*. 3, Europe; N. America. See Yang & Korf (*Mycotaxon* 24: 467, 1985; anamorph), Egger *et al.* (*MR* 95: 866, 1991; as *E-strain mycorrhizas*), Egger *et al.* (*CJB* 74: 773, 1996; DNA), Landvik *et al.* (*Nordic JI Bot.* 17: 403, 1997; DNA), Fujimura *et al.* (*Mycorrhiza* 15: 79, 2005; after fire), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Tedersoo *et al.* (*New Phytol.* 170: 581, 2006; mycorrhizas), Perry *et al.* (*MR* 111: 549, 2007; phylogeny).
- wild type** (1) the naturally occurring species or taxon as opposed to morphological variants resulting from culture *in vitro* or biochemical mutants obtained therefrom; prototroph; (2) arbitrary designation for one or more strains chosen as genetic standards.
- Willeya** Müll. Arg. (1883) = *Staurothele* fide Zahlbruckner (*Catalogus Lichenum Universalis* 1, 1921).
- Willia** E.C. Hansen (1904) [non *Willia* Müll. Hal. 1890, *Musci*] = *Hansenula*.
- Williopsis** Zender (1925), Saccharomycetaceae. 11, widespread. See Naumov *et al.* (*Mikrobiologiya* 54: 239, 1985; key 6 spp.), Naumov *et al.* (*Molek. Genet., Mikrobiol. Virusol.* 2: 3, 1987), Liu & Kurtzman (*Antonie van Leeuwenhoek* 60: 21, 1991; rRNA, key 5 spp.), Yamada *et al.* (*Biosc., Biotechn., Biochem.* 58: 1236, 1994), James *et al.* (*Int. J. Syst. Bacteriol.* 48: 591, 1998; phylogeny), Kurtzman in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 413, 1998), Naumova *et al.* (*Syst. Appl. Microbiol.* 27: 192, 2004).
- Wilmia** Dianese, Inácio & Dorn-Silva (2001), Phaeosphaeriaceae. 1, Brazil. See Dianese *et al.* (*Mycol.* 93: 1014, 2001).
- Wilmsia** Körb. (1865) = *Placynthium* fide Henssen (*Symb. bot. upsal.* 18 no. 1, 1963).
- Wilsonia** Cheel & Dughi (1944) [non *Wilsonia* R. Br. 1810, *Convolvulaceae*] nom. inval. = *Polychidium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Wiloniellanom.** dub.
- Wilsonomyces** Adask., J.M. Ogawa & E.E. Butler (1990) = *Thyrostroma* fide Sutton (*in litt.*), Adaskaveg (*CJB* 73: 432, 1995), Sutton (*Arnoldia* 14: 33, 1997).
- wilt**, a plant disease (esp. *Verticillium*, *Fusarium*) characterized by loss of turgidity and collapse of leaves. See Mace *et al.* (Eds) (*Fungal wilt diseases of plants*, 1981). Cf. hadromycosis.
- Wiltshirea** Bat. & Peres (1962) = *Phaeosaccardinula* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Wine making**. E.C. Hansen (q.v.), later a director of the Carlsberg Physiological Laboratory, first showed that yeasts were invariably present in the soils of vineyards. Hansen's use of pure culture techniques in brewing were introduced into the wine industry between 1880 and 1890. The first distribution of pure yeast cultures for wine making was made from Geisenheimam Rhein in 1890. The term 'pure yeast culture' as used in wine making is not precise, since grape must (the juice produced after the grapes are crushed) is not sterile before the addition of the yeast starter. Sulphur dioxide and large amounts of yeast starter overwhelm the other organisms naturally present and result in a fermentation by *Saccharomyces cerevisiae*. Suitable strains must have: a high ethanol-producing ability (18-20% vol/vol), be cold resistant (fermenting at 4°C), be resistant to sulphite, ethanol (have an ability to start a new fermentation at 8-12% ethanol), tannin, and high concentrations of sugar (able to start fermentation above 30% wt/vol of sugar), be heat resistant (ability to ferment at 30-32°C), and be able to produce low volatile acidity (mostly as acetic acid). In wine making sulphur dioxide is added to the grape must at the rate of 50-200 ppm for 2 h prior to adding the yeast. The temperature of the fermentation (in vats) is controlled and usually below 30°C; high temperatures can destroy the wine. In general, red wines ferment for 3-6 days at 20-30°C, and white for 1-2 weeks at 10-21°C. The fermented juice is then drawn off from the residues and stored in a second vat for 7-11 days at 20-30°C. The wine is then racked, stored and aged to allow for clearing and flavour and colour development. Another form of wine depends on the 'noble rot' (*Botrytis cinerea*); grapes left on the vine until they are overripe become mouldy with *B. cinerea*, the grapes crack open, and the fungus lives on the juice and the sugar content increases; the mouldy and shrivelled grapes are hand-picked, and made into Sauterne (France), Tokai (Hungary), and Trockenbeerenauslesen (Germany).
- Lit.*: Ainsworth (1976), Amerine & Kunkee (*Ann. Rev. Microbiol.* 22: 323, 1968), Benda (*in* Read, Prescott & Dunn's *industrial microbiology*, edn 4: 293, 1982), Beuchart (Ed.) (*Food and beverage mycology*, 1987), Kendrick (*The fifth kingdom*, edn 2, 1992), Rose (Ed.) (*Alcoholic beverages*, 1977), Varnam (*in* Jones, *Exploitation of micro-organisms*: 297, 1993) See also Brewing, Fermented foods and drinks, Food and beverage mycology, Food spoilage, Mycotoxicoses, Yeast.
- Winfrenatia** T.N. Taylor, Hass & Kerp (1997), Fossil Fungi. 1, Great Britain. See Taylor *et al.* (*Am. J. Bot.* 84: 993, 1997).
- Wingea** Van der Walt (1971) = *Debaryomyces* Lodder & Kreger ex Kreger fide Kurtzman & Robnett (*Antonie van Leeuwenhoek* 66: 337, 1994).
- Winter** (Heinrich Georg; 1848-1887; Germany). Student, Leipzig (1870-1872), then Munich (1872-1873), then Halle (1873); Lecturer in Botany, Zürich Polytechnic (1876-1883); Editor for Fungi, *Rabenhorst's Kryptogamen-Flora* edn 2, Leipzig (1883-1887). Editor of *Hedwigia* (1879-1887). *Publs.* Pilze in *Rabenhorst's Kryptogamen-Flora* edn 2 (1881-1887). *Biogs, obits etc.* Grumann (1974: 55); Pazschke (*Hedwigia* 26: 185, 1887) [portrait]; Stafleu & Cowan (*TL-2* 7: 380, 1988).
- winter mushroom**, see enokitake.
- winter spore**, a resting spore for overwintering, e.g. a teliospore of *Puccinia graminis*. See teliospore.
- Winterella** (Sacc.) Kuntze (1891) nom. dub. ? = *Montagnula* fide Reid & Booth (*CJB* 65: 1320, 1987), Holm (*SA* 11: 29, 1992), Castlebury *et al.* (*Mycol.* 94: 1017, 2002), Mejia *et al.* (*MR* 112: 23, 2008; phylogeny).
- Winterella** Berl. (1893) [non *Winterella* (Sacc.) Kuntze

1891] = *Nitschkia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Winteria (Rehm) Sacc. (1883) = *Mycowinteria*.

Winteria Sacc. (1878) = *Selinia* fide Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).

Winterina Sacc. (1891) nom. ambig., Fungi.

Winterina Sacc. (1899) = *Calyculosphaeria*.

Winteromyces Speg. (1912) = *Gibbera* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).

witches' brooms, massed outgrowths (proliferations) of the branches of woody plants caused by mites, viruses, etc., and fungi, esp. rusts (e.g. *Pucciniastrum goeppertianum* (*Vaccinium*), *Gymnosporangium elisii* (*Chamaecyparis*), *Melampsorella cerastii* (*Abies* and *Picea*)) and *Taphrina* (e.g. *T. betulina* (birch), *T. cerasi* (cherry), *T. insititiae* (plum)); also the 'krulloten' of Cacao caused by *Crinipellis perniciosus*.

witches' butter, basidioma of *Exidia glandulosa*.

Wittmannia R. Czaker (1997), Microsporidia. 1. See Czaker (*J. Eukary. Microbiol.* 44: 445, 1997).

Witwateromyces Hallbauer, Jahns & Van Warmelo (1977), Fossil Fungi, Ascomycota (?L). 1 (Precambrian), S. Africa.

Woessia D. Hawksw. & Poelt (1986) nom. rej., anamorphic *Lecanoraceae*, Hso.0fH.15 (L). 11, widespread. See Sérusiaux (*Biblthca Lichenol.* 58: 411, 1995).

Wojnowicia Sacc. (1899), anamorphic *Pezizomycotina*, Cpd. = eP.15. 4, widespread. *W. hirta* (cereal foot-rot). See Sutton (*Česká Mykol.* 29: 97, 1975), Farr & Bills (*Mycol.* 87: 518, 1995; key).

Woldmaria W.B. Cooke (1961), Niaceae. 1, Europe; N. America. See Cooke (*Beih. Sydowia* 4: 29, 1961), Bodensteiner *et al.* (*Mol. Phylogen. Evol.* 33: 501, 2004; phylogeny).

Wolfina Seaver ex Eckblad (1968), Chorioactidaceae. 3, USA; China. See Pfister & Kurogi (*Mycotaxon* 89: 277, 2004), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny), Pfister *et al.* (*MR* 112: 513, 2008).

Wolfiporia Ryvarden & Gilb. (1984), Polyporaceae. 6, widespread (north temperate). See Ginns (*Mycotaxon* 21: 332, 1984).

wolf's-moss, *Letharia vulpina*, from Scandinavian belief that it was poisonous to wolves.

Wolkia Ramsb. (1915), *Pezizomycotina*. 1, Java.

Wood-attacking fungi. Wood is not an easily degraded substratum. It is usually low in nitrogen and phosphorus, two elements essential for hyphal growth; hardwoods contain tannings, and softwoods various phenolic compounds, and these are generally toxic to fungi; wood also contains few easily assimilable sugars and starches, most of the organic material being in the form of cellulose, hemicellulose and lignin. Lignin in particular is resistant to enzymes, and covers other cellular material in the wood protecting it from decay. As a result, only certain specialized fungi are associated with wood decay. These, with the exception of a few ascomycetes (e.g. *Chaetomium*, *Ustilina*, *Xylaria*) are basidiomycetes, the following genera being specially important: *Armillaria*, *Coniophora*, *Collybia*, *Coriolus*, *Daedalea*, *Echinodontium*, *Fistulina*, *Fomes*, *Ganoderma*, *Heterobasidion*, *Hydnum*, *Hymenochaete*, *Lentinus*, *Lenzites*, *Merulius*, *Peniophora*, *Phellinus*, *Pholiota*, *Piptoporus*, *Polyporus*, *Poria*, *Serpula*, *Schizophyllum*, *Stereum*, *Trametes*.

There are three generally-recognized types of timber decay, based partly on symptoms: (1) **Brown**

rots - cellulose and hemicellulose are decayed, but lignin remains more or less intact; symptoms are brick-shaped cracks, the wood becoming brown and crumbling when handled; production of the enzyme glucose oxidase is associated with this type of rot and may be a diagnostic feature; only basidiomycetes are associated with brown rots, typical examples being *Piptoporus betulinus* and *Serpula lacrymans*; (2) **White rots** - all components of the wood (cellulose, hemicellulose and lignin) are degraded more or less simultaneously, and the wood becomes progressively more fragile while remaining pale; *Armillaria* and *Heterobasidion* are two basidiomycete genera causing economically important white rots in standing timber, and white rots are also caused by some ascomycetes, e.g. species of *Xylaria*. (3) **Soft rots** - similar to brown rots (in that cellulose and hemicellulose are decayed, with lignin remaining more or less intact), but occurring in wood with a high moisture content and with nitrogen available; soft rot fungi are found in rotting window frames, decaying floor boards, jetties, cooling tower slats and fence posts (where, typically, nitrogen is obtained from the surrounding soil).

Rots of standing timber, due to colonization by fungi via wounds, broken branches and dead roots are sometimes classified by rot position, e.g. **top rot** (branches), **core or heart rot** (trunk), **butt rot** (base). Two other terms used to describe wood rots should be noted: (1) **Dry rot** - a brown rot caused by *Serpula lacrymans*. This is a major decay fungus of buildings in temperate areas. The name is misleading as stable damp conditions are needed for initiation of growth. As the fungus develops, it conducts water to drier wood through hyphal strands which penetrate masonry and plaster though not feeding on those materials. Eradication can be difficult and costly. See Jennings & Bravery (*Serpula lacrymans: fundamental biology and control strategies*, 1991). (2) **Wet rot** - caused by many fungal species, including brown, white and soft rot types. A common example is *Coniophora puteana*, the 'cellar fungus'.

Certain fungi are a cause of staining in wood. Stored wood may be stained by the growth of surface moulds (*Alternaria*, *Aspergillus*, *Mucor*, *Penicillium*, *Rhizopus*, etc.) or by fungi in the wood (e.g. *Ophiostoma*, a cause of 'blue stain'), sometimes of living trees. Brown oak (*Quercus*) wood stained by *Fistulina hepatica*; Cartwright, *TBMS* 21: 68, 1937) is valued, and wood coloured green by *Chlorociboria aeruginascens* is used in making 'Tunbridge Ware'. Wood having 'zone lines' (q.v.) is sometimes used for ornaments (see spalted wood). Some wood staining fungi also damage wood pulp; see Melin & Nannfeldt (*Svenska Skogvs Fören. Tidskr.* 314: 397, 1934).

Forest hygiene and good forestry practice are the chief methods by which decay in living trees is controlled. In cut trees, in stored wood, and wood in buildings, steps may be taken to maintain conditions in which fungal growth does not take place: water content of the wood and the air are kept low, with good ventilation, and fungicides used. A range of preservatives is available for preservation of wood, but subject to various national regulations in their use. In the UK, for example, only products cleared for use under the Control of Pesticides Regulations (www.hse.gov.uk/biocides/copr/index.htm) should be

used. Active ingredients may include coal tar creosote (a coal tar oil), copper and zinc naphthenates, organotin compounds, phenolic compounds, and copper, chromium and arsenic salts.

Lit.: Boyce (*Forest pathology*, edn 3, 1961), Bravery *et al.* (*Recognizing wood rot and insect damage in buildings*, 1987), Carroll & Wicklow (Eds) (*The fungal community*, edn 2, 1992), Cartwright & Findlay (*Decay of timber and its prevention*, edn 2, 1958), Cockroft (Ed.) (*Some wood-destroying basidiomycetes*, 1981), Deacon (*Fungal biology*, 2005), Dix & Webster (*The ecology of fungi*, 1995), Easton & Hale (*Wood. Decay, pests and protection*, 1993), Fergus (*Illustrated genera of wood decay fungi*, 1960), Findlay (*Dry rot and other timber troubles*, 1952), Findlay (Ed.) (*Preservation of timber in the tropics*, 1985), Gilbertson (*Mycol.* 72: 1, 1980; wood-rotting fungi of N. Am., 119 refs), Hunt & Garratt (*Wood preservation*, 1938), Nobles (*CJB* 43: 1097, 1965; identification of cultures; keys 149 spp.), Rayner & Boddy (*Fungal decomposition of wood*, 1988), Stalpers (*Stud. Mycol.* 16, 1978; keys 550 spp. polypores in culture), Wang & Zabel (Eds) (*Identification manual for fungi from utility poles in Eastern United States*, 1990), Zainal (*Micro-morphological studies on soft rot fungi in wood* [*Bibl. Mycol.* 70], 1981).

Woodiella Sacc. & P. Syd. (1899), Helotiales. 1, S. Africa.

Wood's light, Ultra-violet light filtered through nickel oxide-containing soda glass. *Microsporium*- but not *Trichophyton*-infected hairs show a bright greenish fluorescence in Wood's light, an effect made use of in diagnosis (see Davison & Gregory, *Can. J. Res.* 7: 378, 1932). For examination of agarics by Wood's light see Deysson (*BSMF* 74: 207, 1958).

Wormald (Hugh; 1879-1955; England). Plant pathologist, Wye College, Kent (1911-1922); Head of the Plant Pathology Section, East Malling Research Station (1923-1939). Noted for his work on diseases of fruit trees, especially bacterial diseases and brown rot. *Publs.* Brown rot diseases of fruit trees. *Bulletin of the Ministry of Agriculture* 88 (1935); *Technical Bulletin of the Ministry of Agriculture* 3 (1954); *Diseases of Fruits and Hops* (1939) [edn 3, 1955]. *Biogs, obits etc.* Barnes (*TBMS* 39: 289, 1956) [portrait]; Harris (*Report East Malling Research Station 1955*: 15, 1956) [portrait].

Woronichina Naumov (1951) [non *Woronichina* Elenkin 1933, *Algae*] = *Stigmatula* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Woronin (Michael Stepanovitch; 1838-1903; Russia). Student, University of St Petersburg (1854-1858), then Heidelberg (1858-1859, then Freiberg, with de Bary (q.v.) (1859-1860); visited Antibes (1860); masters degree, St Petersburg (1861); doctorate, Odesa (1874); private scientist, mostly St Petersburg (1861-1903); Member of the Imperial Academy of Sciences, St Petersburg (1898-1903). A pioneer plant pathologist in Russia, who elucidated the cause of club-root disease of *Brassica* crops and made successful recommendations for its control; gave his name to 'Woronin bodies' (q.v.); also celebrated for his discovery of nitrogen-fixing bacteria in nodules on legumes. *Publs.* Untersuchungen über die Entwicklung des Rostpilzes (*Puccinia helianthi*), welcher die Krankheit der Sonnenblumen verursacht. *Botanische Zeitung* (1872); *Plasmodiophora brassi-*

cae, Urheber der Kohlpflanzenhernie. *Pringsheim's Jahrbücher für Wissenschaftliche Botanik* (1877) [English translation, *Phytopathological Classics* 4, 1934]; Beitrag zur Kenntnis der Monoblepharideen. *Mémoires de l'Académie Impériale des Sciences St Péterbourg* (1904); Ueber *Sclerotinia cinerea* und *Sclerotinia fructigena*. *Mémoires de l'Académie Impériale des Sciences St Péterbourg* (1900); (with de Bary, q.v.) *Beiträge zur Morphologie und Physiologie der Pilze* (1864-1881) [a series published in *Abhandlungen von der Senckenbergischen Naturforschenden Gesellschaft*]. *Biogs, obits etc.* Grumann (1974: 568); Khokhriakov ([*Mikologiya i Fitopatologiya*] 11: 451, 1977 [in Russian]); Smith (*Phytopathology* 2: 1, 1912); Stafleu & Cowan (*TL-2* 7: 455, 1988).

Woronin bodies. Rounded or elongated-oval highly refractive bodies in the cells of certain ascomycetes, particularly in association with septa (Buller, 5: 127, 1933); in *Erysiphe graminis*, see McKeen (*Can. J. Microbiol.* 17: 1557, 1971); Woronin bodies seal septal pores in response to damage of adjacent cells and, in *Magnaporthe grisea*, have been shown to provide a defence against the antagonistic and nutrient-limiting environment encountered within the host plant (Soundararajan *et al.*, *The plant cell* 16: 1564, 2004); the genetic control and formation of Woronin bodies have been investigated (Wei Kiat Tey *et al.*, *Molecular biology of the cell* 16: 2651, 2005; Liu *et al.*, *Journal of cell biology* 180: 325, 2008). **Woronin's hypha** (of ascomycetes), a coiled hypha probably homologous with an archicarp (de Bary, 1887); a loosely coiled hypha of large diam., at the centre of a young peritheciium, which later develops ascogenous hyphae (Miller, 1928); scolecite.

Woroninella Racib. (1898) = *Synchytrium* fide Gäumann (*Annls mycol.* 25: 167, 1927).

Woroninula Mekht. (1979) = *Arthrobotrys* fide Scholler *et al.* (*Sydowia* 51: 89, 1999).

wort, see Brewing.

wortmannin, an antibiotic from *Talaromyces wortmannii* (anamorph); antifungal esp. against *Botrytis*, *Cladosporium* and *Rhizopus* (Brian *et al.*, *TBMS* 40: 365, 1957).

Wright (Jorge Eduardo; 1922-2005; Argentina). Mycologist, Laboratorio de Fitopatología, Ministerio de Agricultura y Ganadería (1945-1953); student, University of Michigan (1953-1955); Professor of Systematic Botany (1960-1988) then Professor emeritus (1988-2000), Universidad de Buenos Aires. A leading figure in Latin-American mycology, establishing a unique fungal culture and dried reference collection in Buenos Aires (BACF), and first President of the Asociación de Micología Carlos Spegazzini, Argentina's learned society for non-medical mycologists. *Publs.* The genus *Tulostoma* (*Gasteromycetes*) - A World Monograph (1987); (with Deschamps) *Patología Forestal del Cono Sur de América*. vol. I (1997); (with Alberto) *Guia de los Hongos de la Región Pampeana* 2 vols (2002). *Biogs, obits etc.* López (*Darwiniana* 43: 300, 2005) [portrait]; López, Cabral & Cafaro (*Mycol.* 98: 518, 2006).

Wrightiella Speg. (1923) [non *Wrightiella* F. Schmitz 1893, *Algae*] = *Leptodothis*.

Wrightoporia Pouzar (1966), Bondarzewiaceae. 23, widespread. Polyphyletic. See David & Rajchenberg (*CJB* 65: 202, 1987; key), Stalpers (*Stud. Mycol.* 40: 129, 1996; key), Cui & Dai (*Nova Hedwigia* 83: 159,

- 2006; China).
- Wrightoporiaceae** Jülich (1982), Agaricomycetes (inc. sed.). 1 gen., 31 spp. See Jülich (*Bibliotheca Mycol.* 85: 396, 1981).
- Wuestneia** Auersw. ex Fuckel (1863), Diaporthales. Anamorph *Harknessia*. 15, widespread (temperate). Polyphyletic, most species are not congeneric with the type. See Holm (*Taxon* 24: 475, 1975; nomencl.), Ananthapadmanaban (*TBMS* 91: 517, 1988), Reid & Booth (*CJB* 67: 909, 1989; key), Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993), Yuan & Mohammed (*MR* 101: 195, 1997), Crous & Rogers (*Sydowia* 53: 74, 2001), Castlebury *et al.* (*Mycol.* 94: 1017, 2002; phylogeny), Lee *et al.* (*Stud. Mycol.* 50: 235, 2004), Rossman *et al.* (*Mycoscience* 48: 142, 2007), Rossman *et al.* (*Mycoscience* 48: 135, 2007; review).
- Wuestneiopsis** J. Reid & Dowsett (1990), Diaporthales. Anamorph *Mastigospora*. 1, N. America. See Reid & Dowsett (*CJB* 68: 2398, 1990), Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*, 1993).
- WWW**, see Internet.
- wyerone**, a phytoalexin (q.v.) from broad bean (*Vicia faba*).
- Wynnea** Berk. & M.A. Curtis (1867), Sarcoscyphaceae. 4, widespread. See Pfister (*Mycol.* 71: 144, 1979), Kaushal (*Res. Bull. Punjab Univ.* 34: 29, 1983), Liu *et al.* (*Mycotaxon* 30: 465, 1987; key 6 spp.), Li & Kimbrough (*CJB* 74: 10, 1996; spore ontogeny), Harrington *et al.* (*Mycol.* 91: 41, 1999; phylogeny), Zhuang (*Mycotaxon* 87: 131, 2003; Asia), Zhuang (*Nova Hedwigia* 79: 519, 2004; Asia), Padovan *et al.* (*J. Mol. Evol.* 60: 726, 2005; phylogeny).
- Wynnella** Boud. (1885), Helvellaceae. 1, widespread. See Harmaja (*Karstenia* 14: 102, 1974), Kimbrough (*MR* 95: 421, 1991), O'Donnell *et al.* (*Mycol.* 89: 48, 1997), Harrington *et al.* (*Mycol.* 91: 41, 1999), Landvik *et al.* (*Mycol.* 91: 278, 1999), Zhuang (*Mycotaxon* 90: 35, 2004; China), Hansen & Pfister (*Mycol.* 98: 1029, 2006; phylogeny).
- Xanthagaricus** (Heinem.) Little Flower, Hosag. & T.K. Abraham (1997), Agaricaceae. 12, widespread. See Little Flower & Hosagoudar (*New Botanist* 24: 93, 1997).
- Xanthidium**.
- Xanthoanaptychia** S.Y. Kondr. & Kärnefelt (2003) = *Teloschistes* fide Kondratyuk & Kärnefelt (*Ukrainian Jour. Bot.* 60: 427, 2003), Gaya *et al.* (*MR* 112: 528, 2008).
- Xanthocarpia** A. Massal. & De Not. (1853) nom. rej. = *Caloplaca* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Xanthochroales**. An order proposed for poroid basidiomycetes having uninflated hyphae lacking clamp connexions (Corner, *Clavaria*: 22, 1950).
- xanthochroic** (of a hymenomycete basidioma), having a reddish-brown or yellowish-brown context which darkens on treatment with KOH.
- Xanthochrous** Pat. (1897) ≡ *Polystictus*. or *Coltricia* (*Hymenochaet.*) fide Donk (1974).
- Xanthoconium** Singer (1944), Boletaceae. 7, cosmopolitan. See Wolfe (*CJB* 65: 2142, 1987), Gori (*Boll. Gruppo Micol. 'G. Bresadola'* 40: 239, 1997).
- Xanthodactylon** P.A. Duvign. (1941), Teloschistaceae (L). 1, S.W. Africa. See Kärnefelt (*Cryptog. Bot.* 1: 147, 1989).
- Xanthoglossum** (Sacc.) Kuntze (1891) = *Microglossum* Gillet fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Xanthomaculina** Hale (1985), Parmeliaceae (L). 3, S. Africa. See Büdel & Wessels (*Dinteria* 18: 3, 1986; vagrant *X. huena*), Henssen (*Cryptog. Bryol.-Lichenol.* 19: 267, 1998; ontogeny, thallus), Blanco *et al.* (*Taxon* 53: 959, 2004; phylogeny), Thell *et al.* (*Mycol. Progr* 3: 297, 2004; phylogeny), Thell *et al.* (*J. Hattori bot. Lab.* 100: 797, 2006).
- Xanthomendoza** S.Y. Kondr. & Kärnefelt (1997), Teloschistaceae (L). 17, Americas. See Kondratyuk & Kärnefelt (*Progr. Probl. Lichenol. Nineties. Proc. Third Symp. Intern. Assoc. Lichenol. [Bibliotheca Lichenol.* 68]: 26, 1997), Søchting *et al.* (*Mitteilungen aus dem Institut für Allgemeine Botanik Hamburg* 30-32: 225, 2002), Lindblom (*Bryologist* 109: 1, 2006), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Gaya *et al.* (*MR* 112: 528, 2008; phylogeny).
- Xanthoparmelia** (Vain.) Hale (1974), Parmeliaceae (L). c 500, widespread (esp. southern hemisphere). See Elix *et al.* (*Bull. Br. Mus. nat. hist. Bot.* 15: 163, 1986; key 117 spp. Australasia), Hale (*Smithson. Contr. Bot.* 74, 1990; monogr.), Thomson (*Bryologist* 96: 342, 1993; key 55 spp. N. Am.), Nash *et al.* (*Bibliotheca Lichenol.* 56, 1995; key 77 spp. S.Am.), Calvelo (*Lichenology in Latin America. History, Current Knowledge and Applications* [Proceedings of GLAL-3, Terceiro Encontro do Grupo Latino-Americano de Liqueólogos, São Paulo, Brazil, 24-28 September, 1997]: 117, 1998; key, S America), Crespo & Cubero (*Lichenologist* 30: 369, 1998; phylogeny), Mattsson & Wedin (*Lichenologist* 30: 463, 1998; phylogeny), Elix (*Mycotaxon* 73: 51, 1999; S Africa), Elix & Kantvilas (*Mycotaxon* 73: 441, 1999; Australia), Elix (*Bibliotheca Lichenol.* 80, 2001), Divakar & Upreti (*Nova Hedwigia* 75: 507, 2002; India), Eliasaro & Adler (*Mitteilungen aus dem Institut für Allgemeine Botanik Hamburg* 30-32: 25, 2002; Brazil), Elix (*Lichenologist* 34: 283, 2002; Africa), Giordani *et al.* (*Lichenologist* 34: 189, 2002; Italy), Hawksworth & Crespo (*Taxon* 51: 807, 2002; nomencl.), Elix (*Mycotaxon* 87: 395, 2003; generic limits), Elix (*Lichenologist* 35: 291, 2003; Australia), Blanco *et al.* (*Taxon* 53: 959, 2004; phylogeny), Elix (*Lichenologist* 36: 277, 2004; Australia), Nash *et al.* (*Symb. bot. upsal.* 34 no. 1: 289, 2004; Mexico), Blanco *et al.* (*Mol. Phylogen. Evol.* 39: 52, 2006; phylogeny), Elix (*J. Hattori bot. Lab.* 100: 635, 2006; Australia), Miadlikowska *et al.* (*Mycol.* 98: 1088, 2006; phylogeny), Thell *et al.* (*J. Hattori bot. Lab.* 100: 797, 2006; phylogeny), Del Prado *et al.* (*MR* 111: 685, 2007; ascospore anatomy), Honegger & Zippler (*MR* 111: 424, 2007; mating systems), Pérez-Ortega & Elix (*Lichenologist* 39: 297, 2007; Spain, key).
- Xanthopeltis** R. Sant. (1949), Teloschistaceae (L). 1, Chile. See Follmann (*Revta Universitaria (Chile)* 47: 33, 1962), Kärnefelt (*Cryptog. bot.* 1: 147, 1989).
- Xanthophyllumyces** Golubev (1995), Cystofilobasidiaceae. Anamorph *Phaffia*. 1, widespread. See Golubev (*Yeast Chichester* 11: 101, 1995; taxonomy), Kucsera *et al.* (*Antonie van Leeuwenhoek* 73: 163, 1998; life cycle), Medwid (*J. Industr. Microbiol. Biotechnol.* 21: 228, 1998; ploidy), Fell *et al.* (*Int. J. Syst. Evol. Microbiol.* 50: 1351, 2000; mol. phylogeny), Weiss *et al.* (*Frontiers in Basidiomycete Mycology*: 7, 2004).

- Xanthoporia** Murrill (1916) = *Inonotus* fide Pegler (*TBMS* 47: 175, 1964).
- Xanthoporina** C.W. Dodge (1948) = *Collemopsidium* fide Aptroot (*in litt.*).
- Xanthoporus** Audet (2007), Agaricomycetes. 1.
- Xanthopsis** Acloque (1893) [non *Xanthopsis* (DC.) Koch 1851, *Compositae*] = *Catolechia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Xanthopsora** Gotth. Schneid. & W.A. Weber (1980) [non *Xanthopsora* Speg. 1922] = *Xanthopsorella*.
- Xanthopsora** Speg. (1922) = *Linochora* fide Petrak & Sydow (*Annls mycol.* 33: 176, 1935).
- Xanthopsorella** Kalb & Hafellner (1984), Catillariaceae (L.). 1, Mexico; USA. See Kalb & Hafellner (*Nova Hedwigia* Beih. 79: 384, 1984), Timdal (*Mycotaxon* 31: 101, 1988).
- Xanthopsorellaceae** Hafellner (1984) = Catillariaceae.
- Xanthopyrenia** Bachm. (1919) = *Collemopsidium* fide Aptroot (*in litt.*).
- Xanthopyreniaceae** Zahlbr. (1926), Pyrenulales (L.). 5 gen. (+ 4 syn.), 35 spp.
Lit.: Hawksworth (*J. Linn. Soc. Bot.* 96: 3, 1988), Santesson (*Lichenologist* 24: 7, 1992), Fałtynowicz & Sagin (*Acta Mycologica Warszawa* 30: 147, 1995), Harada (*Bryologist* 102: 50, 1999), McCarthy & Kantvilas (*Lichenologist* 31: 227, 1999), Schultz *et al.* (*Pl. Biol.* 2: 482, 2000), Mohr *et al.* (*MR* 108: 515, 2004), Calatayud *et al.* (*Lichenologist* 39: 129, 2007).
- Xanthoria** (Fr.) Th. Fr. (1860) nom. cons., Teloschistaceae (L.). c. 56, widespread. See Thomson (*Am. midl. Nat.* 41: 706, 1949; N. Am.), Almborn (*Bot. Notiser* 16: 161, 1963; S. Afr.), Steiner & Poelt (*Pl. Syst. Evol.* 140: 151, 1982; sect. *Xanthoriella*), Awasthi (*Proc. Indian Acad. Sci. Pl. Sci.* 96: 227, 1985; Indian spp.), Janex-Favre & Ghaleb (*Cryptog. Bryol.-Lichénol.* 7: 457, 1986; ontogeny), Poelt & Petutschnig (*Nova Hedwigia* 54: 1, 1992; key *X. candelaria* group), Arnold & Poelt (*Bibliotheca Lichenol.* 57: 49, 1995; chemistry), Castello (*Cryptog. Bryol.-Lichénol.* 16: 79, 1995; Antarctica), Lindblom (*J. Hattori bot. Lab.* 83: 75, 1997; N. Am.), Franc & Kärnefelt (*Graphis Scripta* 9: 49, 1998; phylogeny), Kärnefelt *et al.* (*Lichenologist* 34: 333, 2002; S Africa), Murtagh *et al.* (*MR* 106: 1277, 2002; infraspecific variation), Gaya *et al.* (*Am. J. Bot.* 90: 1095, 2003; phylogeny), Scherrer & Honegger (*New Phytol.* 158: 375, 2003; hydrophobin genes), Søchting & Lutzoni (*MR* 107: 1266, 2003; reln with *Caloplaca*), Wang *et al.* (*Mycosystema* 22: 536, 2003; chemistry), Honegger *et al.* (*Lichenologist* 36: 381, 2004; genetic diversity), Kondratyuk *et al.* (*Bibliotheca Lichenol.* 88: 349, 2004; S Africa), Lindblom & Ekman (*MR* 109: 187, 2005), Lindblom *et al.* (*Graphis Scripta* 17: 12, 2005; Scandinavia), Scherrer *et al.* (*Fungal Genetics Biol.* 42: 976, 2005; mating types), Sano *et al.* (*Jap. J. Med. Mycol.* 47: 113, 2006; phylogeny), Lindblom & Ekman (*Lichenologist* 39: 259, 2007; population biology), Gaya *et al.* (*MR* 112: 528, 2008; phylogeny).
- Xanthoriicola** D. Hawksw. (1973), anamorphic *Pezizomycotina*, Hsp.0eP.15. 1 (on lichens, *Xanthoria*), Europe. See Hawksworth (*Bull. Br. Mus. nat. hist. Bot.* 6: 183, 1979; SEM).
- Xanthoriomyces** E.A. Thomas ex Cif. & Tomas. (1953) = *Xanthoria*.
- Xanthothecium** Arx & Samson (1973), Onygenaceae. 1, widespread. See Currah (*Mycotaxon* 24: 1, 1985; posn).
- Xeilaria**, see *Cheilaria*.
- Xenasma** Donk (1957), Xenasmataceae. 9, Europe; N. America. See Hjortstam *et al.* (*Cortic. N. Europ.* 8, 1988; key Eur. spp.) Sensus lato 48 spp., Liberta (*Mycol.* 52: 884, 1962; key).
- Xenasmataceae** Oberw. (1966), Polyporales. 3 gen., 27 spp.
Lit.: Hallenberg (*Mycotaxon* 27: 361, 1986), Hjortstam & Larsson (*Mycotaxon* 29: 315, 1987), Lin & Chen (*Taiwania* 35: 69, 1990), Nakasone (*Mycol. Mem.* 15: 412 pp., 1990), Maekawa (*Rep. Tottori Mycol. Inst.* 31: 1, 1993), Ginns (*Mycol.* 90: 19, 1998), Greslebin & Rajchenberg (*N.Z. J. Bot.* 41: 437, 2003), Larsson *et al.* (*MR* 108: 983, 2004).
- Xenasmatella** Oberw. (1966), Xenasmataceae. 14, widespread. See Hjortstam *et al.* (*Cortic. N. Europ.* 8, 1988; sub *Phlebiella*).
- Xenidiocercus** Nag Raj (1993), anamorphic *Pezizomycotina*, Cpd.0eH.19. 3, India; W. Africa. See Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*: 975, 1993), Wu & Sutton (*Mycoscience* 36: 271, 1995).
- xenobiotic** (1) a chemical not normally synthesized or metabolized by living organisms, e.g. a manufactured drug; (2) chemical waste or other pollutant toxic to a living organism.
- Xenobotrytis** R.F. Castañeda & W.B. Kendr. (1990) = *Paracostantinella* fide Kendrick (*in litt.*).
- Xenocalonectria** Crous & C.L. Schoch (2000), Nectriaceae. Anamorph *Xenocyliandrocladium*. 1, Ecuador. See Schoch *et al.* (*Stud. Mycol.* 45: 45, 2000), Crous (*Taxonomy and Pathology of Cyliandrocladium (Calonectria) and Allied Genera*: 278 pp., 2002).
- Xenochalara** M.J. Wingf. & Crous (2000), anamorphic *Pezizomycotina*. 1, Netherlands. See Coetsee *et al.* (*S. Afr. J. Bot.* 66: 101, 2000).
- Xenochora** Petr. (1948), anamorphic *Pezizomycotina*, Cpd.0eH/1eP.?. 1, Ecuador.
- Xenocyliandrocladium** Decock, Hennebert & Crous (1997), anamorphic *Xenocalonectria*, Hso.?.?. 3, Ecuador. See Decock *et al.* (*MR* 101: 788, 1997), Schoch *et al.* (*Stud. Mycol.* 45: 45, 2000), Crous *et al.* (*Mycoscience* 42: 559, 2001), Crous (*Taxonomy and Pathology of Cyliandrocladium (Calonectria) and Allied Genera*: 278 pp., 2002).
- Xenodiella** Syd. (1935), anamorphic *Xenodium*, Hsp.0eH.?. 1, S. America.
- Xenodimerium** Petr. (1947) ? = *Eudarluca* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Xenodiscella** Petr. (1954) = *Rhagadolobium* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Xenodium** Syd. (1935), Elsinoaceae. Anamorph *Xenodiella*. 1, S. America.
- Xenodochus** Schltdl. (1826), Phragmidiaceae. 2 (on *Sanguisorba* (*Rosaceae*)), widespread (north temperate). See Sato & Sato (*TMSJ* 21: 411, 1980; life cycle).
- Xenodomus** Petr. (1922), anamorphic *Pezizomycotina*, Cpd.0eH.?. 1, N. America.
- Xenogliocladiopsis** Crous & W.B. Kendr. (1994), anamorphic *Arnaudiella*, Hso.0eH.15. 1, S. Africa. See Crous & Kendrick (*CJB* 72: 63, 1994).
- Xenogloea** Syd. & P. Syd. (1919) = *Kriegeria* Bres.
- Xenoheteroconium** Bhat, W.B. Kendr. & Nag Raj (1993), anamorphic *Pezizomycotina*, Hso. = eP.1. 1, India. See Bhat & Kendrick (*Mycotaxon* 49: 80, 1993).

- Xenokylindria** DiCosmo, S.M. Berch & W.B. Kendr. (1983), anamorphic *Pezizomycotina*, Hso.1eH.19. 1, Japan. See DiCosmo *et al.* (*Mycol.* 75: 971, 1983).
- Xenolachne** D.P. Rogers (1947), Tremellales. 2, USA; Europe. See Grauwinkel (*Rheinland-Pfälzisches Pilzjournal* 3: 3, 1993).
- Xenolecia** Hertel (1984), Porpidiaceae (L.). 1, Chile. See Hertel (*Nova Hedwigia* Beih. 79: 439, 1984).
- Xenolophium** Syd. (1925), Melanommataceae. 4, widespread (tropical). See Huhndorf (*Mycol.* 85: 490, 1993).
- Xenomeris** Syd. (1924), Capnodiales. Anamorphs *Hormonema*-like, *Sclerophoma*. c. 11, widespread. *X. abietis* (dieback of conifers). See Funk & Shoemaker (*Mycol.* 63: 567, 1971), Samuels *et al.* (*Brittonia* 40: 392, 1988), Barr (*Sydowia* 41: 25, 1989), Winton *et al.* (*Mycol.* 99: 240, 2007; phylogeny).
- Xenomycetes** Ces. (1879) = *Sclerocystis* fide Zycha *et al.* (*Mucorales*, 1969).
- Xenomoxa** Syd. (1939), *Pezizomycotina*. 1, Ecuador.
- Xenonectria** Höhn. (1920) = *Byssosphaeria* fide Barr (*Mycotaxon* 20, 1984).
- Xenonectriella** Weese (1919), Nectriaceae. 4 (lichenicolous), widespread. See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Xenopeltis** Syd. & P. Syd. (1919), anamorphic *Pezizomycotina*, Cpt.0eH.?. 1, Philippines.
- Xenoplaca** Petr. (1949), anamorphic *Pezizomycotina*, Hso.0eP.?. 1, S. America. See von Arx (*Persoonia* 11: 388, 1981; redescr.).
- Xenopus** Penz. & Sacc. (1901) nom. dub., Agaricomycetes. 'basidiomycetes'. See Hughes (*CJB* 36: 747, 1958).
- Xenosoma** Syd. & P. Syd. (1921) nom. dub., Agaricomycetes. 'gasteromycetes' or ? *Trichosphaeriales*.
- Xenosperma** Oberw. (1965), Xenasmataceae. 4, widespread. See Oberwinkler (*Sydowia* 19: 45, 1965).
- Xenosphaeria** Trevis. (1860) = *Dacampia* fide Alstrup & Hawksworth (*Meddr Grønland Biosc.* 31, 1990).
- xenospore**, a spore dispersed from its place of origin (Gregory, in Madelin, 1966). Cf. memnospore.
- Xenosporella** Höhn. (1923) = *Xenosporium* fide Pirozynski (*Mycol. Pap.* 105, 1966).
- Xenosporium** Penz. & Sacc. (1901), anamorphic *Thaxteriellopsis*, Hso.#eP.1. 13, widespread (esp. tropical). See Pirozynski (*Mycol. Pap.* 105, 1966; key), Goos (*Mycol.* 82: 742, 1990; key), Bussaban *et al.* (*Fungal Diversity* 14: 61, 2003; Thailand), Zhao *et al.* (*Nova Hedwigia* 82: 127, 2006).
- Xenostele** Syd. & P. Syd. (1921), Pucciniaceae. 4 (on *Lauraceae*), Asia. See Cummins (*Illustr. Gen. Rust Fungi*, 1959; as *Puccinia*), Zhuang (*Mycosystema* 3: 29, 1990; species on *Lauraceae* (as *Puccinia*)).
- Xenostigme** Syd. (1930), ? Meliolaceae. 1 (from leaves), S. America.
- Xenostigmella** Petr. (1950) ? = *Balladynopsis* fide Sivanesan (*Mycol. Pap.* 146, 1981).
- Xenostigmata** Crous (1998) ? = *Pseudocercospora* fide Crous (*Mycol. Mem.* 21: 154, 1998), Crous & Braun (*CBS Diversity Ser.* 1: 571 pp., 2003), Batzer *et al.* (*Mycol.* 97: 1268, 2005).
- Xenostilbum** Petr. (1959) = *Calostilbella* fide von Arx (*Persoonia* 11: 391, 1981).
- Xenostomella** Syd. (1930), Microthyriaceae. 2, S. America.
- Xenostroma** Höhn. (1915), anamorphic *Pezizomycotina*, St.0eH/1eP.?. 1, Europe.
- Xenothecium** Höhn. (1919), ? Hyponectriaceae. 1, S. America.
- Xenotypa** Petr. (1955), Valsaceae. 1, Europe; N. America. See Pirozynski (*CJB* 52: 2129, 1974), Barr (*Mycol. Mem.* 7, 1978).
- Xenus** Kohlm. & Volkm.-Kohlm. (1992), Pyrenulales. 1 (on coralline alga), Belize. See Eriksson & Hawksworth (*SA* 11: 189, 1993).
- Xepicula** Nag Raj (1993), anamorphic *Pezizomycotina*, Ccu.0eH/1eP.15. 2, widespread. See Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*: 979, 1993), Seifert *et al.* (*Mycotaxon* 87: 317, 2003).
- Xepiculopsis** Nag Raj (1993), anamorphic *Pezizomycotina*, Ccu.0eH/1eP.15. 2, widespread. See Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*: 9823, 1993), Seifert *et al.* (*Mycotaxon* 87: 317, 2003).
- xero-** (prefix), dry; drought.
- Xerocarpus** P. Karst. (1881) [non *Xerocarpus* Guill., Perr. & A. Rich. 1832, *Papilionaceae*] = *Phanerochaete* fide Donk (*Taxon* 6: 17, 1957).
- Xerocomaceae** Pegler & T.W.K. Young (1981) = Boletaceae.
- Xerocomellus** Šutara (2008) = *Boletus* Fr. fide Kuyper (*in litt.*).
- Xerocomopsis** Reichert (1940) = *Boletus* Fr.
- Xerocomus** Qué. (1887) nom. cons. = *Boletus* Fr. fide Kuyper (*in litt.*).
- Xeroconium** D. Hawksw. (1981), anamorphic *Pezizomycotina*, Cpd.0eP.19. 1, Finland. See Hawksworth (*Bull. Br. Mus. nat. Hist. Bot.* 9: 33, 1981).
- Xerocoprinus** Maire (1907), Agaricaceae. 1, Africa.
- Xerodiscus** Petr. (1943) = *Arthonia* fide Müller & von Arx (*Beitr. Kryptfl. Schweiz* 11 no. 2, 1962).
- Xeromedulla** Korf & W.Y. Zhuang (1987), Helotiaceae. 3, China; Philippines. See Zhuang & Korf (*Mycotaxon* 30: 189, 1987).
- Xeromphalia**, see *Xeromphalina*.
- Xeromphalina** Kühner & Maire (1934), ? Mycenaceae. c. 30, widespread. See Smith (*Pap. Mich. Acad. Sci.* 38: 53, 1953; N. Am.), Singer (*Boln Soc. argent. Bot.* 10: 302, 1965), Miller (*Mycol.* 60: 156, 1968; key 12 N. Am. spp.), Horak (*Sydowia* 32: 131, 1979; Indo-malaya & Austral. spp.), Klán (*Česká Mykol.* 38: 205, 1984; Eur. spp.), Antonín (*Mykol. Listy* 82: 1, 2002; key Centr. Eur. spp.), Antonín & Noordeloos (*A monograph of the genera Hemimycena*, □, 2004), Cléménçon (*Persoonia* 18: 449, 2005; basidiome developm).
- Xeromyces** L.R. Fraser (1954) = *Monascus* fide Hawksworth & Pitt (*Aust. J. Bot.* 31: 51, 1983; posn), Pitt & Hocking (*CSIRO Food Res. Q.* 42: 1, 1983), Udagawa *et al.* (*TMSJ* 27: 303, 1986), Kuraishi *et al.* (*Antonie van Leeuwenhoek* 77: 179, 2000; ubiquinones), Park & Jong (*Mycoscience* 44: 25, 2003; phylogeny), Stchigel *et al.* (*Stud. Mycol.* 50: 299, 2004; phylogeny).
- xerophilic**, favouring habitats in which water is not available; either living in desert conditions or where water is not generally available because of the physiological status of cells (c.f. water activity).
- xerophyte**, a plant of dry habitats; sometimes incorrectly applied to fungi.
- Xerosporae**, hyphomycetes and coelomycetes with dry spores. Cf. *Gloiosporae* See Wakefield & Bisby (*TBMS* 25: 49, 1942).
- Xerotinus** Rchb. (1828) = *Xerotus*.
- xerotolerant**, able to grow under dry conditions (Pitt *in*

- Duckworth (Ed.), *Water relations of foods*, 1975).
- Xerotrema** Sherwood & Coppins (1980), Odontotremataceae. 1, British Isles. See Sherwood & Coppins (*Notes R. bot. Gdn Edinb.* 38: 368, 1980), Lumbsch *et al.* (*Mol. Phylogen. Evol.* 31: 822, 2004; phylogeny).
- Xerotus** Fr. (1828), Polyporaceae. 4, Africa. See Pegler (*The polypores [Bull. BMS Suppl.]*, 1973; sub *Xerotinus*), Ryvarden (*Syn. Fung.* 5, 1991).
- Xerula** Maire (1933), Physalacriaceae. c. 15, widespread (north temperate). See Dörfelt (*Mycotaxon* 15: 62, 1982; nomencl., bibliogr.), Petersen & Nagasawa (*Rep. Tottori Mycol. Inst.* 43, 2006).
- Xerulaceae** Jülich (1982) = Physalacriaceae.
Lit.: Redhead (*CJB* 66: 479, 1988) however, they fit well in the *Physalacriaceae* clade; see, Moncalvo *et al.* (*Syst. Biol.* 49: 278, 2000), Matheny *et al.* (*Mycol.* 98: 982, 2006).
- Xerulina** Singer (1962) = *Cyptotrama* fide Kuyper (*in litt.*).
- Xiambola** Minter & Hol.-Jech. (1981), anamorphic *Pezizomycotina*, Ccu.1eH.38. 1, Czech Republic. See Minter & Holubová-Jechová (*Folia geobot. phytotax.* 16: 213, 1981).
- Xiphomyces** Syd. & P. Syd. (1916), anamorphic *Pezizomycotina*, Hsp.0eP.?. 2, Philippines; Tristan da Cunha.
- Xylaria** Hill ex Grev. (1823) nom. rej. prop. $\equiv$ *Cordyceps*.
- Xylaria** Hill ex Schrank (1789) nom. cons., Xylariaceae. Anamorphs *Moelleroclavus*, *Geniculosporium*-like, *Xylocoremium*. c. 300, widespread (esp. tropical). *X. digitata* (root rot of hardwoods); *X. hypoxylon*, the Candle-snuff fungus (black root rot of apple); *X. vaporaria* (an invader of mushroom beds). See Dennis (*Kew Bull.* 1956: 401, 1957; trop. Am.), Dennis (*Revta Biol. Lisb.* 1: 175, 1958; trop. Afr.), Dennis (*Bull. Jard. bot. Brux.* 31: 111, 1961; Congo), Joly (*Revue Mycol. Paris* 33: 155, 1966; Vietnam), Dennis *in* Parmasto (*Zhivaya priroda Dal'nego Vostoka*: 42, 1972; E. former USSR), Rogers (*Mycol.* 75: 457, 1983), Bertault (*BSMF* 100: 139, 1984; key 45 spp., Eur., N. Afr.), Rogers (*Mycol.* 76: 23, 1984), Silveira & Rodrigues (*Acta Amazon. Supl.* 15: 7, 1985; key 11 spp. Brazil), Rogers (*Mycotaxon* 26: 85, 1986; key 30 spp. USA), Rogers (*Sydowia* 38: 255, 1986; sectional classif., anamorphs), Rogers & Callan (*Mycol.* 78: 391, 1986; *X. polymorpha*-group, USA), Rogers & Samuels (*N.Z. Jl Bot.* 24: 615, 1986; key 19 NZ spp.), Rogers *et al.* (*Mycotaxon* 31: 103, 1988; key 41 spp. Venezuela), San Martín & Rogers (*Mycotaxon* 34: 283, 1989; key 63 spp. Mexico), Callan & Rogers (*Mycotaxon* 46: 141, 1993; cultural features, 23 US spp.), Læssøe (*SA* 13: 43, 1994; ? synonym of *Xylaria*), van der Gucht (*Mycotaxon* 60: 327, 1996; New Guinea), Rogers *et al.* (*MR* 101: 345, 1997; *Moelleroclavus* anam.), Ju & Rogers (*Mycotaxon* 73: 343, 1999; Taiwan), Læssøe (*Kew Bull.* 54: 605, 1999; *X. comosa* group), Lee *et al.* (*FEMS Microbiol. Lett.* 187: 89, 2000; phylogeny), Ju & Rogers (*MR* 105: 1134, 2001; anamorph), San Martín *et al.* (*Mycotaxon* 79: 337, 2001; Mexico), Rogers *et al.* (*Sydowia* 54: 91, 2002; fructicolous spp.), Davis *et al.* (*Am. J. Bot.* 90: 1661, 2003; endophytes), Medardi (*Riv. Micol.* 46: 25, 2003; Italy), Rogers & Ju (*Mycol. Progr.* 3: 37, 2004; Costa Rica), Hladki & Romero (*Lilloa* 42: 47, 2005; Argentina), Rogers *et al.* (*Mycol.* 97: 914, 2005; on termite nests), Zhang *et al.* (*Mycol.* 98: 1076, 2006; phylogeny), Ju & Hsieh (*Mycol.* 99: 936, 2007; on termite nests, Taiwan), Stadler *et al.* (*Mycol. Progr.* 7: 53, 2008; chemistry, entonaemoid spp.).
- Xylariaceae** Tul. & C. Tul. (1861), Xylariales. 85 gen. (+ 71 syn.), 1343 spp.
Lit.: Rogers (*Mycol.* 71: 1, 1979; review), Petrini & Müller (*Mycol. Helv.* 1: 501, 1986; keys 33 spp., culture), Petrini & Petrini (*Sydowia* 38: 216, 1985; keys 22 spp.; culture), Whalley (*Sydowia* 38: 369, 1986; ecology, distrib.), Dargan (*Beih. Nova Hedwigia* 44: 489, 1987), Rogers *et al.* (*Mycotaxon* 29: 113, 1987; keys 60 spp. Indonesia), Whalley & Edwards *in* Rayner *et al.* (Eds) (*Evolutionary biology of the fungi*: 423, 1987), Romero & Minter (*TBMS* 90: 457, 1988; asci), González & Rogers (*Mycotaxon* 34: 283, 1989), Barr (*Mycotaxon* 39: 43, 1990; circumscri.), Silveira & Rodrigues (*Acta Amazon. Supl.* 20: 8, 1990), Callan & Rogers (*Mycotaxon* 46: 141, 1993), Chapela *et al.* (*MR* 97: 157, 1993), Petrini & Petrini (*Bibliotheca Mycol.* 150: 193, 1993; arctic-alp. spp.), Læssøe (*SA* 13: 43, 1994), Læssøe & Spooner (*Kew Bull.* 49: 1, 1993), Rappaz (*Mycol. Helv.* 7: 99, 1995; on hardwood, Eur., N. Am.), Whalley & Edwards (*CJB* 73 Suppl. 1: S802, 1995; secondary metabolites), Ju & Rogers (*Mycol. Mem.* 20: 365 pp., 1996), Whalley (*MR* 100: 897, 1996; review), Ju *et al.* (*Mycotaxon* 61: 243, 1997), Ju *et al.* (*Mycotaxon* 66: 1, 1998), Rogers & Ju (*Mycotaxon* 68: 345, 1998), Rogers *et al.* (*Mycotaxon* 67: 61, 1998), Ju & Rogers (*Mycotaxon* 73: 343, 1999; Taiwan), Johannesson *et al.* (*MR* 104: 275, 2000), Lee *et al.* (*FEMS Microbiol. Lett.* 187: 89, 2000), Rogers (*MR* 104: 1412, 2000; review), Sánchez-Ballesteros *et al.* (*Mycol.* 92: 964, 2000; molecular phylogeny), Collado *et al.* (*Mycol.* 93: 875, 2001), Platas *et al.* (*MR* 108: 71, 2004), Stadler *et al.* (*MR* 108: 239, 2004), Hsieh *et al.* (*Mycol.* 97: 844, 2005), Triebel *et al.* (*Nova Hedwigia* 80: 25, 2005), Bitzer *et al.* (*MR* 112: 251, 2008; phylogeny, chemistry).
- Xylariales** Nannf. (1932). Xylariomycetidae. 9 fam., 209 gen., 2487 spp. Stromata usually well-developed, mostly consisting only of fungal tissue. Ascomata perithecial, rarely cleistothecial, $\pm$ globose, superficial or immersed in the stroma, usually black- and thick-walled, the ostiole usually papillate, periphysate. Interascal tissue well-developed, of narrow paraphyses. Asci cylindrical, persistent, relatively thick-walled but without separable layers, with an often complex J+ apical ring, usually 8-spored, $\pm$ spherical in some cleistocarpous taxa and without apical apparatus. Ascospores usually pigmented, sometimes transversely septate, with germ pores or slits, sometimes with a mucous sheath or mucous appendages. Anamorphs varied, usually hyphomycetous, some pycnidial. Saprobes and plant parasites, mainly on bark or wood, some associated with termitaria, cosmop.
- Probably polyphyletic; the *Amphisphaeriaceae* have been given their own order by some authors and other fams (esp. *Hyponectriaceae*) are still poorly understood. Fams:
- (1) **Amphisphaeriaceae**
 - (2) **Cainiaceae**
 - (3) **Clypeosphaeriaceae**
 - (4) **Diatrypaceae**
 - (5) **Graphostromataceae**

- (6) **Hyponectriaceae**
 (7) **Iodosphaeriaceae**
 (8) **Myelospermataceae**
 (9) **Xylariaceae**
Lit.: von Arx (*Sydowia* 34: 13, 1982; fams.), von Arx & Müller (*Beitr. Kryptogfl. Schweiz* 11(1), 1954), Dennis (*British Ascomycetes*, 1978), Müller & von Arx (*Beitr. Kryptogfl. Schweiz* 11(2), 1962; in Ainsworth *et al.*, *The Fungi* 4A, 1973; keys gen.), Barr (*Mycotaxon* 37: 43, 1990).
- Xylariodiscus** Henn. (1899) = *Xylaria* Hill ex Schrank fide Höhnelt (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt. 1* 119: 928, 1910), Dennis (*Bull. Jard. bot. Brux.* 34: 231, 1961), Læssøe (*SA* 13: 43, 1994; ? synonym of *Xylaria*).
- Xylariomycetidae** O.E. Erikss. & Winka (1997), Sordariomycetes. Ord.:
Xylarinales
 For *Lit.* see fam.
- Xylariopsis** F.L. Tai (1934) = *Konradia* fide Boedijn (*Annls mycol.* 33: 229, 1935).
- Xylasclerotes** Stach & Pickh. (1957), Fossil Fungi. 1 (Carboniferous), Germany. See Stach & Pickhardt (*Palaeontologische Zeitschrift* 31: 140, 1957).
- Xylastra** A. Massal. (1855) = *Opegrapha* Ach. fide Zahlbruckner (*Catalogus Lichenum Universalis* 2, 1923).
- Xyleborus** R.C. Harris & Ladd (2007), Stereocaulaceae (L). 1, USA. See Harris & Ladd (*Opuscula Philolichenum* 4: 57, 2007).
- Xylissus** Raf. (1808) nom. nud., Fungi. See Merrill (*Index Rafinesq.*, 1949).
- Xylobolus** P. Karst. (1881), Stereaceae. 3, widespread. See Chamuris (*Mycol. Mem.* 14, 1988; key N. Am. spp.), Solheim & Hofton (*Sopp og Nyttevekster* 1: 54, 2005; *Xylobolus frustulatus*).
- Xylobotryum** Pat. (1895), Dothideomycetes. 2 or 3, widespread (tropical). See Rossman (*Mycotaxon* 4: 179, 1976), Barr (*Prodr. Cl. Loculoasc.*, 1987), Eriksson & Hawksworth (*SA* 7: 95, 1988), Ju & Rogers (*Cryptog. Bot.* 4: 346, 1994; ontogeny, posn).
- Xyloceras** A.L. Sm. (1901) = *Xylobotryum* fide Müller & von Arx in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 87, 1973).
- Xylochia** B. Sutton (1983), anamorphic *Pezizomycotina*, Hso.#eH-P.1/10. 1, India. See Sutton (*TBMS* 80: 255, 1983).
- Xylochoeras** Fr. (1849) = *Sclerotium* fide Saccardo (*Syll. fung.* 14: 1, 1899).
- Xylochora** Arx & E. Müll. (1954), Xylariales. 2 (from wood), Europe. See Kang *et al.* (*Fungal Diversity* 2: 135, 1999).
- Xylocladium** P. Syd. ex Lindau (1900), anamorphic *Camillea*, Hsy.0eH.8. 10, widespread (esp. tropical). See Læssøe *et al.* (*MR* 93: 152, 1989), Rogers *et al.* (*Nova Hedwigia* 71: 431, 2000; Venezuela).
- Xylocoremium** J.D. Rogers (1984), anamorphic *Xylaria*, Hsy.0eH.14. 1, USA. See Rogers (*Mycol.* 76: 913, 1984).
- Xylocoryneum** Sacc. [not traced] nom. dub., anamorphic *Pezizomycotina*.
- Xylocrea** Möller (1901) ? = *Sarcoxydon* fide Læssøe (*SA* 13: 43, 1994).
- Xylodon** (Pers.) Gray (1821) nom. rej., Schizoporaaceae. See Donk (*Taxon* 12: 113, 1963).
- xylogenous**, living on wood.
- Xyloglossum** Pers. (1818) = *Acrospermum* fide Bonorden (*Handb. Mycol.*, 1851).
- Xyloglyphis** Clem. (1909), anamorphic *Pezizomycotina*, St.0eH.15. 1, Europe. See Sherwood (*Mycotaxon* 5: 87, 1977).
- Xylogone** Arx & T. Nilsson (1969), *Pezizomycotina*. 1, Sweden. See Currah (*Mycotaxon* 21: 1, 1985; posn).
- Xylogramma** Wallr. (1833), Helotiaceae. Anamorph *Cystotricha*. 18, widespread (north temperate). See Sherwood (*Mycotaxon* 5: 1, 1977).
- Xylographa** (Fr.) Fr. (1836), Agyriaceae ($\pm$ L). 8, Europe; N. America. See Brodo (*Graphis Scripta* 4: 61, 1992; Europe), Lumbsch (*J. Hattori bot. Lab.* 83: 1, 1997), Randlane (*Folia cryptog. Estonica* 42: 105, 2006; Estonia), Lumbsch *et al.* (*MR* 111: 1133, 2007).
- Xylographaceae** Tuck. (1888) = *Trapeliaceae*.
- Xylographomyces** Cif. & Tomas. (1953) $\equiv$ *Xylographa*.
- Xylohypha** (Fr.) E.W. Mason ex Deighton (1960), anamorphic *Pezizomycotina*, Hso.0eP.3. 7, widespread. See Hughes & Sugiyama (*N.Z. J Bot.* 10: 447, 1972), Padhye *et al.* (*J. Clin. Microbiol.* 26: 702, 1988; from human), Sekhon *et al.* (*European Journal of Epidemiology* 8: 387, 1992; phaeohyphomycosis, review), Hoog *et al.* (*J. Med. Vet. Mycol.* 33: 339, 1995; physiology), Masclaux *et al.* (*J. Med. Vet. Mycol.* 33: 327, 1995; phylogeny).
- Xylohyphites** Kalgutkar & Sigler (1995), Fossil Fungi, anamorphic *Pezizomycotina*. 1 (Tertiary), India. See Kalgutkar & Sigler (*MR* 99: 514, 1995).
- Xylohyphopsis** W.A. Baker & Partridge (2000), anamorphic *Pezizomycotina*. 2, S. Africa. See Partridge *et al.* (*Mycotaxon* 74: 486, 2000).
- xyloma** (of *Dothideales*), a sclerotium-like body producing sporogenous structures inside (de Bary) (obso.).
- Xyloma** Pers. (1794) = *Rhytisma* fide Nannfeldt (*Nova Acta R. Soc. Scient. upsal.*, 1932).
- Xyloma** Raf. (1837) nom. dub., Fungi (L). No spp. included.
- Xylomataceae** Fr. (1821) = *Rhytismataceae*.
- Xylomelasma** Réblová (2006), Sordariomycetidae. 2, France; New Zealand. See Réblová (*Mycol.* 98: 87, 2006).
- Xylometron** Paulet (1808) nom. rej. = *Pycnopus* fide Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974).
- Xylomides** Schimp. (1869) $\equiv$ *Xylomites*.
- Xylomites** Unger (1841), Fossil Fungi. 57 (Tertiary), Argentina; Europe.
- Xylomyces** Goos, R.D. Brooks & Lamore (1977), anamorphic *Aliquandostipitaceae*, Hso. $\equiv$ eP.3. 8, USA. See Goos *et al.* (*Mycol.* 69: 282, 1977), Goh *et al.* (*MR* 101: 1323, 1997), Kohlmeyer & Volkmann-Kohlmeyer (*Fungal Diversity* 1: 159, 1998), Campbell *et al.* (*CJB* 85: 873, 2007; phylogeny).
- Xylomyzon** Pers. (1825) = *Serpula* fide Cooke (*Spec. Publ. Div. Myc. Dis. Surv. US Department of Agriculture* 3, 1953).
- Xylopezia** Höhn. (1917) = *Exarmidium* fide Sherwood (*Mycotaxon* 5: 1, 1977), Sherwood-Pike & Boise (*Brittonia* 38: 35, 1986), Aptroot (*Nova Hedwigia* 66: 89, 1998).
- Xylophagaceae** Murrill (1903) = *Coniophoraceae*.
- Xylophagus** Link (1809) $\equiv$ *Serpula*.
- Xylophallus** (Schltdl.) E. Fisch. (1933) = *Mutinus* fide Dring in Ainsworth *et al.* (Eds) (*The Fungi* 4B: 458, 1973).
- Xylopilus** P. Karst. (1882) = *Fomes* fide Donk (*Per-*

- sonia* 1: 173, 1960).
- Xylopodium** Mont. (1845) = *Phellorinia* fide Stalpers (*in litt.*).
- Xyloschistes** Vain. ex Zahlbr. (1903), ? *Ostropales* (L). 1, Lapland. See Redinger (*Feddes Repert.* 43: 49, 1938), Etayo (*Monogr. Inst. Pirenaico Ecol.* 5: 43, 1990).
- Xyloschistomyces** Cif. & Tomas. (1953) ≡ *Xyloschistes*.
- Xyloschizon** Syd. (1922), *Rhytismataceae*. 2, N. America.
- Xylosorium** Zundel (1939) = *Pericladium* fide Mundkur (*Mycol.* 36: 287, 1944).
- Xylosphaera** Dumort. (1822) nom. rej. prop. = *Xylaria* Hill ex Schrank fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Xylosphaeria** Cooke (1879) nom. dub., *Pezizomycotina*. 1, British Isles. See Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Xylosphaeria** G.H. Otth (1869) ≡ *Mycothyridium* Petr.
- Xylostroma** Tode (1790) = *Daedalea* fide Donk (*Verh. K. ned. Akad. Wet. tweede sect.* 62: 1, 1974; based on mycelium).
- xylostromata**, sheets of mycelium as in *Xylostroma*.
- Xylotumulus** J.D. Rogers, Y.M. Ju & Hemmes (2006), *Xylariaceae*. 1, Hawaii. See Rogers *et al.* (*Sydowia* 58: 290, 2006).
- Xynophila** Malloch & Cain (1971) = *Aphanoascus* fide Cano & Guarro (*MR* 94, 1990).
- Xyphasma** Rebent. (1844) nom. dub. ≡ *Hyphasma*.
- Xystozukalia** Theiss. (1916) ? = *Scorias* fide Luttrell in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 135, 1973).
- Yalodendron** Capr. (1962) nom. nud., anamorphic *Pezizomycotina*. Used for a yeast from fish. See Capriotti (*Arch. Mikrobiol.* 42: 407, 1962).
- Yalomyces** Nag Raj (1993), anamorphic *Pezizomycotina*, Cpd.#eH.15/19. 1, India.
- Yamadazyma** Billon-Grand (1989), *Saccharomycetales*. See Fiol & Claisse (*J. gen. appl. Microbiol.* Tokyo 37: 309, 1991; cytochromes), Yamada *et al.* (*Biosc., Biotechn., Biochem.* 59: 445, 1995; rDNA), Yamada *et al.* (*Biosc., Biotechn., Biochem.* 59: 1172, 1995; rDNA), Kurtzman in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 273, 1998), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Yamamotoa** Bat. (1960), *Asterinaceae*. Anamorph *Peltasterella*. 2 or 3, Brazil. See Batista (*Publicações Inst. Micol. Recife* 291: 11, 1960).
- Yarrowia** Van der Walt & Arx (1981), *Saccharomycetales*. 1, USA. Perhaps allied to the *Dipodascaceae*. See Deák *et al.* (*Appl. Environm. Microbiol.* 66: 4340, 2000; from poultry), Suzzi *et al.* (*Int. J. Food Microbiol.* 69: 69, 2001; from cheese), Kurtzman (*Antonie van Leeuwenhoek* 88: 121, 2005; phylogeny), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Yatesula** Syd. & P. Syd. (1917), *Chaetothyriaceae*. 3 or 2, widespread (tropical). See Magnes (*Bibliotheca Mycol.* 165, 1997).
- Ybotromyces** Rulamort (1986), anamorphic *Pezizomycotina*, Hso.0eP.38. 1 (from humans), Spain. See Benoldi *et al.* (*J. Med. Vet. Mycol.* 29: 9, 1991; cutaneous phaeohyphomycosis, as *Botryomyces*).
- yeasticidal**, able to kill yeasts (q.v.).
- Yeasts**. Unicellular, budding fungi. The yeasts are not a formal taxonomic unit but a growth form exhibited by a range of unrelated fungi, and one exhibited in some cases by primarily filamentous forms as a part of the life-cycle or under particular environmental

conditions. The yeast growth form is typically unicellular, with asexual reproduction occurring by budding (an at least some cases this seems to involve the same processes as conidiogenesis but in the context of organisms existing as separate individual cells); occasionally yeast cells may be seen in short branched or unbranched chains, and in some species hyphae may also be encountered. Different genera are included depending on the authority and definition used; Kurtzman & Fell (Eds) (1998) accept 100 gen. and >700 spp., and Barnett *et al.* (*Yeasts: characteristics and identification*, 2000) 93 gen. and 678 spp. The best known fungi with a yeast form of growth are those used in baking and fermentation of alcoholic drinks, particularly *Saccharomyces cerevisiae*. The yeast form of growth also occurs in fungi in a wide range of other habitats, including leaf surfaces, soil (Sláviková & Vadkertiová, *J. Basic Microbiol.* 43: 430, 2003) and medical and veterinary environments. They have also, more recently, been noted from insect guts (Suh *et al.*, *MR* 103: 261, 2005) and the deep ocean (Bass *et al.*, *Proc. Roy. Soc. B. Biol. Sci.* 274: 3069, 2007), and probably many of these fungi remain undiscovered. The yeast form of growth makes these organisms ideal for genetic and other research (e.g. Ostergaard *et al.*, *Microbiol. Mol. Biol. Rev.* 64: 34, 2000; d'Enfert & Hube (*Candida, comparative and functional genomics*, 2008), and the yeast *Saccharomyces cerevisiae* was the first eukaryote to have its genome fully sequenced (Williams, *Science* 272: 481, 1996).

Sporogenous yeasts have teleomorphs in either the ascomycetes (esp. *Saccharomycetales* and *Schizosaccharomycetales*) or the basidiomycetes (*Sporidiales*, *Tremellales*); **asporogenous yeasts** are conidial fungi; **apiculate** -, yeasts (e.g. *Saccharomycodes*, *Nadsonia*, *Hanseniaspora*, *Kloeckera*) having minute polar projections which are multiple scars (annellides) (Streiblova *et al.*, *J. Bact.* 88: 1104, 1964); **baker's**, **brewer's** or **beer** -, *Saccharomyces cerevisiae*; **black** -, yeast-like states of *Aureobasidium*, *Cladosporium*, *Moniliella*, etc., and esp. anamorphs of *Herpotrichiellae* (q.v.) incl. *Exophiala*, *Ramichloridium* and *Rhinocladiella* (de Hoog & Hermanides-Nijhof, *Stud. Mycol.* 15, 1977; de Hoog (Ed.), *Stud. Mycol.* 19, 1979; *Ann. Rep. Res. Center Path. Fungi, Chiba* 7: 50, 1993, surveys); **bottom** -, one settling out at the bottom of a fermented liquid (the wort), e.g. *S. uvarum*; **top** -, one accumulating at the surface of the fermented wort, e.g. *S. cerevisiae*; **Chinese** -, *Amylomyces rouxii* and other fungi (Ellis *et al.*, *Mycol.* 68: 131, 1976); **'flor'** -, one to which special qualities of wines (e.g. bouquet, taste) are due; **food** -, dry *Candida utilis* (q.v.) and other yeasts; **petite** -, a respiratory deficient mutant (Bulder, *Ant. v. Leeuwenhoek* 30: 1, 1964); **scum** -, one (e.g. *Trichosporon cutaneum*) forming a surface scum or slime layer; **shadow (mirror)** -, *Bullera*, *Sporobolomyces* etc., producing ballistospores; **springer** -, the Institut Pasteur, Paris, strain of *S. cerevisiae*; **toddy** -, a mixture of yeasts which ferment the juice of the palmyra palm (*Borassus flabellifer*) (Ahmad *et al.*, *Mycol.* 46: 708, 1954); **wine** -, races of *S. cerevisiae*.

Lit. (covering anamorphs and teleomorphs): **Identification**: Arx *et al.* (*Stud. Mycol.* 14, 1977; genera), Barnett (*J. gen. Microbiol.* 99: 183, 1977; nutritional tests), Barnett & Pankhurst (*A new key to the yeasts*,

- 1974), Barnett *et al.* (*A guide to identifying and classifying yeasts*, 1979; *Yeasts: characteristics and identification*, 1983; edn 2, 1990; edn 3, 2000), Belin (*Can. J. Microbiol.* 27: 1235, 1981; spp. described since 1973), Kudrjanzev (*Sistematika drozheĩ*, 1954 [Russ., Germ., transl. *Die Systematik der Hefen*, 1960]), Kurtzman & Fell (Eds) (*The yeasts*, edn 4, 1998), Lodder (Ed.) (*The Yeasts*, edn 3, 1984; edn 2, 1970; edn 1, 1952), Lodder & Kreger-van Rij (*The yeasts*, 1952), Moore (*Bot. mar.* 23: 361, 1980; basidiomycetous yeasts), Nakase *et al.* (*Jap. J. Med. Myc.* 32: 21, 1991; systematics of basidiomycetous yeasts), Payne *et al.* (*J. gen. Microbiol.* 128: 1265, 1982; computer generated keys gen.), Yarrow & Nakase (*Ant. v. Leeuwenhoek* 41: 81, 1975; DNA base composition).
- General:** Fragner (*Česká Myk.* 39: 234, 1985; spp. on humans), Fukazawa, *et al.* (*Handb. Appl. Mycol.: Humans, Animals & Insects* 2: 425, 1991; serology and immunology of medically important yeasts), Guthrie & Fink (Ed.) (*Guide to yeast genetics and molecular biology*, 1991), Herskowitz (*Nature* 357: 190, 1992; regulation hyphal growth), Jong *et al.* (*Mycotaxon* 31: 207, 1988; coding strain features), Kirsop & Kurtzman (Eds) (*Yeasts*, 1988; guide to sources), Odds (*J. med. vet. mycol.* 29: 413, 1991; preservation in distilled water), Kurtzman (*Int. J. Syst. Bact.* 42: 1, 1992; review), Prescott (Ed.) (*Methods in cell biology*, 11, 12, *Yeast cells*, 1975), Rose & Péter (Eds) (*Biodiversity and ecophysiology of yeasts. The yeast handbook* 1, 2006), Rose & Harrison (Eds) (*The yeasts*, 1, *Biology of yeasts*, 1969, edn 2, 1987; 2, *Physiology and biochemistry of yeasts*, edn 2, 1986; 3, *Yeast technology*, 1970; 4, *Yeast organelles*, edn 2, 1991), Rose *et al.* (*The Yeasts*, 6, *Yeast genetics*, edn 2, 1995), Seehaus *et al.* (*Current Genetics* 10: 103, 1985; gene probes), Sherman *et al.* (Eds) (*Methods in yeast genetics*, 1987), Skinner *et al.* (Eds) (*Biology and activities of yeasts*, 1980).
- See also Boekhout *et al.* (*Yeasts of the world, morphology, physiology, sequences and identification*, 2002; compact disk).
- See also *Blastomycota*, Anamorphic fungi, *Saccharomycetales*, *Schizosaccharomycetales*, *Ustomycetes*.
- yellow rice**, rice discoloured by *Penicillium islandicum* and rendered carcinogenic for rodents and possibly humans; see Mycotoxins.
- yellow**, of cabbage (*Fusarium oxysporum* f.sp. *conglutinans*).
- Yelsemia** J. Walker (2001), Melanotaeniaceae. 4 (on *Anthericaceae*, *Byblidaceae*, *Campanulaceae*, *Droseraceae*), Australia; N. America; S.E. Asia. See Walker (*Australasian Mycologist* 20: 61, 2001; Australia), Shivas & Vánky (*Fungal Diversity* 13: 131, 2003; Australia).
- Yenia** Liou (1949) = *Ustilago* fide Mordue (*Mycopathologia* 116: 227, 1991).
- Yinmingella** Goh, K.M. Tsui & K.D. Hyde (1999), anamorphic *Pezizomycotina*, Hso.???. 1, Hong Kong. See Goh *et al.* (*CJB* 76: 1693, 1998).
- Yoshinagaia** Henn. (1904), ? Dothioraceae. Anamorph *Japonia*. 1, Japan. See Eriksson & Hawksworth (*SA* 5: 161, 1986; nomencl.), Sivanesan & Hsieh (*MR* 99: 1295, 1995).
- Yoshinagamyces** Hara (1912) = *Japonia* fide Sivanesan & Hsieh (*MR* 99: 1295, 1995).
- Yoshinagella** Höhn. (1913), Dothideales. 3, Japan; Hawaii.
- Youngiomyces** Y.J. Yao (1995), Endogonaceae. 4, N. America; Australasia. See Yao *et al.* (*Genera of Endogonales*: 229 pp., 1996).
- Ypsilina** J. Webster, Descals & Marvanová (1999), anamorphic *Pezizomycotina*, Hso.???. 1, British Isles. See Descals *et al.* (*CJB* 76: 1658, 1998).
- Ypsilon**.
- Ypsilonia** Lév. (1846), anamorphic *Acanthotheciella*, Ccu.0bP.1. 5, widespread. See Nag Raj (*CJB* 55: 1599, 1977).
- Ypsilonidium** Donk (1972) = *Thanatephorus* fide Langer (*Bibliotheca Mycol.* 158, 1994).
- Ypsilospora** Cummins (1941), Raveneliaceae. 3 (on *Baphia*, *Inga* (*Leguminosae*)), W. Africa; America (tropical). See Ono & Hennen (*TBMS* 73: 229, 1979), Eboh (*TBMS* 85: 39, 1985; syn. of *Chaconia*), Hernández & Hennen (*Mycol.* 95: 728, 2003).
- YPSS**, see Media.
- Yuccamyces** Gour, Dyko & B. Sutton (1979), anamorphic *Pezizomycotina*, Hsp.0fH.3. 5, India; Cuba. See Gour *et al.* (*TBMS* 72: 413, 1979).
- Yuea** O.E. Erikss. (2003), Xylariales. 1, Chile. See Eriksson (*Mycotaxon* 85: 314, 2003).
- Yukonia** R. Sprague (1962) = *Buergenerula* fide Barr (*Mycol.* 68: 611, 1976).
- Yunnanania** H.Z. Kong (1998), anamorphic *Pezizomycotina*, Hso.???. 1, China. See Kong (*Mycotaxon* 69: 320, 1998).
- Yurrajia**.
- Zaghouania** Pat. (1901), Pucciniaceae. 2 (on *Oleaceae*), mediterranean; India; Japan; Taiwan. See Thirumalachar (*Bot. Gaz.* 107: 74, 1945; morphology, life cycle [as *Cytospora*]), Bahçecioglu & Gjaerum (*Mycotaxon* 90: 55, 2004; Turkey).
- Zaghouaniaceae** Syd. & P. Syd. (1915) = Pucciniaceae.
- Zahlbruckner** (Alexander; 1860-1938; Slovakia, later Austria). Born, St Georgen [then in Hungary], near Pressburg [now Bratislava]; PhD, Vienna University (1883); member of staff (1883-1899), then Keeper (1899-1918) then Director (1918-), Naturhistorischen Museum, Vienna. Published important regional works on lichen-forming fungi of central Africa, China, Chile (Easter Island and Juan Fernández Island), Dalmatia, Formosa, Hawaii (partly with Magnusson, q.v.), Japan, Java, Samoa and South America; was the first author to provide a comprehensive account of genera and families of lichen-forming fungi. planned the sections for lichen-forming fungi in *Rabenhorst's Kryptogamenflora* (9, 1930-1960); published exsiccata (e.g. *Lichenes Rariores Exsiccati*). Collections in Padua (PAD) and Vienna (W). *Publs. Flechten. Engler & Prantl, Die Natürlichen Pflanzenfamilien* (1903-1907); *Catalogus Lichenum Universalis* 10 vols (1921-1940) [a major catalogue of lichen-forming fungi, publications in which their names have been used, and details of synonymy; it remains the basic nomenclatural reference work on lichen-forming fungi]. *Biogs, obits etc.* Dickinson (*Kew Bulletin* 1938: 304, 1938); Grumann (1974: 444); Keissler (*Revue de Mycologie* 4: 3, 1939) [portrait]; Lackovičova (*Dr Alexander Zahlbruckner (1860-1938) Osonost' a Dielo*, 1988) [bibliography, biography]; Redinger (*Annales de Cryptogamie Exotique* 6: 85, 1933) [bibliography, portrait]; Stafleu & Cowan (*TL-2* 7: 500, 1988).

- Zahlbrucknera** Herre (1910) [non *Zahlbrucknera* Rchb. 1832, *Saxifragaceae*] = *Zahlbrucknerella*.
- Zahlbrucknerella** Herre (1912), *Lichinaceae* (L). 8, widespread. See Henssen (*Lichenologist* 9: 17, 1977; key), Schultz & Büdel (*Lichenologist* 34: 39, 2002; key), Henssen (*Bibliotheca Lichenol.* 88: 195, 2004).
- Zakatoshia** B. Sutton (1973), anamorphic *Pezizomycotina*, Hso.0eH.15. 2 (on fungi), Canada; Austria. See Gams (*Windahlia* 16: 59, 1986).
- Zalerion** R.T. Moore & Meyers (1962), anamorphic *Lulwoana*, Hsy.0 = hP.1. 9 (mainly marine), N. America; Europe. See Buczacki (*TBMS* 59: 159, 1972), Fisher & Webster (*Nova Hedwigia* 54: 77, 1992), Campbell *et al.* (*MR* 109: 556, 2005; phylogeny, teleomorph), Baschien *et al.* (*Nova Hedwigia* 83: 311, 2006).
- Zamenhofia** Clauzade & Cl. Roux (1985) = *Porina* Müll. Arg. fide Roux (*SA* 6: 156, 1987), McCarthy (*Bibliotheca Lichenol.* 52, 1993).
- Zanchia** Rick (1958) nom. dub., *Basidiomycota*. See Donk (*Taxon* 12: 167, 1963).
- Zanclospora** S. Hughes & W.B. Kendr. (1965), anamorphic *Pezizomycotina*, Hso.0eH.15. 6, southern hemisphere. See Hughes & Kendrick (*N.Z. J. Bot.* 3: 151, 1965).
- Zasmidium** Fr. (1849) nom. dub., anamorphic *Mycosphaerellaceae*. fide Hawksworth & Riedl (*Taxon* 26: 208, 1977), Arzanlou *et al.* (*Stud. Mycol.* 58: 75, 2007).
- zearalenone**, a toxin of *Fusarium graminearum* (teleomorph *Gibberella zeae*); the cause of vulvovaginitis and infertility in cattle and pigs.
- Zebrospora** McKenzie (1991), anamorphic *Pezizomycotina*, Hso. = eP.10. 1, Australasia; Pacific Islands. See McKenzie (*Mycotaxon* 41: 189, 1991).
- Zelandiocoela** Nag Raj (1993), anamorphic *Pezizomycotina*, St.0eH.15. 1, New Zealand. See Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*: 990, 1993).
- Zelleromyces** Singer & A.H. Sm. (1960) = *Lactarius*. Gasteroid forms are polyphyletic and have formerly been morphologically recognised as a separate genus. fide Miller *et al.* (*Mycol.* 93: 344, 2001), Lebel (*Australasian Mycol.* 21: 4, 2002; Australian spp.), Nuytinck *et al.* (*Belgian Jour. Bot.* 136: 145, 2004; European spp.), Miller *et al.* (*Mycol.* 98: 960, 2006).
- Zeloasperisporium** R.F. Castañeda (1996), anamorphic *Venturiaceae*, Hso.?.?. 2, Cuba. See Castañeda Ruiz *et al.* (*Mycotaxon* 60: 284, 1996), Crous *et al.* (*Stud. Mycol.* 58: 185, 2007; phylogeny).
- Zelopelta** B. Sutton & R.D. Gaur (1984), anamorphic *Pezizomycotina*, Cpt.1bH.10. 1, India. See Sutton & Gaur (*TBMS* 82: 558, 1984).
- Zelosatchmopsis** Nag Raj (1991), anamorphic *Pezizomycotina*, Ccu.0eH.15. 1, Cuba. See Nag Raj (*CJB* 69: 633, 1991).
- Zelotriadelphia** R.F. Castañeda, Saikawa, M. Stadler & Iturr. (2005), anamorphic *Pezizomycotina*. 1, Cuba. See Castañeda Ruiz *et al.* (*Mycotaxon* 91: 340, 2005).
- Zendera** Redhead & Malloch (1977) = *Dipodascus* fide von Arx (*Persoonia* 9: 393, 1977).
- Zeora** Fr. (1825) = *Lecanora* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- zeorine** (of apothecia), like those of *Zeora*.
- Zephirea** Velen. (1947) = *Mycena* fide Horak (*Synopsis generum Agaricalium*, 1968).
- Zercosporidium** Thor (1930) nom. dub., ? Fungi. 1, Svalbard.
- Zernya** Petr. (1947), anamorphic *Pezizomycotina*, Cpd.1eH.?. 1, Brazil.
- Zerovaemyces** Gorovij (1977) = *Rhacophyllus* fide Kuyper (*in litt.*).
- Zerovaemycetaceae** Gorovij (1977) = *Agaricaceae*.
- Zeta** Bat. & R. Garnier (1961) nom. dub., *Pseudoperisporiaceae*. 1, Brazil. See Rossman *et al.* (*Stud. Mycol.* 42: 248 pp., 1999).
- Zetesimomyces** Nag Raj (1988), anamorphic *Pezizomycotina*, Ccu.1eH.15. 1, Cuba. See Nag Raj (*CJB* 66: 2143, 1988).
- Zetiaspizna** Nag Raj (1993), anamorphic *Amphisphaeriaceae*, Cpd. = eP.19. 5, widespread. See Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*: 996, 1993), Jeewon *et al.* (*Mol. Phylogen. Evol.* 25: 378, 2002).
- Zeuctomorpha** Sivan., P.M. Kirk & Govindu (1984), *Pleosporaceae*. 1, India. See Sivanesan *et al.* (*Bitunicate Ascomycetes and their Anamorphs*: 572, 1984).
- Zeugandromyces** Thaxt. (1912), *Laboulbeniaceae*. 3, widespread. See Nannfeldt (*Svensk bot. Tidskr.* 43: 468, 1949).
- zeugite**, the organ in which fertilization is completed and the dikaryophase ends; e.g. an ascus or a basidium.
- Zeus** Minter & Diam. (1987), *Rhytismataceae*. 1, Greece. See Minter *et al.* (*TBMS* 88: 55, 1987).
- Zevadia** J.C. David & D. Hawksw. (1995), anamorphic *Pezizomycotina*, Hso.?.?. 1, Ireland. See David & Hawksworth (*Bibliotheca Lichenol.* 58: 64, 1995).
- Zignoëlla** Sacc. (1878) = *Chaetosphaeria*. A highly confused genus in need of further revision. fide Müller (*SA* 6: 156, 1987), Cannon (*SA* 15: 121, 1997), Réblová & Gams (*Czech Mycol.* 51: 1, 1999), Fernández *et al.* (*Mycol.* 98: 121, 2006).
- Zignoina** Cooke (1885) ? = *Wallrothiella* fide Eriksson & Hawksworth (*SA* 6: 253, 1987), Réblová & Seifert (*Mycol.* 96: 343, 2004).
- Zilingia** Petr. (1934), anamorphic *Pezizomycotina*, St.0eH.?. 1, Siberia.
- Zimmermanniella** Henn. (1902), *Phyllachoraceae*. 1 (from living leaves), S.E. Asia. See Petrak (*Hedwigia* 68, 1928), Cannon (*IMI Descr. Fungi Bact.* 140: no. 1140, 1992).
- Zinzipegasa** Nag Raj (1993), anamorphic *Pezizomycotina*, Cac. = eH.15/19. 1, Argentina. See Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*: 1005, 1993).
- Zobelia** Opiz (1855) = *Choiromyces* fide Trappe (*TBMS* 65: 496, 1975).
- Zodiomyces** Thaxt. (1891), *Laboulbeniaceae*. 2, widespread. See Weir & Blackwell (*MR* 105: 1182, 2001; phylogeny).
- Zodiomycetaceae** Nann. (1934) = *Laboulbeniaceae*.
- Zoellneria** Velen. (1934), *Sclerotiniaceae*. Anamorph *Amerosporium*. 1, Europe. See Spooner (*Bibliotheca Mycol.* 116, 1987), Johnston & Gamundi (*N.Z. J. Bot.* 38: 493, 2000).
- Zoggium** Lar.N. Vassiljeva (2001), *Mytilinidiaceae*. 1, Europe. See Vasil'eva (*Mikol. Fitopatol.* 35: 17, 2001).
- Zografia** Bogoyavl. (1922) = *Coelomomyces* fide Keilin (*Parasitol.* 19: 365, 1927).
- zonate**, having concentric lines often forming alternating pale and darker zones near the margins; used of crustose lichen thalli, polypore surfaces, etc.
- zonation** (of cultures), regular concentric variation of

texture, pigmentation or sporulation frequently associated with fluctuations (esp. diurnal) in light, temperature, or other factors; 'Liesegang' phenomenon. See Bisby (*Mycol.* 17: 89, 1925), Hein (*Am. J. Bot.* 17: 143, 1930), Kafi & Tarr (*TBMS* 46: 549, 1964). **ecological** -, see Ecology.

zone lines, narrow, dark brown, or black, lines (pseudosclerotia) or plates (pseudosclerotial plates) in decayed wood (esp. hardwoods) generally caused by fungi (Lopez *et al.*, *TBMS* 64: 465, 1975); see also spalted (wood).

Zonilia Raf. (1815) nom. dub., Fungi. No spp. included.

Zonosporis Clem. (1931) = Schwanniomyces.

zoogametes, a motile gamete; planogametes.

Zoogloea Eberth (1873) = Trichosporon fide Kirk (*in litt.*).

zoogloea (of bacteria), a colony embedded in a slimy substance.

zoogonidium (1) ? = zoospore (q.v.), (2) an aplanospore of a photobiont within the thallus of a lichen (obsol.).

Zoopagaceae Drechsler (1938), Zoopagales. 5 gen., 67 spp.

Lit.: Drechsler (*Mycol.* 26: 135, 1934) *et seq.*; family proposed by, Drechsler (*Mycol.* 30: 152, 1938), Duddington *in* Ainsworth *et al.* (Eds) (*The Fungi* 4B: 231, 1973; emend. & keys), Dyal (*Sydowia* 27: 293, 1973), Dayal (*Sydowia* 27: 293, 1976; keys) Predacious fungi, Tanabe *et al.* (*Mol. Phylogen. Evol.* 16: 253, 2000), Barron (*Biodiversity of Fungi* Inventory and Monitoring Methods: 435, 2004).

Zoopagales Bessey ex R.K. Benj. (1979). Zoopagomycotina. 5 fam., 22 gen., 190 spp. Asexual reproduction by conidia or merosporangia, sexual reproduction by zygospores; cosmop. parasites of fungi (mycoparasites), nematodes, amoebae, and other small terrestrial animals. Fams:

- (1) **Cochlonemataceae**
- (2) **Helicocephalidaceae**
- (3) **Piptocephalidaceae**
- (4) **Sigmoideomycetaceae**
- (5) **Zoopagaceae**

Lit.: Duddington (*in* Ainsworth *et al.*, *The Fungi* 4B: 231, 1973, *Biol. Rev.* 31: 152, 1956), Drechsler (*Biol. Rev.* 16: 265, 1941; review), Dyal (*Sydowia* 27: 293, 1973; key spp. on amoebae & nematodes), Patil & Patil (*Indian Phytopath.* 47: 217, 1994), Tanabe *et al.* (*Mol. Phylogen. Evol.* 16: 253, 2000; phylogeny), White *et al.* (*Mycol.* 98: 860, 2006; molecular phylogeny), Hibbett *et al.* (*MR* 111: 109, 2007), and see under Families.

Zoopage Drechsler (1935), Zoopagaceae. 11, N. America. See Drechsler (*Mycol.* 27: 30, 1935), Drechsler (*Mycol.* 28: 363, 1936), Drechsler (*Mycol.* 29: 229, 1937), Drechsler (*Mycol.* 39: 379, 1947), Jones (*TBMS* 45: 348, 1962), Dyal (*Sydowia* 27: 293, 1976; keys parasites of nematodes and amoebae, bibliogr.).

Zoopagomycotina Benny (2007), Zygomycota. 22 gen., 190 spp., Ord.:

Zoopagales

Lit.: James *et al.* (*Mycol.* 98: 860, 2006; molecular phylogeny), Hibbett *et al.* (*MR* 111: 109, 2007), Hoffmann *et al.* (*in*: Gherbawy (Ed.) *Current Advances in Molecular Mycology*): in press, 2008).

Zoopagus Sommerst. (1911), Zoopagaceae. 5 (on *Algae*), Europe; N. America. See Dick *in* Ainsworth *et al.* (Eds) (*The Fungi* 4A: 145, 1973), Coffell *et al.*

(*Mycol.* 82: 326, 1990; status; based on a misidentified *Cephaliophora*), Dick (*MR* 94: 347, 1990; key, emend. of genus), Dick *et al.* (*Mycol.* 82: 316, 1990; status), Powell *et al.* (*Mycol.* 82: 460, 1990; status; based on a misidentified *Cephaliophora*), Morikawa *et al.* (*MR* 97: 421, 1993; status), Glockling (*MR* 101: 1179, 1997), Saikawa (*Mycol.* 89: 268, 1997; ultrastr.), Liu *et al.* (*Mycosystema* 17: 105, 1998), Tanabe *et al.* (*Mycol.* 91: 830, 1999; phylogeny), White *et al.* (*Mycol.* 98: 872, 2006; phylogeny).

zoophilic (of dermatophytes, etc.), preferentially pathogenic for animals; cf. anthrophilic.

Zoophthora A. Batko (1964), Entomophthoraceae. 32, widespread. See Remaudière & Hennebert (*Mycotaxon* 11: 269, 1980), Ben-Ze'ev & Kenneth (*Mycotaxon* 14: 456, 1982), Glare *et al.* (*Aust. J. Bot.* 35: 49, 1987), Humber (*Mycotaxon* 34: 441, 1989), Keller (*Sydowia* 43: 39, 1991; key), Balaży (*Flora Polska* 24: 1, 1993), Keller & Petrini (*Sydowia* 57: 23, 2005; key), Keller (*Sydowia* 58: 38, 2006; Switzerland), Keller (*Sydowia* 59: 75, 2007; Switzerland, comb.nov.).

zoosporangium (zoosporange), a sporangium producing zoospores.

zoospore, a motile sporangiospore, i.e. one having flagella; swarm spore; swarmer; simbiospore; planospore; planont; cf. swarm-cell; see Waterhouse (*TBMS* 45: 1, 1962), Fuller (*Mycol.* 69: 1, 1977), Lange & Olson (*Dansk bot. Arkiv.* 33, 1979; unflagellate zoospores).

Zopf (Wilhelm; 1846-1909; Germany). Student under O. Brefeld (q.v.), Berlin (1874-1877); PhD, Halle (1878); Assistant Professor (1883) then Professor (1887), Halle University. Made major contributions to knowledge of an exceptionally wide range of fungi and lichens, including accounts of *Chaetomium*, lichenicolous fungi, and lichen chemistry. *Publs. Die pilze in Morphologischer, Physiologischer, Biologischer und Systematischer Beziehung* (1890); *Untersuchungen über die durch Parasitische Pilze Hervorgegerufenen Krankheiten der Flechten* (1897-1898); *Die Flechtenstoffe* (1907). *Biogs, obits etc.* Grunmann (1974: 55); Huneck *et al.* (*Willdenowia* 7: 31, 1973) [application of Zopf's chemical names]; Stafleu & Cowan (*TL-2* 7: 553, 1988); Tobler (*Bericht der Deutschen Botanischen Gesellschaft* 27: (58), 1910) [portrait].

Zopfia Rabenh. (1874), Zopfiaceae. 5, widespread. See Hawksworth (*CJB* 57: 91, 1979), Kruys *et al.* (*MR* 110: 527, 2006; phylogeny).

Zopfiaceae G. Arnaud ex D. Hawksw. (1992), ? Pleosporales. 8 gen. (+ 2 syn.), 18 spp. Polyphyletic as currently circumscribed.

Lit.: Hawksworth (*CJB* 57: 91, 1979), Hawksworth (*SA* 6: 153, 1987), Hyde (*Trans. Mycol. Soc. Japan* 30: 333, 1989), LoBuglio *et al.* (*Mol. Phylogen. Evol.* 6: 287, 1996), Ranghoo & Hyde (*MR* 103: 938, 1999), Kruys *et al.* (*MR* 110: 527, 2006).

Zopfiella G. Winter (1884), Lasiosphaeriaceae. 24, widespread. See Malloch & Cain (*CJB* 49: 869, 1971), Guarro *et al.* (*SA* 10: 79, 1991; key), Huhndorf *et al.* (*Mycol.* 96: 368, 2004; phylogeny), Miller & Huhndorf (*Mol. Phylogen. Evol.* 35: 60, 2005; phylogeny), Cai *et al.* (*MR* 110: 359, 2006; phylogeny).

Zopfinula Kirschst. (1939) = Keissleriella fide Bose (*Phytopath. Z.* 41, 1961).

Zopfiofoveola D. Hawksw. (1979), Zopfiaceae. 1,

- Sweden. See Hawksworth (*CJB* 57: 91, 1979).
- Zopheromyces** B. Sutton & Hodges (1977), anamorphic *Pezizomycotina*, Hso.1eP.6. 1, Brazil. See Sutton & Hodges (*Nova Hedwigia* 28: 493, 1977).
- Zosterodiscus** Hertel (1984) = *Lecidea* fide Hertel (*Mitt. bot. StSamml., München* 23: 321, 1987).
- Zschackea** M. Choisy & Werner (1932) = *Verrucaria* Schrad. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Zugazaea** Korf, Iturr. & Lizoň (1998), *Helotiales*. 1, Canary Islands. See Iturriaga *et al.* (*Mycol.* 90: 697, 1998).
- Zukalia** Sacc. (1891) = *Chaetothyrium* fide von Arx & Müller (*Stud. Mycol.* 9, 1975).
- Zukalina** Kuntze (1891) ? = *Ascozonus* fide Velenovský (*Monogr. Dicom. Boehm.*, 1934), van Brummelen (*Persoonia* 16: 425, 1998).
- Zukaliopsis** Henn. (1904) = *Mollerella* fide von Arx (*Persoonia* 2: 421, 1963).
- Zundeliomyces** Vánky (1987), *Microbotryaceae*. 1 (on *Polygonum*), Kazakhstan. See Vánky (*TBMS* 89: 477, 1987), Piepenbring (*Frontiers in Basidiomycete Mycology*: 117, 2004; gall morphology).
- Zundelula** Thirum. & Naras. (1952) = *Dermatosorus* fide Langdon (*TBMS* 68: 447, 1977).
- Zunura** Nag Raj (1993), anamorphic *Pezizomycotina*, Cac.0eH.19. 1, India. See Nag Raj (*Coelomycetous Anamorphs with Appendage-bearing Conidia*: 1006, 1993).
- Zwackhia** Körb. (1855) = *Opegrapha* Ach. fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Zwackhiomyces** Grube & Hafellner (1990), *Xanthopyreniaceae*. 9 (lichenicolous), widespread. See Grube & Hafellner (*Nova Hedwigia* 51: 283, 1990; monogr.), Harris (*More Florida Lichens*, 1995), Aptroot (*Lichenologist* 30: 501, 1998), Hoffmann & Hafellner (*Biblthca Lichenol.* 77: 1, 2000), Calatayud *et al.* (*Lichenologist* 39: 129, 2007; Spain, Iran, key).
- Zychaea** Benny & R.K. Benj. (1975), *Syncephalas-traceae*. 1, Mexico. See Benny & Benjamin (*Aliso* 8: 334, 1975), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny).
- Zygaenobia** Weiser (1951), *Entomophthorales*. 1, former Czechoslovakia. See Weiser (*Ent. Listy* 14: 134, 1951).
- zygantium**, gametangium of a zygomycete.
- Zygnemomyces** K. Miura (1973), *Meristacraceae*. 2, Japan; Australia. See Miura (*Rep. Tottori Mycol. Inst.* 10: 520, 1973), McCulloch (*TBMS* 68: 173, 1977), Tucker (*Mycotaxon* 13: 481, 1981; key), Saikawa *et al.* (*CJB* 75: 762, 1997; ultrastr.).
- Zygoascus** M.T. Sm. (1986), *Trichomonascaceae*. Anamorph *Candida*. 1, widespread. See von Arx & van der Walt (*Stud. Mycol.* 30: 167, 1987), Smith in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 422, 1998), Brandt *et al.* (*J. Clin. Microbiol.* 42: 3363, 2004; from human), Smith *et al.* (*Int. J. Syst. Evol. Microbiol.* 55: 1353, 2005; phylogeny), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny), Kurtzman & Robnett (*FEMS Yeast Res.* 7: 141, 2007).
- Zygochytrium** Sorokīn (1874), ? *Chytridiomycetes*. 1 (on dead insect), Europe.
- zygoconidium**, Asexual propagule formed from the fusion or conjoining of two conidia generated simultaneously from adjacent conidiogenous loci. Kendrick & Watling (*The Whole Fungus*: 543, 1979) applied the term isthmospore (q.v.) to this structure and although similar in appearance, it is distinct in the nature of its origin. Zygoconidia are known in a number of genera, mainly basidiomycete anamorphs (e.g. *Anastomyces*, *Christiansenia* and *Zygogloea*). The term was first introduced by Boidin (*Bull. Soc. Linn. Lyon* 39: 132, 1970) but more recently taken up by others following Oberwinkler & Bandoni (*Norw. J. Bot.* 2: 501, 1982).
- Zygodesmella** Gonz. Frag. (1917) nom. dub., *Fungi*. See Donk (*Taxon* 11: 103, 1962).
- Zygodesmus** Corda (1837) nom. dub., *Pezizomycotina*. See Rogers (*Mycol.* 40: 633, 1948).
- Zygofabospora** Kudrjanzev (1960) = *Kluyveromyces* fide Naumov (*Mikrobiologiya* 57: 114, 1988; key), Kurtzman *et al.* (*Taxon* 50: 907, 2001; nomencl.), Naumov & Naumova (*FEMS Yeast Res.* 2: 39, 2002), Naumova *et al.* (*FEMS Yeast Res.* 5: 263, 2004; phylogeny).
- Zygogloea** P. Roberts (1994), *Pucciniomycotina*. 1, British Isles. See Roberts (*Mycotaxon* 52: 241, 1994).
- Zygothansula** Lodder (1932) = *Pichia* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Zygoipomyces** Krassiln., Babeva & Meavahd (1967) = *Lipomyces* fide Lodder (*Yeasts, a taxonomic study* 2nd edn, 1970).
- Zygomycetes** G. Winter (1880), *Zygomycota*. Saprobes or parasites (esp. of arthropods). A polyphyletic taxon as traditionally circumscribed at this rank; see subphyla of the *Zygomycota*.
- zygomycosis**, a mycosis caused by a member of the *Zygomycetes*. Cf. *Mucormycosis*, *phycomycosis*.
- Zygomycota** Moreau (1954), *Fungi*. 10 ord., 27 fam., 168 gen., 1065 spp. A polyphyletic (or paraphyletic) taxon including four subphyla:
- (1) **Entomophthoromycotina**
 - (2) **Kickxellomycotina**
 - (3) **Mucoromycotina**
 - (4) **Zoopagomycotina**
- Lit.*: Benjamin (*in* Kendrick (Ed.), *The whole fungus*: 579, 1979), Benny (*in* Parker, 1982, 1: 184), O'Donnell (*Zygomycetes in culture*, 1979), Jeffries (*Bot. J. Linn. Soc.* 91: 135, 1985; mycoparasitism), Schipper (*in* Rayner *et al.* (Ed.), *Evolutionary biology of the fungi*: 261, 1987), Morton & Benny (*Mycotaxon* 37: 471, 1990; *Endogonales*, *Glomales*), Chien (*in* Peng & Chou (Eds), *Biodiversity & terrestrial ecosystems* (*Acad. Sinica Monogr.* 14) p. 215, 1994), Weitzman & Della-Latta (*Clin. Microbiol. Newsletter* 19: 81, 1997; zygomycosis), Cavalier-Smith (*Biol. Rev.* 73: 203, 1998), Benny *et al.* (*in* McLaughlin *et al.* (Eds), *The Mycota* 7A, 113, 2000), Tanabe *et al.* (*Mol. Phylogen. Evol.* 16: 253, 2000), Strauss *et al.* (*South African Journal of Science* 96: 597, 2000; medium for selective isolation of *Kickxellales*, *Mortierellales*, *Mucorales*, and *Piptocephalidaceae* [*Zoopagales*]), Shalchian-Tabrizi *et al.* (*PLoS ONE* 3(3): e2098, 2008; phylogeny), Benny (*Aliso* 26: 37, 2008; methods of isolation, culture, observation and preservation), and under Subphyla and Orders.
- Zygomycotina** Caval.-Sm. (1998), see *Zygomycota*.
- Zygophiala** E.W. Mason (1945), anamorphic *Schizothyrium*, Hso.1eP.10. 1, Jamaica. See Nasu & Kunoh (*TMSJ* 27: 225, 1986; on grapes), Williamson & Sutton (*Pl. Dis.* 84: 714, 2000; on apple), Batzer *et al.* (*Mycol.* 97: 1268, 2005; phylogeny).
- zygophore** (of *Mucorales*), a special hyphal branch producing copulation branches.
- Zygopichia** (Klöcker) Kudrjanzev (1960) = *Pichia* fide

- Batra in Subramanian (Ed.) (*Taxonomy of fungi* 1: 187, 1978), Wu *et al.* (*FEMS Yeast Res.* 6: 305, 2006).
- Zygopichia** E.K. Novák & Zsolt (1961) = *Pichia* fide von Arx (*Gen. Fungi Sporul. Cult.* Edn 3, 1981).
- Zygopleurage** Boedijn (1962), Lasiosphaeriaceae. 1 (coprophilous), widespread (tropical). See Lundqvist (*Symb. bot. upsal.* 20 no. 1, 1972; key), Huhndorf *et al.* (*Mycol.* 96: 368, 2004), Miller & Huhndorf (*Mol. Phylogen. Evol.* 35: 60, 2005), Cai *et al.* (*MR* 110: 359, 2006; phylogeny).
- Zygopolaris** S.T. Moss, Lichtw. & Manier (1975), Legeriomycetaceae. 2 (in *Ephemeroptera*), Mexico; USA. See Moss & Lichtwardt (*CJB* 55: 3099, 1977; ultrastr.), Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986; key), White (*MR* 110: 1011, 2006; phylogeny), Valle *et al.* (*Mycol.* 100: 149, 2008; Mexico).
- Zygorenospora** Krassiln. (1954) = *Zygofabospora* fide Naumov (*Mikol. Fitopatol.* 21: 131, 1987).
- Zygorhizidium** Löwenthal (1904), Chytridiaceae. c. 11, Europe; N. America. See Sparrow (*Aquatic Phycomycetes* Edn 2: 548, 1960; key), Doggett & Porter (*Mycol.* 88: 720, 1996; sexual reproduction).
- Zygorhynchus** Vuill. (1903), Mucoraceae. 8 (esp. in soil), widespread. See Hesseltine *et al.* (*Mycol.* 51: 173, 1959; key), Schipper *et al.* (*Persoonia* 8: 321, 1975; zygospore ornamentation), O'Donnell *et al.* (*CJB* 56: 1061, 1978; ontogeny), Heath & Rethoret (*Eur. J. Cell Biol.* 28: 180, 1982; mitosis, ultrastr.), Schipper (*Persoonia* 13: 97, 1986; key), Brown (*J. Phytopath.* 120: 298, 1987), Taiwo *et al.* (*Microbios* 51: 23, 1987), Taiwo *et al.* (*Microbios* 52: 183, 1987; physiology), Brown (*J. Phytopath.* 123: 222, 1988; biocontrol), Brown & Surgeoner (*Ann. appl. Biol.* 118: 39, 1991; plant growth enhancement), Edelmann & Klomparens (*Mycol.* 87: 304, 1995; ultrastr. zygospore dev.), Voigt & Wöstemeyer (*Gene* 270: 113, 2001; phylogeny), Zheng (*Mycotaxon* 84: 367, 2002; China).
- Zygorrhynchus**, see *Zygorhynchus*.
- Zygosaccharis** Clem. & Shear (1931) ≡ *Zygosaccharomyces*.
- Zygosaccharomyces** B.T.P. Barker (1901), Saccharomycetaceae. 11 (osmotolerant), widespread. See von Arx *et al.* (*Stud. Mycol.* 14: 1, 1977), Kreger-van Rij (Ed.) (*Yeasts, a taxonomic study* 3rd edn, 1984; key), Kurtzman (*Yeast Chichester* 6: 213, 1990; 9 spp. by DNA complementarity), James *et al.* (*Yeast Chichester* 10: 871, 1994; molec. syst.), James *et al.* (*Int. J. Syst. Bacteriol.* 46: 189, 1996; ITS), Kurtzman in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 424, 1998), Steels *et al.* (*Int. J. Syst. Bacteriol.* 49: 319, 1999), Steels *et al.* (*FEMS Yeast Res.* 2: 113, 2002; physiology), Esteve-Zarzoso *et al.* (*Syst. Appl. Microbiol.* 26: 404, 2003; phylogeny), James & Stratford (*Yeasts in Food Beneficial and Detrimental Aspects*: 171, 2003; spoilage-causing spp.), Kurtzman (*FEMS Yeast Res.* 4: 233, 2003), Duarte *et al.* (*Syst. Appl. Microbiol.* 27: 436, 2004; isozymes), Rawsthorne & Phister (*Int. J. Food Microbiol.* 112: 1, 2006; molecular detection), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).
- Zygosaccharomycodes** Nishiw. (1929) = *Saccharomyces* fide Batra in Subramanian (Ed.) (*Taxonomy of fungi* 1: 187, 1978).
- Zygospermella** Cain (1935), Lasiosphaeriaceae. 2 (coprophilous), N. America; Europe. See Lundqvist

(*Symb. bot. upsal.* 20 no. 1, 1972; key), Huhndorf *et al.* (*Mycol.* 96: 368, 2004).

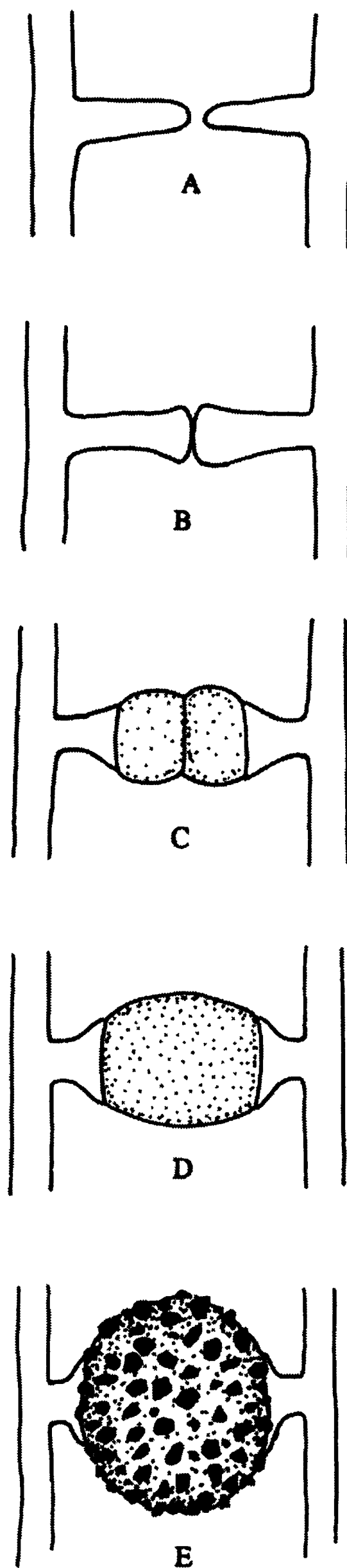


Fig. 27. Stages in zygospore formation in *Mucor mucedo*. A,B, young progametangia; C, gametangia and suspensors; D, young zygospore; E, mature zygospore. Not to scale.

Zygospermum Cain (1934) [non *Zygospermum* Thwaites ex Baill. 1858, *Euphorbiaceae*] ≡ *Zygospermella*.

zygospore, the resting spore resulting from the conjugation of isogametes or (in *Zygomycetes*), from the fusion of like gametangia (Fig. 27).

Zygosporites Will. (1880), Fossil Fungi, *Zygomycetes*. 1 (Carboniferous), British Isles. See Pia in Hirnier (*Handb. Paläobot.* 1, 1927).

Zygosporium Mont. (1842), anamorphic *Pezizomycotina*, Hso.0eP.1. 11, widespread. See Hughes (*Mycol. Pap.* 44, 1951), Ichinoe (*Bull. natn Inst. Hyg. Sci.* 89: 135, 1971), Heredia Abarca & Mercado Sierra (*Mycotaxon* 68: 137, 1998), Whitton *et al.* (*Fungal Diversity* 12: 207, 2003; review).

zygote, the result of fusion of two gametes; a cell in which two nuclei of opposite sex have undergone fusion (Buller, 1941).

Zygothrix Reinsch ex Rabenh. (1866) nom. dub., Fungi. Based on sterile hyphae.

Zygotorulaspora Kurtzman (2003), *Saccharomycetales*. 2. See Kurtzman (*FEMS Yeast Res.* 4: 243, 2003), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny).

Zygowillia (Klöcker) Kudrjanzev (1960) = *Pichia* fide Lodder (*Yeasts, a taxonomic study* 2nd edn, 1970).

Zygowilliopsis Kudrjanzev (1960) = *Williopsis* fide

Yamada *et al.* (*Biosc., Biotechn., Biochem.* 58: 1236, 1994; status), Yamada *et al.* (*Biosc., Biotechn., Biochem.* 63: 827, 1999), Naumova *et al.* (*Syst. Appl. Microbiol.* 27: 192, 2004).

Zygozoma Van der Walt & Arx (1987) = *Lipomyces* fide van der Walt *et al.* (*Syst. Appl. Microbiol.* 12: 288, 1989; key 3 spp.) but see van der Walt *et al.* (*Antonie van Leeuwenhoek* 59: 77, 1991; ultrastr.), Doublés & McLaughlin (*Mycol.* 84: 671, 1992), Smith in Kurtzman & Fell (Eds) (*Yeasts, a taxonomic study* 4th edn: 433, 1998), Suh *et al.* (*Mycol.* 98: 1006, 2006; phylogeny), Kurtzman *et al.* (*FEMS Yeast Res.* 7: 1027, 2007; phylogeny).

zymurgy, the practice of fermentation as in brewing and wine-making.

Zythia Fr. (1849), anamorphic *Pezizomycotina*, Cpd.0-1eH.?. 25, widespread.

Zythiaceae Clem. (1909). See *Nectrioidaceae*.

Zythiostroma Höhn. ex Falck (1923), anamorphic *Nectria*, St.0eH.15. 2 or 3, Europe; Java.

Zyxiphora B. Sutton (1981), anamorphic *Pezizomycotina*, Hsy.0eP.1. 1, India. See Sutton (*Kavaka* 8: 55, 1980).

- Achlya** Nees (1823), Saprolegniaceae. c. 50, widespread (north temperate). See Johnson (*The genus Achlya*, 1956), Riethmüller *et al.* (*Mycol.* 94: 834, 2002; phylogeny), Spencer *et al.* (*MR* 106: 549, 2002; revision), Markovskaja (*Botanica Lithuanica* 10: 141, 2004; Lithuania), Johnson *et al.* (*Mycotaxon* 92: 11, 2005; systematics).
- Achlyopsis** De Wild. (1896) nom. dub., Pythiales. ? = Pythiogeton (Pythiogeton.). See Voglmayr *et al.* (*MR* 103: 591, 1999).
- Actinobotrys** H. Hoffm. (1856) = *Bremia* fide Saccardo (*Syll. fung.* 7: 1, 1888).
- Adlerocystis** Feldm.-Muhs. & Havivi (1963), ? Chromista. 2 (symbiotic on *Ornithodoros*), Israel. See Feldman-Muhsam & Havivi (*Parasitology* 53: 183, 1963; related to *Blastocystis*).
- Albuginaceae** J. Schröt. (1893), Albuginales. 3 gen. (+ 1 syn.), 53 spp.
- Albuginales** Thines (2005). Albuginomycetidae. 1 fam., 3 gen., 53 spp. Fam.:
Albuginaceae
Lit.: Thines & Spring (*Mycotaxon* 92: 443, 2005). See also *Lit.* under *Peronosporales*.
- Albuginomycetidae** Thines (2005), Oomycetes. Ord.:
Albuginales
For *Lit.* see fam.
- Albugo** (Pers.) Roussel (1806), Albuginaceae. c. 45, widespread. The 'White Blisters' or 'White Rusts'; *A. candida* (white blister of crucifers). See Biga (*Sydowia* 9: 339, 1955; key), Pound & Williams (*Phytopathology* 53: 1146, 1963; physiologic races *A. candida*), Choi & Priest (*Mycotaxon* 53: 261, 1995; key), Priest (*Mycotaxon* 58: 69, 1996; spp. on *Gentianaceae*), Legon *et al.* (*Mycologist* 16: 114, 2002; *A. tragopogonis* var. *inulae* in UK), Thines & Spring (*Mycotaxon* 92: 443, 2005; split into three genera), Choi *et al.* (*Molecular and Phylogenetic Evolution* 40: 400, 2006), Constantinescu & Thines (*Sydowia* 58: 178, 2006; sporangial dimorphism), Voglmayr & Riethmüller (*MR* 110: 75, 2006; phylogeny), Choi *et al.* (*Fungal Diversity* 27: 11, 2007; genetic diversity in *A. candida*).
- Althornia** E.B.G. Jones & Alderman (1972), Thraustochytriaceae. 1, British Isles. See Jones & Alderman (*Nova Hedwigia* 21: 381, 1971), Raghukumar (*European Journal of Protistology* 38: 127, 2002; ecology).
- Anisolpidiaceae** Karling (1943), Anisolpidiales. 1 gen., 3 or 6 spp.
- Anisolpidiales** M.W. Dick (2001). Chromista. 1 fam., 1 gen., 6 spp. Fam.:
Anisolpidiaceae
For *Lit.* see under fam.
- Anisolpidium** Karling (1943), Anisolpidiaceae. 6 (in marine algae), widespread. See Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Aphanodictyon** Huneycutt ex M.W. Dick (1971), Leptolegniellaceae. 1, USA; Australia. See Dick (*TBMS* 57: 422, 1971), Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Aphanomyces** de Bary (1860), Leptolegniaceae. c. 15 (aquatic), widespread. *A. euteiches* (pea root rot); *A. astaci* (pathogenic for European crayfish, *Astacus*); *A. cochlioides* (sugar beet black rot); *A. invadans* [Epizootic Ulcerative Syndrome in fish]. See Scott (*Tech. Bull. Va agric. Exp. Stn* 151, 1961; keys), Dick (*Straminipilous Fungi*: 670 pp., 2001), Levenfors & Fatehi (*MR* 108: 682, 2004; molecular characterization of *Aphanomyces* species on legumes).
- Aphanomycopsis** Scherff. (1925), Leptolegniellaceae. 8, Europe; N. America. See Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Aplanes** de Bary (1888) = *Achlya* fide Johnson (*The genus Achlya*, 1956).
- Aplanochytrium** Bahnweg & Sparrow (1972), Thraustochytriaceae. 8 (marine), Kerguelen. See Bahnweg & Sparrow (*Arch. Mikrobiol.* 81: 46, 1972), Leander & Porter (*Mycotaxon* 76: 439, 2000; monogr.), Moro *et al.* (*Protist* 154: 331, 2003; sp. nov. from Ross Sea, Antarctica).
- Aplanopsis** Höhnk (1952), Saprolegniaceae. 2, Europe. See Höhnk (*Veröff. Inst. Meeresf. Bremerhaven Sonderband* 1: 127, 1952), Spencer *et al.* (*MR* 106: 549, 2002; revision).
- Apodachlya** Pringsh. (1883), Leptomitaceae. 3, widespread. See Jacobs (*Antonie van Leeuwenhoek* 48: 389, 1982; key), Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Apodachlyella** Indoh (1939), Apodachlyellaceae. 1, widespread. See Longcore *et al.* (*Mycol.* 79: 621, 1987), Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Apodachlyellaceae** M.W. Dick (1986), Leptomitales. 2 gen., 2 spp.
- Apodya** Cornu (1872) = *Leptomit* fide Sparrow (*Aquatic Phycomycetes* Edn 2: 1187 pp., 1960).
- Aqualinderella** R. Emers. & W. Weston (1967), Rhipidiaceae. 1 (anaerobic), widespread. See Emerson (*Mycol.* 62: 359, 1970; oogonium production), Held (*Mycol.* 62: 339, 1970; nutrition), Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Araiospora** Thaxt. (1896), Rhipidiaceae. 4, America; Europe. See Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Archilegnia** Apinis (1935) nom. conf., Saprolegniaceae.
- Artotrogus** Mont. (1845) nom. rej. = *Pythium* Pringsh. fide Middleton (*Mem. Torrey bot. Club* 20, 1943).
- Atkinsiella** Vishniac (1958), Saprolegniomycetidae. 1 (on *Crustacea*), Europe; N. America. See Sparrow & Gotelli (*Mycol.* 61: 199, 1969), Martin (*Am. J. Bot.* 64: 760, 1977; posn), Kitancharoen *et al.* (*Mycoscience* 35: 265, 1994; disease of abalone), Dick (*MR* 102: 1062, 1998; revision of taxa), Dick (*Straminipilous Fungi*: 670 pp., 2001), Hudspeth *et al.* (*Fungal Diversity*: 577, 2004; phylogeny).
- Basidiophora** Roze & Cornu (1869), Peronosporaceae. 1, widespread. See Barreto & Dick (*J. Linn. Soc. Bot.* 107: 313, 1991; key), Constantinescu (*Nova Hedwigia* 66: 251, 1998; revision), Voglmayr *et al.* (*MR* 108: 1011, 2004; phylogeny).
- Benua** Constant. (1998), Peronosporaceae. 1, USA. See Constantinescu (*Nova Hedwigia* 66: 258, 1998), Thines *et al.* (*MR* 111: 1377, 2007; phylogeny).
- Bicillium** H.E. Petersen (1910) = *Eurychasma* fide Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Blastocystis** Alexeev (1911), Chromista. 3 (in alimentary tract of humans and animals), widespread. See Lavier (*Annl's Parasit. hum. comp.* 27: 339, 1952; synonymy), Lee (*TBMS* 54: 313, 1970; ultrastr.), Nakamura *et al.* (*Mol. Biochem. Parasit.* 77: 241, 1996; phylogeny), Silberman *et al.* (*Nature* 380: 398, 1996; phylogeny), Stenzel & Boreham (*Clin. Microbiol. Rev.* 9: 563, 1996; review), Yoshikawa *et al.* (*J. Eukary. Microbiol.* 43: 127, 1996; DNA polymorphism), König & Müller (*Z. Bakteriologie* 286: 435,

- 1997; incidence), Yoshikawa & Oishi (*Protoplasma* **200**: 31, 1997; biodiversity), Hanbold *et al.* (*Medical Mycol.* **36**: 263, 1998).
- Blastulidiopsis** Sigot (1931) = *Blastulidium* fide Manier (*Protistologia* **12**: 225, 1976).
- Blastulidium** Pérez (1903), Leptomitales. 1, France. See Manier (*Protistologia* **12**: 225, 1976), Dick (*Straminipilous Fungi*: 670 pp., 2001; asexual genus *inc. sed.*).
- Blepharospora** Petri (1917) = *Phytophthora* fide Buisman (*Mededelingen uit het Phytopathologisch Laboratorium 'Willie Commelin Scholten'* **11**: 1, 1927).
- Branchiomyces** Plehn (1912), ? Saprolegniales. 2 (on fish), widespread. See Peduzzi (*Mem. Ist. ital. Idrobiol.* **30**: 81, 1973), Neish & Hughes (*Diseases of Fish* **6**: 50, 1980).
- Bremia** Regel (1843), Peronosporaceae. 1, widespread (north temperate). *B. lactucae* (lettuce downy mildew). See Ling & Tai (*TBMS* **28**: 16, 1945), Marlatt (*Bull. agric. Exp. Stns Univ. Fla* **764**: 1, 1974), Michelmores & Ingram (*TBMS* **75**: 47, 1980; heterothallism), Crute & Dixon in Spencer (Ed.) (*The Downy Mildews (London)*: 421, 1981), Morgan (*CMI Descr.*: 682, 1981), Riethmüller *et al.* (*Mycol.* **94**: 834, 2002; phylogeny), Göker *et al.* (*CJB* **81**: 672, 2003; phylogeny), Voglmayr *et al.* (*MR* **108**: 1011, 2004; phylogeny), Thines *et al.* (*MR* **110**: 646, 2006; phylogeny; exclusion of *Bremia graminicola*), Choi *et al.* (*Mycopathologia* **163**: 91, 2007; ITS characteristics), Voglmayr & Constantinescu (*MR* **112**: 487, 2008; phylogeny).
- Bremiella** G.W. Wilson (1914) = *Plasmopara* fide Riethmüller *et al.* (*Mycol.* **94**: 834, 2002), Voglmayr *et al.* (*Mycotaxon* **100**: 11, 2007).
- Brevilegnia** Coker & Couch (1927), Saprolegniaceae. c. 15, widespread. See Johnson (*Mycol.* **69**: 287, 1977; 6 Scandinavian spp.), Inaba & Tokumasu (*Mycoscience* **43**: 59, 2002; Japan), Steciow (*Mycol.* **95**: 934, 2003; Argentina).
- Brevilegniella** M.W. Dick (1961), Leptolegniellaceae. 1 (from soil), USA; British Isles. See Dick (*Pap. Mich. Acad. Sci.* **46**: 195, 1961), Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Calyptralegnia** Coker (1927), Saprolegniaceae. 3, N. America; Europe; Iraq. See Muhsin (*Polskie Archiwum Hydrobiologii* **41**: 415, 1994; Iraq), Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Canteriomyces** Sparrow (1960), Hyphochytriaceae. 1 (on freshwater algae), Europe; N. America. See Sparrow (*University of Michigan Studies, Science Series* **15**: 750, 1960), Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Chlamydomyxa** W.A. Archer (1875) = *Labyrinthula* fide Olive (*The mycetozoa*: 215, 1975).
- Chlamydomyzium** M.W. Dick (1997), Myzocytiopsidaceae. 6 (parasitic in *Aschelminthes*), widespread. See Glockling & Dick (*MR* **101**: 883, 1997), Dick (*Straminipilous Fungi*: 670 pp., 2001), Glockling & Beakes (*MR* **110**: 1119, 2006; structure, development).
- Chlorospora** Speg. (1891) = *Harzia* fide Constantinescu (*Sydowia* **54**: 137, 2002).
- CHROMISTA**. 3 class., 16 ord., 29 fam., 126 gen. (+ 46 syn.), 1036 spp. (incl. Heterokonta, Pseudofungi, Pseudomycotina, stramenopiles). Kingdom of *Eukaryota*. Predominantly unicellular, filamentous, or colonial primarily phototrophic organisms; cell walls not of chitin and β -glucan (often cellulosic); chloro-

plasts (when present) located in the lumen of a generally rough endoplasmic reticulum, lack starch and phycobilisomes and have a two-membraned envelope inside a periplastid membrane, chlorophylls when present *a* and *c*; mitochondria generally with tubular cristae; Golgi bodies and peroxisomes always present; flagella when present, with at least one with rigid, tubular, and usually tripartite flagellar hairs or mastigonemes (except haptophytes); mostly free-living; many microscopic in size (with major exceptions, e.g. brown algae).

Formerly often included in *Protoctista* (syn. *Protista*; e.g. Margulis *et al.*, 1990), but now recognized as a kingdom separate from the *Protozoa*. Includes 10 phyla (Corliss, 1994) or 5 phyla and 7 subphyla (Cavalier-Smith, 1998); encompasses a wide range of golden and brown algae, diatoms, chrysophytes and cryptomonads (but not chlorophyte and red algae; in *Plantae*). Dick (2001) formally proposes the kingdom *Straminipila* (q.v.) with a narrower delimitation than Cavalier-Smith (1998) but also includes the *Plasmodiophoromycetes*.

The 'fungal' phyla are interpreted as having lost chloroplasts secondarily, and are part of subkingdom *Heterokonta*. The classification within the kingdom is unsettled; 2 of the phyla Corliss (1994) accepted comprise organisms studied by mycologists: *Labyrinthomorpha* (incl. *Labyrinthulea* and *Thraustochytriaceae*) and *Pseudofungi* (incl. *Oomycetes* and *Hyphochytriomycetes*); Barr (1992) included the same fungi but used different ranks. Cavalier-Smith (1997, 1998) places the fungal groups in two separate phyla: *Sagenista* (*Labyrinthista* or *Labyrinthulomycetes*) and *Bigyra* (*Pseudofungi* or *Oomycetes* and *Hyphochytriomycetes*). Dick (2001) regards all these groups as belonging to the phylum *Heterokonta*.

Various arrangements and ranks have been proposed for the main groupings of 'fungi' within the *Chromista*; selected ones are compared in Table 3 (Fungi, q.v.). Three fungal phyla belonging to the *Chromista* are accepted in this edition of the *Dictionary*:

- (1) **Hyphochytriomycota**.
- (2) **Labyrinthulomycota**.
- (3) **Oomycota**.

Lit.: Barr (*Mycol.* **84**: 1, 1992), Cantino (*Ann. Rev. Microbiol.* **13**: 103, 1959), Cavalier-Smith (*Prog. Phycol. Res.* **4**: 309, 1986; in Rayner *et al.* (Eds), *Evolutionary biology of the fungi*: 339, 1987; in Osawa & Honjo (Eds), *Evolution of life*: 271, 1991; *Microbiol. Rev.* **57**: 953, 1993; *Arch. Protistenkd.* **148**: 253, 1997; *Biol. Rev.* **73**: 203, 1998), Corliss (*Acta Protozool.* **33**: 1, 1994), Buczacki (Ed.) (*Zoosporic plant pathogens*, 1983), Cordá-Olmedo & Lipson (Eds) (*Phycomycetes*, 1987), Dick (*Straminipilous Fungi*, 2001), Fitzpatrick (1930), Fuller & Jaworski (Eds) (*Zoosporic fungi in teaching and research*, 1986), Margulis *et al.* (Eds) (*Handbook of Protoctista*, 1990) Sparrow (*Aquatic Phycomycetes*, edn 2, 1960; in Ainsworth *et al.* (Eds), *The Fungi* **4B**: 61, 1973; keys classes, orders, etc.); Yoon *et al.* (*proc. Natn Acad. Sci USA* **99**: 15507, 2002); Keeling (*Protist* **155**: 3, 2004).

See Kingdoms of fungi, Phylogeny, Protozoa, Straminipila.

Ciliatomyces I. Foissner & W. Foissner (1995), Lagenaceae. 1 (on cysts of *Kahliella simplex*), Austria. See Foissner & Foissner (*Phyton Horn* **35**: 116, 1995),

- Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Ciliomyces** I. Foissner & W. Foissner (1986) $\equiv$ Ciliatomyces.
- Cladolegnia** Johannes (1955) = Saprolegnia fide Dick in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 145, 1973).
- Cornomyces** M.W. Dick (2001), Leptomitales. 8 (saprotrophic or parasitic in other fungi), widespread. See Dick (*Straminipilous Fungi*: 327, 2001).
- Couchia** W.W. Martin (1981), Saprolegniaceae. 3, USA. See Martin (*Mycol.* 73: 1143, 1981), Martin (*Mycol.* 92: 1149, 2000; sp. n. parasitic in midge eggs).
- Crypticola** Humber, Frances & A.W. Sweeney (1989), Crypticolaceae. 2, Australia. See Humber *et al.* (*J. Invert. Path.* 45: 107, 1989), Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Crypticolaceae** M.W. Dick (1998), Myzocytiopsidales. 1 gen. (+ 1 syn.), 2 spp.
- Cymbanche** Pfitzer (1869) ? = Ectrogella fide Dick (*in litt.*).
- Cystochytrium** Ivimey Cook (1932), Hyphochytriaceae. 1 (on *Veronica* roots), Europe. See Ivimey Cook (*TBMS* 16: 251, 1932).
- Cystopodaceae** Bonord. (1884) = Albuginaceae.
- Cystopus** Lév. (1847) = Albugo fide Wilson (*Bull. Torrey Bot. Club* 34: 61, 1907).
- Cystosiphon** Roze & Cornu (1869), Pythiaceae. 5, widespread. See Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Detonisia** Gonz. Frag. (1925) nom. dub., ? Oomycota.
- Developayella** Tong (1995), Chromista. 1. Heterotrophic flagellate consistently clustering with the chromistan fungi in molecular phylogenies, frequently as a sister group to the hyphochytrids, labyrinthulids and thraustochytrids. See Tong (*Eur. J. Protist.* 31: 24, 1995), Leipe *et al.* (*Eur. J. Protist.* 32: 449, 1996; 16S-like rDNA), Cavalier-Smith in Coombs *et al.* (Eds) (*Evolutionary Relationships Among Protozoa*: 375, 1998; posn. phylum Bigyra: subphylum Bigyromonada as sister group to *Pseudofungi*).
- Diasporangium** Höhnk (1936), Pythiaceae. 1 (in soil), Europe; USA. See Voglmayr *et al.* (*MR* 103: 591, 1999; posn), Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Dicksonomyces** Thirum., P.N. Rao & M.A. Salam (1957) nom. conf., Peronosporales. based on a mixture of *Olpitrichum tenellum* and oospores of *Peronosclerospora sorghi*. See Waterhouse (*Mycol.* 60: 977, 1968).
- Dictypleiosporus** Gandhe (2006), Saprolegniaceae. 1, India. See Gandhe (*Indian Phytopath.* 59: 94, 2006).
- Dictyuchus** Leitg. (1868), Saprolegniaceae. 7, widespread (north temperate). See Blackwood & Powell (*Mycotaxon* 73: 247, 1, 1999; gen. concept), Riethmüller *et al.* (*Mycol.* 94: 834, 2002; phylogeny).
- Diplanes** Leitg. (1868) = Saprolegnia fide Coker (*The Saprolegniaceae with Notes on Other Water Molds*, 1923).
- Diplophrys** J.S.F. Barker (1868), Thraustochytriales. 2, widespread (north temperate). See Olive (*The mycetozoans*: 227, 1975), Dykstra & Porter (*Mycol.* 76: 626, 1984; n.sp.), Leander & Porter (*Mycol.* 93: 459, 2001; phylogenetic position in the *Labyrinthulomycota*).
- Diplophysa** J. Schröt. (1886) = Olpidiopsis fide Sparrow (*Aquatic Phycomycetes* Edn 2: 1187 pp., 1960).
- Ducellieria** Teiling (1957), Ducellieriaceae. 1 (aquatic), British Isles. See Kusel-Fetzmann & Novak (*Pl. Syst. Evol.* 138: 199, 1981; posn), Hesse *et al.* (*Pl. Syst. Evol.* 165: 1, 1989; life cycle, ultrastr.).
- Ducellieriaceae** M.W. Dick (2001), Leptomitales. 1 gen., 1 spp.
- Ectrogella** Zopf (1884), Ectrogellaceae. 5, widespread (north temperate). See Raghu Kumar (*CJB* 58: 2557, 1980; ultrastr.), Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Ectrogellaceae** Cejp (1959), Oomycota (inc. sed.). 1 gen. (+ 1 syn.), 5 spp.
- Elina** N.J. Artemczuk (1972), Thraustochytriaceae. 2, former USSR. See Karling (*Mycol.* 71: 829, 1979), Dick (*Straminipilous Fungi*: 670 pp., 2001; systematic posn) But see.
- Endosphaerium** D'Eliscu (1977), Pythiales. 1 (on fish), USA. See D'Eliscu (*J. Invert. Path.* 30: 420, 1977), Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Eupythium** Nieuwl. (1916) $\equiv$ Pythium Pringsh.
- Eurychasma** Magnus (1905), Eurychasmataceae. 1 (on *Ectocarpus*), Europe; Greenland. See Dick (*Straminipilous Fungi*: 670 pp., 2001), Cavalier-Smith (*J. Mol. Evol.* 62: 388, 2006; phylogeny).
- Eurychasmataceae** H.E. Petersen (1905), Oomycota (inc. sed.). 2 gen., 4 spp.
- Eurychasmidium** Sparrow (1936), Eurychasmataceae. 3 (on marine *Rhodophyceae*), N. America; Europe. See Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Eurychasmopsis** Canter & M.W. Dick (1994), Apodachlyellaceae. 1, British Isles. See Canter & Dick (*MR* 98: 106, 1994), Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Geolegnia** Coker (1925), Saprolegniaceae. 3, N. America; Europe. See Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Gilletia** Sacc. & Penz. (1882) = Basidiophora fide Saccardo (*Syll. fung.* 12: 267, 1897).
- Gilletiaceae** Nann. (1934) = Peronosporaceae.
- Gonimochaete** Drechsler (1946), Myzocytiopsidaceae. 4, widespread. See Drechsler (*Bull. Torrey bot. Club* 73: 1, 1946), Barron (*CJB* 51: 2451, 1973), Newell *et al.* (*Bull. Mar. Sci.* 27: 189, 1977), Barron (*Mycol.* 77: 17, 1985), Saikawa & Anazawa (*CJB* 63: 2326, 1985; ultrastr.), Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Gracea** M.W. Dick (1997), Olpidiopsidales. 2, British Isles. See Dick (*MR* 101: 882, 1997), Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Graminivora** Thines & Göker (2006), Peronosporaceae. 1 (on *Poaceae*), widespread. See Thines *et al.* (*MR* 110: 651, 2006).
- Haliphthoraceae** Vishniac (1958), Oomycota (inc. sed.).
Lit.: Vishniac (*Mycol.* 50: 75, 1958), Dick (*Pap. Mich. Acad. Sci.* 46: 195, 1962).
- Haliphthoros** Vishniac (1958), Oomycota. 3 (on eggs and larvae of Crustacea and Mollusca), widespread (tropical). See Tharp & Bland (*CJB* 55: 2936, 1977; biol. and host range), Dick (*Straminipilous Fungi*: 670 pp., 2001), Hudspeth *et al.* (*Fungal Diversity*: 577, 2004; phylogeny).
- Halocrusticida** K. Nakam. & Hatai (1995), Oomycota. 6, widespread. See Nakamura & Hatai (*Mycoscience* 36: 431, 1995), Hudspeth *et al.* (*Fungal Diversity* 13: 47, 2003; phylogeny), Sekimoto *et al.* (*Mycoscience* 48: 212, 2007; phylogeny).
- Halodaphnea** M.W. Dick (1998), Oomycota. 1. See Dick (*MR* 102: 1065, 1998).

- Halophytophthora** H.H. Ho & S.C. Jong (1990), Peronosporaceae. 16, widespread. See Nakagiri (*TMSJ* 34: 87, 1993; reproduction), Nakagiri (*Fungal Diversity Res. Ser.* 7: 1, 2002; species from tropical and subtropical mangroves), Ho *et al.* (*Mycotaxon* 85: 417, 2003; sp.n. Taiwan).
- Hamidia** Chaudhuri (1942) nom. dub., Saprolegniaceae.
- Haptoglossa** Drechsler (1940), Haptoglossaceae. 11, N. America; Europe. See Davidson & Barron (*CJB* 51: 1317, 1973), Robb & Lee (*CJB* 64: 1935, 1986; ultrastr. gun cell), Glockling & Beakes (*MR* 104: 100, 2000), Dick (*Straminipilous Fungi*: 670 pp., 2001), Glockling & Beakes (*J. Linn. Soc. Bot.* 136: 329, 2001).
- Haptoglossaceae** M.W. Dick (2001), Haptoglossales. 1 gen., 11 spp.
- Haptoglossales** M.W. Dick (2001). Oomycota. 1 fam., 1 gen., 11 spp. Fam.:
Haptoglossaceae
 For *Lit.* see under fam.
- Heterokonta.** See *Chromista*.
- Hyaloperonospora** Constant. (2002), Peronosporaceae. 24, widespread. pathogens of *Brassicaceae*. See Constantinescu & Fatehi (*Nova Hedwigia* 74: 310, 2002), Göker *et al.* (*CJB* 81: 672, 2003; phylogeny), Göker *et al.* (*MR* 107: 1314, 2003; phylogeny), Göker *et al.* (*Mycol. Progr.* 3: 83, 2004; phylogeny).
- Hydatinophagus** Valkanov (1931), Saprolegniaceae. 2, Europe; USA. See Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Hydronea** Carus ex Rchb. (1828) $\equiv$ Achlya.
- Hyphochytriaceae** A. Fisch. (1892), Hyphochytriales. 3 gen. (+ 1 syn.), 8 spp.
- Hyphochytriales** E.A. Bessey ex P.M. Kirk, P.F. Cannon & J.C. David (2001). Hyphochytriomycetes. 2 fam., 6 gen., 24 spp. Fams:
 (1) **Hyphochytriaceae**
 (2) **Rhizidiomycetaceae**
 For *Lit.* see under fam.
- Hyphochytriomycetes** Sparrow ex M.W. Dick (1983), Hyphochytriomycota. 1 ord., 2 fam., 6 gen., 24 spp. Ord.:
 Hyphochytriales
 For *Lit.* see ord. and fam.
- Hyphochytriomycota** Whittaker (1969), Chromista. 1 class., 1 ord., 2 fam., 6 gen., 24 spp. The whole (holocarpic) or part (eucarpic) of the thallus converting into a reproductive structure; holocarpic spp. often with branched rhizoids; zoospores with one anterior flagellum with mastigonemes; lacking protoplasmic and nucleus-associated microtubules. On algae and fungi in freshwater and soil as parasites or saprobes, also saprobic on plant and insect debris. One class: **Hyphochytriomycetes** and Ord.:
Hyphochytriales
 Cavalier-Smith (*Arch. Protistenk.* 148: 253, 1997) and Dick (2001, *in press*) assign the hyphochytrids to class rank within their subphyla *Pseudofungi* and *Peronosporomycotina* respectively. Dick (l.c.) introduces the order *Anisopidiales* which he considers to be *incertae sedis* within the *Straminipila* ($\equiv$ *Chromista*).
Lit.: Fuller (*in Margulis et al.* (Eds), *Handbook of Protoctista*: 380, 1990), Paterson (*in Parker*, 1982, 1: 179), Sparrow (*in Ainsworth et al.* (Eds), *The Fungi* 4B: 61, 1973).
- Hyphochytrium** Zopf (1884), Hyphochytriaceae. 6, widespread (north temperate). See Fuller *in Margulis et al.* (Eds) (*Handbook of Protoctista*: 380, 1990), Dick (*Straminipilous Fungi*: 670 pp., 2001), Fuller *in* McLaughlin *et al.* (Eds) (*The Mycota A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research* 7A: 73, 2001).
- Hyphophagus** Minden (1911) $\equiv$ Hyphochytrium.
- Isoachlya** Kauffman (1921), Saprolegniaceae. c. 10, widespread. See Seymour (*Nova Hedwigia* 19: 1, 1970), Dick *in* Ainsworth *et al.* (Eds) (*The Fungi* 4A: 145, 1973), Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Japonochytrium** Kobayasi & M. Ôkubo (1953), Thraustochytriaceae. 1 (on *Gracilaria*), Japan. See Kobayasi & Ôkubo (*Bull. natn. Sci. Mus. Tokyo*, B 33: 57, 1953), Cavalier-Smith & Chao (*J. Mol. Evol.* 62: 388, 2006; phylogeny).
- Jaraia** Némec (1912) nom. dub., ? Saprolegniaceae.
- Kawakamia** Miyabe (1903) = *Phytophthora* fide Fitzpatrick (*The lower fungi. Phycomycetes*, 1930).
- Labyrinthista**, Chromista. 1 class., 2 ord., 2 fam., 12 gen., 53 spp. (Labyrinthomorpha, Labyrinthulomycota); labyrinthids and thraustochytrids. Trophic stage with an ectoplasmic network, and spindle-shaped or sphaerical cells that move by gliding within the network; uniquely contain bothrosomes; zoospores when present with two flagellae, one with mastigonemes; sexual reproduction known in some spp.
 The spp. occur in salt and freshwater, often associated with plants and algal chromists, some as pathogens; culturable. Class:
Labyrinthulea ($\equiv$ *Labyrinthulomycota*)
 Data from recent molecular investigations conflict with current morphological based classifications and suggest that new lineages need to be recognized.
Lit.: Barr & Allen (*CJB* 63: 138, 1985; flagella), Corliss (1994), Honda *et al.* (*J. Eukaryot. Microbiol.* 46: 637, 1999), Karling (*Predominantly holocarpic and eucarpic simple biflagellate phycomycetes*, 1981), Leander & Porter (*Mycol.* 93: 459, 2001; phylogeny), Moss (*Bot. J. Linn. Soc.* 91: 329, 1985), Olive (1975, 1982), Porter (*in Margulis et al.*, *Handbook of the Protoctista*: 388, 1990), Sparrow (*in Ainsworth et al.*, *The Fungi* 4B: 61, 1973). See also *Mycetozoa*.
- Labyrinthodictyon** Valkanov (1969) = *Labyrinthula* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).
- Labyrinthomorpha.** See *Labyrinthista*.
- Labyrinthomyxa** Duboscq (1921) nom. conf., Labyrinthulaceae. See Olive (*The mycetozoans*: 215, 1975).
- Labyrinthula** Cienk. (1867), Labyrinthulaceae. c/ 12 (in salt and fresh water), widespread (north temperate). *L. macrocystis* (wasting disease of eel-grass, *Zostera* spp.). See Porter (*Protoplasma* 61: 1, 1969; ultrastr.), Porter *in* Margulis *et al.* (Eds) (*Handbook of Protoctista*: 388, 1990), Muehlstein *et al.* (*Mycol.* 82: 180, 1991), Leander & Porter (*Mycol.* 93: 459, 2001; phylogeny), Leander & Leander (*European Journal of Protistology* 40: 317, 2004; phylogeny).
- Labyrinthulaceae** Cienk. (1867), Labyrinthulales. 1 gen. (+ 3 syn.), 12 spp.
Lit.: Dangeard (*Le Botaniste* 24: 217, 1932).
- Labyrinthulales** E.A. Bessey ex P.M. Kirk, P.F. Cannon & J.C. David (2001). Labyrinthulea. 1 fam., 3 gen., 14 spp. Fam.:

Labyrinthulaceae

For *Lit.* see under fam.

Labyrinthulea, **Labyrinthista**. 2 ord., 2 fam., 12 gen., 53 spp. Ords:

(1) **Labyrinthulales**

(2) **Thraustochytriales**

For *Lit.* see ord. and fam.

Labyrinthuloides F.O. Perkins (1973) = *Aplanochytrium* fide Leander & Porter (*Mycotaxon* 76: 439, 2000).

Labyrinthulomycetes. See *Labyrinthulea*.

Labyrinthulomycota. See *Labyrinthista*.

Lagena Vanterp. & Ledingham (1930), **Lagenaceae**. 1 (on wheat roots), N. America. The correct name for this genus when the *Chromista* are included in the *Protozoa* is *Lagenocystis*. See Dick (*Straminipilous Fungi*: 670 pp., 2001).

Lagenaceae M.W. Dick (2001), **Oomycota** (inc. sed.). 3 gen. (+ 2 syn.), 4 spp.

Lagenidiaceae J. Schröt. (1893) = **Pythiaceae**.

Lagenidiales Karling (1939) = **Pythiales**.

Lagenidicopsis N.J. Artemczuk (1972) nom. dub., **Chromista**.

Lagenidiopsis De Wild. (1896) = *Cystosiphon* fide Dick (*in litt.*).

Lagenidium Schenk (1857), **Pythiaceae**. 1, widespread. See Correll *et al.* (*Phytopathology* 83: 1199, 1993; RAPD analysis of *C. orbiculare*), Dick (*Straminipilous Fungi*: 670 pp., 2001).

Lagenisma Drebes (1968), **Lagenismataceae**. 1 (marine on *Coscinodiscus*), widespread (northern hemisphere). See Schnepf & Drebes (*Helgol. wiss. Meeresunters.* 29: 291, 1977; development), Dick (*Straminipilous Fungi*: 670 pp., 2001).

Lagenismataceae M.W. Dick (2001), **Lagenismatales**. 1 gen., 1 spp.

Lagenismatales M.W. Dick (2001). **Oomycetes**. 1 fam., 1 gen., 1 spp. Thallus holocarpic, lacking a cell wall, pseudomycelial, coralloid or allantoid, non-septate, walled at maturity, becoming transformed into a zoosporangium or a gametangium; asexual reproduction by zoosporangia; zoosporogenesis intrasporangial; zoospores diplanetic but not dimorphic; primary cysts with hollow spines; flagellar insertion lateral, heterokont and isokont; sexual reproduction oogamous by contact between gametic cysts; gametes present, flagellate, isogametic; resting spore formed in receptor cyst, aplerotic. Parasitic in marine diatoms. Fam.:

Lagenismataceae

Lit.: Dick (2001).

Lagenocystis H.F. Copel. (1956) ≡ *Lagena*.

Latrostium Zopf (1894), **Rhizidiomycetaceae**. 1 (on *Vaucheria*), Europe. See Dick (*Straminipilous Fungi*: 670 pp., 2001).

Leptolegnia de Bary (1888), **Leptolegniaceae**. 5, widespread (north temperate). See Dick *in* Ainsworth *et al.* (Eds) (*The Fungi* 4A: 145, 1973), López Lasta *et al.* (*Revta Iberoamer. Micol.* 16: 143, 1999), Johnson *et al.* (*Mycotaxon* 92: 1, 2005).

Leptolegniaceae M.W. Dick (1999), **Saprolegniales**. 4 gen., 25 spp.

Leptolegniella Huneycutt (1952), **Leptolegniellaceae**. 5, widespread. See Huneycutt (*J. Elisha Mitchell scient. Soc.* 68: 109, 1952), Dick (*Straminipilous Fungi*: 670 pp., 2001), Rocha & Pires Zottarelli (*Acta Bot. Brasilica* 16: 287, 2002; Brazil).

Leptolegniellaceae M.W. Dick (1971), **Leptomitales**. 5

gen., 16 spp.

Lit.: Dick (*TBMS* 57: 417, 1971).

Leptomitaceae Kütz. (1843), **Leptomitales**. 3 gen. (+ 1 syn.), 5 spp.

Leptomitales Kanouse (1927). **Oomycetes**. 4 fam., 13 gen., 33 spp. Mycelium of regularly constricted hyphae, cytoplasmic streaming obvious; asexual reproduction by zoosporangia, zoosporogenesis intrasporangial, release by dehiscence, discharge vesicles not formed, zoosporangia terminal; sexual reproduction by thin-walled, smooth oogonia, oospores single, pleurotic, no periplasm. Freshwater saprobes and animal parasites, N. temp. Fams:

(1) **Apodachlyellaceae**

(2) **Ducellieriaceae**

(3) **Leptolegniellaceae**

(4) **Leptomitaceae**

Lit.: Dick (2001, *in* Margulis *et al.* (Eds), 661, 1990, *in* Ainsworth *et al.* (Eds), *The Fungi* 4B: 145, 1973).

Leptomit C. Agardh (1824), **Leptomitaceae**. 1, Europe; N. America. See Dick (*Straminipilous Fungi*: 670 pp., 2001).

Lucidium Lohde (1874) nom. dub., **Pythiaceae**.

Medusoides H. Voglmayr (1999), **Pythiogetonaceae**. 1 (on submerged leaves and twigs), USA. See Voglmayr *et al.* (*MR* 103: 603, 1999), Dick (*Straminipilous Fungi*: 670 pp., 2001).

Mindeniella Kanouse (1927), **Rhipidiaceae**. 2, N. America. See Dick (*Straminipilous Fungi*: 670 pp., 2001).

Mindeniellaceae Cejp (1959) = **Rhipidiaceae**.

Mycelophagus L. Mangin (1903) = *Phytophthora* fide Clements & Shear (*Gen. Fung.*, 1931).

Myzocytiopsidaceae M.W. Dick (1997), **Myzocytiopsidales**. 4 gen. (+ 1 syn.), 33 spp.

Lit.: Dick (*MR* 101: 878, 1997), Dick (*Mycol.*, 2001).

Myzocytiopsidales M.W. Dick (2001). **Oomycetes**. 2 fam., 9 gen., 56 spp. Thallus holocarpic over a period of time, pseudomycelial, rarely mycelial, coralloid, septate, without rhizoids; thalloid segments transformed into reproductive structures; asexual reproduction by sporangia, zoosporogenesis intrasporangial, spores zoosporic or aplanosporic, zoospores with lateral flagellar insertion; sexual reproduction homothallic and oogamous or automictic; oospores aplerotic; oospore walls smooth or ornamented. Obligate endoparasites of *Aschelminthes*, *Arthropoda* or algae. Fams:

(1) **Crypticolaceae**

(2) **Myzocytiopsidaceae**

Lit.: Dick (1995), Dick (2001), Glockling & Beakes (*Fungal Diversity* 4: 1, 2000; nematophagous taxa).

Myzocytiopsis M.W. Dick (1997), **Myzocytiopsidaceae**. 15 (endobiotic in *Aschelminthes*), widespread. See Dick (*MR* 101: 883, 1997), Dick (*Straminipilous Fungi*: 670 pp., 2001), Glockling & Beakes (*Mycol.* 98: 1, 2006; ultrastr.).

Myzocyti Schenk (1858), **Pythiaceae**. 4, widespread. See Dick (*Straminipilous Fungi*: 670 pp., 2001), Kadlubowska (*Nova Hedwigia* 37: 29, 2002; Poland), Pereira & Vélez (*Nova Hedwigia* 78: 469, 2004; *Myzocyti* *megastomum* on *Rhizoclonium*).

Naegelia Reinsch (1878) ≡ *Sapromyces* fide Coker & Mathews (*N. Amer. Fl.* 2, 1937).

Naegeliella J. Schröt. (1893) [non *Naegeliella* Correns

- 1892, *Algae*] $\equiv$ *Sapromyces* fide Coker & Mathews (*N. Amer. Fl.* 2, 1937).
- Nellymyces** A. Batko (1972), Rhipidiaceae. 1 (on immersed *Alnus glutinosa*), Poland. See Batko (*Acta Mycologica Warszawa* 7: 256, 1971), Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Nematophthora** Kerry & D.H. Crump (1980), Lep- tolegniellaceae. 1 (on nematodes), British Isles. See Kerry & Crump (*TBMS* 74: 119, 1980), Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Nematosporangium** (A. Fisch.) J. Schröt. (1893) = *Pythium* Pringsh. fide Fitzpatrick (*The lower fungi. Phycomycetes*, 1930).
- Newbya** M.W. Dick & Mark A. Spencer (2002), Saprolegniaceae. 11, widespread. See Spencer *et al.* (*MR* 106: 558, 2002), Markovskaja (*Botanica Lithuanica* 10: 141, 2004; Lithuania).
- Novotelnova** Voglmayr & Constant. (2008), Peronosporaceae. 1, Europe. See Voglmayr & Constantinescu (*MR* 112: 487, 2008).
- Nozemia** Pethybr. (1913) = *Phytophthora* fide Lafferty & Pethybridge (*Sci. Proc. Roy. Dublin Soc. N.S.* 17: 29, 1922).
- Olpidiomorpha** Scherff. (1926), Rozellopsidales. 1 (on *Pseudospora*), Europe. See Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Olpidiopsidaceae** Sparrow ex Cejp (1959), Olpidiopsidales. 2 gen. (+ 5 syn.), 20 spp.
- Olpidiopsidales** M.W. Dick (2001). Oomycetes. 1 fam., 3 gen., 22 spp. Thallus holocarpic, initially plasmodial, olpidioid, subspherical or allantoid, non-septate, without rhizoids; each thallus becoming transformed into a reproductive structure; asexual reproduction by zoosporangia, zoosporogenesis intrasporangial, zoospores heterokont with subapical flagellar insertion; sexual reproduction heterothallic, larger thalli functioning as oogonia, smaller contiguous thalli as antheridia (companion cells); oospores plerotic. Obligate parasites of flagellate fungi and green algae in freshwater and damp soil. Fam.:
- Olpidiopsidaceae**
Lit.: Dick (*in* Margulis *et al.* (Eds), 1990), Dick (1995), Dick (2001).
- Olpidiopsis** Cornu (1872), Olpidiopsidaceae. 16 (on *Oomycetes*), widespread. See Dick (*Straminipilous Fungi*: 670 pp., 2001), Eliades *et al.* (*Darwiniana* 40: 39, 2002; Argentina).
- Oomycetes** G. Winter (1880), Oomycota. 8 ord., 19 fam., 95 gen., 911 spp. Ords:
- (1) **Albuginales**
 - (2) **Leptomitales**
 - (3) **Myzocytiopsidales**
 - (4) **Olpidiopsidales**
 - (5) **Peronosporales**
 - (6) **Pythiales**
 - (7) **Rhipidiales**
 - (8) **Saprolegniales**
- For *Lit.* see ord. and fam.
- Oomycota** Arx (1967), Chromista. 1 class., 13 ord., 25 fam., 106 gen., 956 spp. Aquatic or terrestrial, freshwater or marine, saprobic or parasitic (some economically important on higher plants); thallus unicellular to mycelial (hyphae coenocytic), mainly aseptate; assimilative phase diploid (as in plants); zoospores with unequal (anisokont, heterokont) flagella, a tinsel one diverted with 2 rows of mastigonemes formed, and a whiplash one smooth or with fine flexous hairs backwards; with protoplasmic and nucleus-associated microtubules; the cell walls are a glucan-cellulose, rarely with minor amounts of chitin. Cosmop. and widespr.
- Dick (*CJB* 73(Suppl.): S712, 1995) and (2001) has proposed that the oomycetes should be recognized as class *Peronosporomycetes* and divided into three subclasses: *Peronosporomycetidae*; *Rhipidiomycetidae*; *Saprolegniomycetidae*. The sequence data in Riethmüller *et al.* (*CJB* 77: 1790, 1999) support these subclasses.
- Lit.*: Buczaki (Ed.) (*Zoosporic plant pathogens: a modern perspective*, 1983), Cavalier-Smith (1987, *in* Green *et al.* (Eds), *The chromophyte algae*: 379, 1989, 1993), Cejp (*Oomycetes* 1, 1959 [Flora CSR]), Corliss (1994), Dick (*New Phytol.* 71: 1151, 1972; morphology and taxonomy; *in* Subramanian (Ed.), *Taxonomy of fungi*: 82, 1978, *in* Parker, 1982, 1: 179), Dick & Win-Tin (*Biol. Rev.* 48: 133, 1973; cytology), Fitzpatrick (1930), Fuller (*in* Margulis *et al.* (Eds), 1990: 380), Fuller & Jaworski (Eds) (*Zoosporic fungi in teaching and research*, 1986), Sparrow (*Aquatic phycomycetes* edn 2, 1960; *in* Ainsworth *et al.* (Eds), *The Fungi* 4B: 61, 1973; ordinal classification, Dick *Bot. J. Linn. Soc.* 89: 171, 1984, *in* Margulis *et al.* (Eds), 1990: 661, *CJB* 73(suppl.): S712, 1995, *Straminipilous Fungi*, 2001). See also *Lit.* under Orders.
- Pachymetra** B.J. Croft & M.W. Dick (1989), Lep- tolegniaceae. 1 (on *Saccharum officinarum*), Australia. See Croft & Dick (*J. Linn. Soc. Bot.* 99: 100, 1989), Riethmüller *et al.* (*Mycol.* 94: 834, 2002; phylogeny; relationship to *Aphanomyces*).
- Paraperonospora** Constant. (1989), Peronosporaceae. 9, widespread. See Constantinescu (*Sydowia* 41: 84, 1989), Riethmüller *et al.* (*Mycol.* 94: 834, 2002; phylogeny), Göker *et al.* (*CJB* 81: 672, 2003; phylogeny), Voglmayr *et al.* (*MR* 108: 1011, 2004; phylogeny).
- Perofascia** Constant. (2002), Peronosporaceae. 1. See Constantinescu & Fatehi (*Nova Hedwigia* 74: 324, 2002), Choi *et al.* (*MR* 107: 1314, 2003; phylogeny), Voglmayr (*MR* 107: 1132, 2003; phylogeny), Göker *et al.* (*Mycol. Progr.* 3: 83, 2004; phylogeny), Scott *et al.* (*MR* 108: 198, 2004; phylogeny).
- Peronium** Cohn (1854) ? = *Olpidiopsis* fide Dick (*in litt.*).
- Peronophythora** C.C. Chen ex W.H. Ko, H.S. Chang, H.J. Su, C.C. Chen & L.S. Leu (1978), Pythiaceae. 1, China; New Guinea; Taiwan; Vietnam. Arguments for both considering it a distinct genus or to merge with *Phytophthora* have been advanced. See Huang *et al.* (*Acta Mycol. Sin.* 2: 201, 1983), Hall (*Mycopathologia* 106: 189, 1989), Hudspeth *et al.* (*Mycol.* 92: 674, 2000), Petersen & Rosendahl (*MR* 104: 1295, 2000), Cook *et al.* (*Nova Hedwigia Beiheft* 122: 231, 2001), Riethmüller *et al.* (*Mycol.* 94: 834, 2002; phylogeny), Voglmayr (*MR* 107: 1132, 2003; phylogeny), Zhang *et al.* (*Botanical Studies* 48: 79, 2007).
- Peronophythoraceae** W.H. Ko, H.S. Chang, H.J. Su, C.C. Chen & L.S. Leu (1978) = Pythiaceae.
- Peronoplasmopara** (Berl.) G.P. Clinton (1905) $\equiv$ *Pseudoperonospora*.
- Peronosclerospora** (S. Ito) Hara (1927), Peronosporaceae. 9, widespread. Sorghum downy mildew (*P. sorghi*). See Shaw (*Mycol.* 70: 594, 1978), Williams (*Adv. Pl. Pathol.* 2: 1, 1984), Bock *et al.* (*MR* 104: 61, 2000), Ryley & Langdon (*Mycotaxon* 79: 87, 2001; Australia), Perumal *et al.* (*MR* 110: 471, 2006;

- characterization, genetic distance analysis *Peronosclerospora sorghi*), Thines *et al.* (MR 112: 345, 2008; phylogeny).
- Peronosclerospora** C.G. Shaw (1978) = *Peronosclerospora* (S. Ito) Hara fide Shaw & Waterhouse (Mycol. 72: 425, 1980).
- Peronospora** Corda (1837), Peronosporaceae. c. 75, widespread. Downy mildews, e.g. of beet (*Beta*) (*P. farinosa* f.sp. *betae*), clover (*P. trifoliorum*), crucifers (*P. parasitica*), onion (*Allium*) (*P. destructor*), spinach (*Spinacia*) (*P. farinosa* f.sp. *spinaciae*), tobacco (*P. hyoscyami* f.sp. *tabacina*). See Gäumann (Beitr. Kryptfl. Schweiz 5, 1923; 260 spp. recognized), Lindquist (Physis 15: 13, 1939; Argentina), Gustavsson (Op. bot. Soc. bot. Lund 3, 1959; Scandinavia), Yerkes & Shaw (Phytopathology 49: 502, 1959; spp. on Cruciferae, *P. parasitica*, and Chenopodiaceae, *P. farinosa*), Ramfsjell (Nytt Mag. Bot. 8: 147, 1960; Norway), Rao (Nova Hedwigia 16: 269, 1968; India), Constantinescu (Thunbergia 15, 1991; annotated list names), Petersen & Rosendahl (MR 104: 1295, 2000; phylogeny), Dick (Straminipilous Fungi: 670 pp., 2001), Cooke *et al.* (Advances in Downy Mildew Research: 161, 2002; rel. between *Peronospora* and *Phytophthora*), Riethmüller *et al.* (Mycol. 94: 834, 2002; phylogeny), Göker *et al.* (CJB 81: 672, 2003; phylogeny), Voglmayr (MR 107: 1132, 2003; phylogeny), Belbahri *et al.* (MR 109: 1276, 2005; real time PCR detection), Cunnington (Nova Hedwigia 82: 23, 2006; phylogeny, spp. on Vicia), Choi *et al.* (MR 111: 381, 2007), Choi *et al.* (Mycopathol. 165: 155, 2008; phylogeny, spp. on Chenopodiaceae), García-Blázquez *et al.* (MR 112: 502, 2008; phylogeny, spp. on Fabaceae).
- Peronosporaceae** de Bary (1863), Peronosporales. 20 gen. (+ 15 syn.), 365 spp.
- Peronosporales** E. Fisch. (1892). Oomycetes. 1 fam., 20 gen., 365 spp. Mycelium intercellular with intracellular haustoria; dispersal by sporangia (zoospores) or conidia (conidiosporangia); sexual reproduction by oogamy: oospheres fertilized by nuclei from an antheridium, resulting in an oospore with thick and smooth or ornamented wall; cosmop., obligate parasites, almost totally confined to dicots, some economically important plant pathogens. Fam:
- Peronosporaceae**
- Lit.: Lit. Note that some of publications listed do not match modern phylogenetic scheme.
- (General): Fitzpatrick (The Lower Fungi. Phycomycetes: 85-233, 1930). Gäumann (Die Pilze: 49-65, 1949). Waterhouse (in Ainsworth *et al.* The Fungi IVB: 165-183, 1968). Spencer (Ed.) (The Downy mildews, 1981). Dick (Straminipilous Fungi, 2001). Spencer-Phillips *et al.* (Eds) (Advances in Downy Mildew Research 1, 2002). Spencer-Phillips & Jeger (Eds) (Advances in Downy Mildew Research 2, 2004). Lebeda *et al.* (Eds) (Advances in Downy Mildew Research 3, 2007).
- (Monographs & lists): Jaczewski (Mikologicheskaya Flora evropejskoj i aziatskoj Rossii. I Peronosporovye 1901; Russia). Jaczewski & Jaczewski (Opredelitel' Gribov I Fikomitsety 3rd edn, 1931; world wide) Ito (Mycological Flora of Japan I Phycomycetes 1936; Japan). Lindtner (Bull. Mus. Hist. Nat. Pays Serbe Ser. B 9: 1-153, 1957; former Yugoslavia). Ciferri (Riv. Patol. Veg. 1: 333, 1961; Italy). Jörstad (Nytt Mag. Bot. 11: 47, 1964; Norway). Palti & Chorin (Phytopath. Medit. 3: 50, 1964; Israel). Ul'yanishchev (Mikoflora Azerbajdzhana IV Peronosporovye Griby 1967; Azerbaijan). Ubrizsy (Acta Phytopath. Acad. Sci. Hung. 2: 153, 1967; Hungary). Osipyan (Mikoflora Armyanskoj SSR I Peronosporovye Gariby, 1968; Armenia). Kochman & Majewski (Grzyby (Mycota) IV Phycomycetes, Peronosporales 1970; Poland). Gaponenko (Semejstvo Peronosporaceae Srednej Azii i Yujnogo Kazakhstana 1972; Kazakstan). Benua & Karpova-Benua (Parazitnye griby Yakutii 1973; Russia, Yakutia). Vasyagina *et al.* (Flora Sporovykh Rastenij Kazakhstana X Phycomycetes & Myxomycetes 1977; Kazakhstan). Constantinescu & Negrean (Mycotaxon 16: 537, 1983; Romania). Stanyaviciene (Peronosporovye Griby Pribaltiki 1984; Estonia, Latvia, Lithuania). Kirgizbaeva *et al.* (Flora Gribov Uzbekistana 2 Nizshchie griby 1985; Uzbekistan). Novotel'nova & Pystina (Flora Sporovykh Rastenij SSSR XI Griby (3). Peronosporales 1985; former USSR). Ul'yanishchev (Opredelitel' Gribov Zakavkaz'ya. Peronosporovye Griby 1985; Armenia, Azerbaijan, Georgia). Vanev *et al.* (Gybite v Bylgariya 2 Razred Peronosporales 1993, Bulgaria). Mazelaitis & Stanevičienė (Lietuvos Grybai I Myxomycota & Peronosporales 1995; Lithuania). Yu (Ed.) (Flora Fungorum Sinicorum 6 Peronosporales 1998; China). Preece (A Checklist of the Downy Mildews (Peronosporaceae) of the British Isles 2002; British Isles). Shin & Choi (Mycotaxon 86: 249, 2003; Korea). Brandenburger & Hagedorn (Mitt. Biol. Bundesanstalt f. Land- u. Forstw. Berlin-Dahlem 405, 2006; Germany). García-Blázquez *et al.* (Mycotaxon 98: 185, 2007; Andorra, Portugal, Spain & Balearic Islands).
- Peronosporomycetes** Locq. (1974), see Oomycetes.
- Peronosporomycetidae** M.W. Dick (2001), Oomycetes. See Oomycetes.
- Peronosporomycotina**, see Oomycota.
- Petersenia** Sparrow (1934), Pontismataceae. 3 (on marine Rhodophyceae), widespread. See Miller (Mycol. 54: 422, 1963), Pueschel & van der Meer (CJB 63: 409, 1985; ultrastr.), van der Meer & Pueschel (CJB 63: 404, 1985; n.sp.), Molina in Moss (Ed.) (The Biology of Marine Fungi: 165, 1986), Dick (Straminipilous Fungi: 670 pp., 2001).
- Phloeophthora** Kleb. (1905) = *Phytophthora* fide Klebahn (Krankh. Fliehd.: 75 pp., 1909).
- Phragmosporangium** Seymour (2005), Saprolegniaceae. 1, Liberia. See Johnson *et al.* (Mycotaxon 92: 6, 2005).
- Physotheca**, see Rhysotheca.
- Phytophthora** de Bary (1876), Peronosporaceae. c. 90, widespread. Includes important pathogens of: apple and pear (*P. cactorum* and *P. syringae*, fruit rot); cacao etc. (*P. palmivora*, pod rot and canker); chestnut (*P. cambivora*, ink disease); citrus (*P. citrophthora*, gummosis, foot and brown fruit rots); lima bean (*P. phaseoli*, downy mildew, *P. erythroseptica* and *P. megasperma*, pink rot); tomato and potato (*P. infestans*, blight; *P. cryptogea*, foot rot; *P. nicotianae*, foot and buck-eye rots in tobacco, tomato and many other plants). See Tucker (Res. Bull. Mo agric. Exp. Stn 153, 1931; taxonomy), Tucker (Res. Bull. Mo agric. Exp. Stn 184, 1933; distribution), Blackwell (Mycol. Pap. 30, 1949; terminology), Waterhouse & Blackwell (Mycol. Pap. 57, 1954; key Br. spp.), Hickman (TBMS 41: 1, 1958; gen. review), Rangaswami (Pythiaceae fungi, 1962;

- P. infestans*), Waterhouse (*Mycol. Pap.* 92, 1963; key), Chee (*RAM* 48: 337, 1969; *P. palmivora*), Waterhouse (*Mycol. Pap.* 122, 1970), Newhook & Podger (*Ann. Rev. Phytopath.* 10: 299, 1972; hosts of *P. cinnamomi* in Australia, NZ), Gregory (Ed.) (*Phytophthora disease of cocoa*, 1974; pod rot and canker *P. palmivora*), Ribeiro (*A source book of the genus Phytophthora*, 1978), Brasier & Griffin (*TBMS* 72: 111, 1979; taxonomy *P. palmivora*), Zentmyer (*P. cinnamomi and the diseases it causes* [*Am. phytopath. Soc. Monogr.*] 10, 1980; *P. cinnamomi*), Stamps *et al.* (*Mycol. Pap.* 162, 1990; tabular key), Ingram & Williams (*Adv. Pl. Path.* 7, 1991; *P. infestans*), Lucas *et al.* (Eds) (*Phytophthora*, 1991; *P. infestans*), Erwin & Ribeiro (*Phytophthora Diseases Worldwide*, 1996), Goodwin (*Phytopathology* 87: 462, 1997; popln genetics), Göker *et al.* (*CJB* 81: 672, 2003; phylogeny), Martin & Tooley (*Mycol.* 95: 269, 2003; phylogeny), Drenth & Guest (*ACIAR Monograph* 114: 30, 2004; tropical spp.), Grünwald & Flier (*Annual Review of Phytopathology* 43: 171, 2005; *Phytophthora infestans* at its center of origin), Drenth *et al.* (*Australas. Pl. Path.* 35: 147, 2006; DNA-based detection and identification method), Schena *et al.* (*Molecular Plant Pathology* 7: 365, 2006; detection and quantification with multiplex real-time PCR), Villa *et al.* (*Mycol.* 98: 410, 2006; phylogeny).
- Plasmopara** J. Schröt. (1886), Peronosporaceae. c. 110, widespread. *P. viticola* (vine downy mildew), *P. halstedii* (downy mildew of sunflowers). See Constantinescu (*Mycotaxon* 43: 471, 1992; spp. on *Umbelliferae*), Dick (*Advances in Downy Mildew Research*: 1, 2002; evolution), Riethmüller *et al.* (*Mycol.* 94: 834, 2002; phylogeny), Göker *et al.* (*CJB* 81: 672, 2003; phylogeny), Voglmayr *et al.* (*MR* 108: 1011, 2004; phylogeny), Constantinescu *et al.* (*Taxon* 54: 813, 2005; typification), Voglmayr *et al.* (*MR* 110: 633, 2006; spp. on *Geraniaceae*).
- Plasmoparopsis** De Wild. (1896) = *Pythiogeton* fide Dick (*in litt.*).
- Plasmoverna** Constant., Voglmayr, Fatehi & Thines (2005), Peronosporaceae. 7, widespread. See Constantinescu *et al.* (*Taxon* 54: 818, 2005).
- Plectospira** Drechsler (1927), Leptolegniaceae. 4, N. America; Japan. See Watanabe (*Mycol.* 79: 77, 1987).
- Pleocystidium** C. Fisch (1884), Olpidiopsidaceae. 4 (parasitic in freshwater algae), widespread. See Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Pleotrachelus** Zopf (1884), Rozellopsidales. 4 (parasitic on fungi), Europe; Canada. See Karling (*Chytriomyc. Iconogr.*, 1977; = *Olpidium*), Dick (*Straminipilous Fungi*, 2001).
- Plerogone** M.W. Dick (1986), Leptomitaceae. 1, USA; British Isles. See Dick (*J. Linn. Soc. Bot.* 93: 228, 1986), Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Poakatesthia** Thines & Göker (2007), Peronosporaceae. 1 (on *Pennisetum*), Ethiopia. See Thines *et al.* (*MR* 111: 1380, 2007).
- Pontisma** H.E. Petersen (1905), Pontismataceae. 6, widespread. See Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Pontismataceae** H.E. Petersen ex P.M. Kirk, P.F. Cannon & J.C. David (2001), Oomycota (inc. sed.). 2 gen., 9 spp.
- Pringsheimina** Kuntze (1891) ≡ *Achlya*.
- Protascus** P.A. Dang. (1903) nom. conf., Myzocytiop-
- sidaceae. See Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Protoachlya** Coker (1923), Saprolegniaceae. 6, N. America; Europe. See Dick (*Straminipilous Fungi*: 670 pp., 2001), Padgett & Johnson (*Mycol.* 96: 205, 2004; zoosporangial discharge), Johnson *et al.* (*Mycotaxon* 92: 11, 2005; systematics).
- Protobremia** Voglmayr, Riethm., Göker, Weiss & Oberw. (2004), Peronosporaceae. 1. See Voglmayr *et al.* (*MR* 108: 1023, 2004).
- Pseudolpidiaceae** H.E. Petersen (1909) = Olpidiopsidaceae.
- Pseudolpidiella** Cejp (1959) = *Sirolpidium* fide Dick (*in litt.*).
- Pseudolpidiopsis** Minden (1911) = *Pleocystidium* fide Dick (*in litt.*).
- Pseudolpidium** A. Fisch. (1892) = *Olpidiopsis* fide Shanor (*J. Elisha Mitchell scient. Soc.* 55: 179, 1939).
- Pseudoperonospora** Rostovzev (1903), Peronosporaceae. 6, widespread. *P. cubensis* (cucurbit downy mildew); *P. humuli* (hop (*Humulus*) downy mildew). See Waterhouse & Brothers (*Mycol. Pap.* 148, 1981; monogr., keys), Constantinescu (*Crypt. Mycol.* 21: 93, 2000; sporangium ultrastr.), Göker *et al.* (*CJB* 81: 672, 2003; phylogeny), Voglmayr (*MR* 107: 1132, 2003; phylogeny), Choi *et al.* (*MR* 109: 841, 2005; *P. humuli* as syn. of *P. cubensis*).
- Pseudoplasmodium** Molisch (1925) = *Labyrinthula* fide Olive (*The mycetozoans*, 1975).
- Pseudoplasmapara** Sawada (1922) = *Plasmopara* fide Fitzpatrick (*The lower fungi. Phycomycetes*, 1930).
- Pseudosphaerita** P.A. Dang. (1895), Pseudosphaeritaceae. 4 (on *Algae*), France; Mexico. See Karling (*Bull. Torrey bot. Club* 99: 223, 1973), Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Pseudosphaeritaceae** M.W. Dick (2001), Rozellopsidales. 2 gen., 14 spp.
- Pustula** Thines (2005), Albuginaceae. 4. See Thines & Spring (*Mycotaxon* 92: 454, 2005), Constantinescu & Thines (*Sydowia* 58: 178, 2006; sporangial dimorphism).
- Pyrrhosorus** Juel (1901), ? Labyrinthulales. 1 (on red algae), Europe. See Dick (*Straminipilous Fungi*: 670 pp., 2001; systematic posn).
- Pythiaceae** J. Schröt. (1893), Pythiales. 7 gen. (+ 5 syn.), 163 spp.
Lit.: See Middleton (*Tijdschr. PlZiekt.* 58: 226, 1952; generic concepts), Rangaswami (*Pythiaceae fungi*, 1962; host list), Dick in Margulis *et al.* (Eds) (*Handbook of Protoctista*: 661, 1990), Barr *et al.* (*CJB* 70: 2163, 1992; flagellum ultrastr.).
- Pythiacystis** R.E. Sm. & E.H. Sm. (1906) = *Phytophthora* fide Leonian (*Am. J. Bot.* 12: 444, 1925).
- Pythiales** M.W. Dick (2001). Oomycetes. 2 fam., 10 gen., 174 spp. Thallus mycelial or pseudomycelial. Asexual reproduction by sporangia or conidiosporangia; zoosporogenesis intrasporangial or extrasporangial in a vesicle; zoosporangia terminal, or sequential (percurrent or by internal or sympodial proliferation); sporangiophores rarely differentiated. Sexual reproduction by thin-walled oogonia; oospores usually single, aplerotic or nearly plerotic, periplasm absent or minimal and not persistent; oospore wall almost always smooth, ooplast solid and translucent. Cosmop., in plants, fungi and animals, or saprotrophic. Fams:
- (1) **Pythiaceae**

(2) **Pythiogetonaceae**

Lit.: Dick *et al.* (1984), Dick (1995), Dick (2001).
Pythiella Couch (1935), Lagenaceae. 2 (in *Pythium*), Cuba; N. America. See Dick (*Straminipilous Fungi*: 670 pp., 2001).

Pythiogeton Minden (1916), Pythiogetonaceae. 9, widespread (north temperate). See Drechsler (*J. Wash. Acad. Sci.* 22: 421, 1932), Batko (*Acta Mycologica* Warszawa 7: 241, 1971; key), Voglmayr *et al.* (*MR* 103: 591, 1999), Dick (*Straminipilous Fungi*: 670 pp., 2001), Ann *et al.* (*Mycol.* 98: 116, 2006; sp.n. Taiwan).

Pythiogetonaceae M.W. Dick (1999), Pythiales. 2 gen. (+ 1 syn.), 10 spp.

Pythiomorpha H.E. Petersen (1909) = *Phytophthora* fide Blackwell *et al.* (*TBMS* 25: 148, 1941), Waterhouse (*TBMS* 41: 196, 1958).

Pythiopsis de Bary (1888), Saprolegniaceae. 5, widespread. See Spencer *et al.* (*MR* 106: 549, 2002; revision), Johnson *et al.* (*Mycotaxon* 92: 1, 2005; systematics).

Pythium Nees (1823) nom. rej., Saprolegniales.

Pythium Pringsh. (1858) nom. cons., Pythiaceae. c. 150, widespread. Causing damping-off, root diseases, and mycoparasitic; a few marine (*P. thalassium*; on marine pea-crab, *Pinnotheres*). See Middleton (*Mem. Torrey bot. Club* 20 no. 1, 1943), Atkins (*TBMS* 38: 31, 1955; *P. thalassium*), Rangaswami (*Pythiaceae fungi*, 1962; host list), Waterhouse (*Mycol. Pap.* 110, 1968; diagnoses, descriptions, figs. from original papers), Hendrix & Campbell (*Mycol.* 66: 681, 1974), van der Plaats-Niterink (*Stud. Mycol.* 21, 1981; key), Dick (*Keys to Pythium*, 1990; key), Bailey *et al.* (*FEMS Microbiol. Lett.* 207: 153, 2002; identification of plant pathogenic spp.), Schurko *et al.* (*MR* 107: 537, 2003; *Pythium insidiosum*, molecular phylogeny), Kong *et al.* (*FEMS Microbiol. Lett.* 240: 229, 2004; species identification), Vanittanakom *et al.* (*J. Clin. Microbiol.* 42: 3970, 2004; *Pythium insidiosum*, emerging human pathogen), Tambong *et al.* (*Appl. Environm. Microbiol.* 72: 2691, 2006; identification and detection), Villa *et al.* (*Mycol.* 98: 410, 2006; phylogeny).

Reessia C. Fisch (1883), Rhizidiomycetaceae. 2 (on *Lemna*), Europe.

Reticularia P.A. Dang. (1890) = *Syzygangia* fide Dick (*in litt.*).

Rheosporangium Edson (1915) = *Pythium* Pringsh. fide Fitzpatrick (*Mycol.* 15: 166, 1923).

Rhipidiaceae Sparrow ex Cejp (1959), Rhipidiales. 6 gen. (+ 2 syn.), 15 spp.

Rhipidiales M.W. Dick (2001). Oomycetes. 1 fam., 6 gen., 15 spp. Thallus eucarpic, monocentric, saccate or pseudomycelial, with rhizoids. Asexual reproduction by zoosporangia; zoosporogenesis intrasporangial sometimes with a plasmodial membrane vesicle; zoosporangia terminal; sporangiophores absent. Sexual reproduction by oogonia; oogonia more or less thick-walled; oospores usually single, aplerotic, periplasm persistent, sometimes permanent; oospore wall with a more or less rugose exospore. Saprotrophs in fresh or stagnant water; facultatively or obligately fermentative. Fam.:

Rhipidiaceae

Lit.: Dick *et al.* (1984), Dick (1995), Dick (2001).

Rhipidiomycetidae, Oomycetes. See *Oomycota*.

Rhipidium Cornu (1871) nom. cons., Rhipidiaceae. 4, widespread. See Dick (*Straminipilous Fungi*: 670

pp., 2001).

Rhizidiomycetes Zopf (1884), Rhizidiomycetaceae. 13, widespread. See Sparrow (*Aquatic Phycomycetes* Edn 2: 751, 1960; key), Fuller (*Am. J. Bot.* 49: 64, 1962; culture), Dick (*Straminipilous Fungi*: 670 pp., 2001), Fuller in McLaughlin *et al.* (Eds) (*The Mycota A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research* 7A: 73, 2001), Letcher *et al.* (*Australasian Mycologist* 22: 99, 2004; Australia).

Rhizidiomycetaceae Karling ex P.M. Kirk, P.F. Cannon & J.C. David (2001), Hyphochytriales. 3 gen. (+ 1 syn.), 16 spp.

Rhizidiomycopsis Sparrow (1960) = *Rhizidiomyces* fide Longcore (*in litt.*).

Rhizoblepharis P.A. Dang. (1900) nom. dub., Chromista. 'phycomycetes'.

Rhysotheca G.W. Wilson (1907) = *Plasmopara* fide Fitzpatrick (*The lower fungi. Phycomycetes*, 1930).

Rozellopsidaceae M.W. Dick (2001), Rozellopsidales. 1 gen. (+ 1 syn.), 4 spp.

Rozellopsidales M.W. Dick (2001). Oomycota. 2 fam., 5 gen., 23 spp. Thallus holocarpic, plasmodial following infection and during the assimilative phase, plasmodium sometimes capable of vegetative division, transformed into a single sporangium or into discrete walled segments or sporangia, or into a single resting spore; asexual reproduction by zoospores, zoosporogenesis intrasporangial; zoospores motile within the zoosporangium prior to discharge; zoospores often with posterior refractive granules, and one or two flagella, biflagellate zoospores anisokont; sexual reproduction not established. Obligate endoparasites of flagellate fungi, algae or protoctists in freshwater. Fams:

(1) **Pseudosphaeritaceae**(2) **Rozellopsidaceae**

Lit.: Dick (2001; systematics).

Rozellopsis Karling ex Cejp (1959), Rozellopsidaceae. 4, Europe; Japan. See Karling ex Cejp (*Fl. ČSR B(2), Oomycetes*: 342, 454, 1959), Dick (*Straminipilous Fungi*: 670 pp., 2001).

Salilagenidiaceae M.W. Dick (2001), Salilagenidiales. 1 gen., 6 spp.

Salilagenidiales M.W. Dick (2001). Saprolegniomycetidae. 1 fam., 1 gen., 6 spp. Fam.:

Salilagenidiaceae

For *Lit.* see under fam.

Salilagenidium M.W. Dick (2001), Salilagenidiaceae. 6, widespread. See Dick (*Straminipilous Fungi*: 314, 2001).

Saprolegnia Nees (1823), Saprolegniaceae. 15 (in freshwater), widespread (esp. north temperate). *S. parasitica* and other spp. pathogenic to fish and other aquatic vertebrates. See Tiffney (*Mycol.* 31: 310, 1939; of fish), Scott *et al.* (*Virg. J. Sci.* 14: 42, 1963), Seymour (*Nova Hedwigia* 19: 1, 1970; gen. account, key 19 spp.), Mil'ko (*Mikol. Fitopatol.* 13: 288, 1979), Neish & Hughes (*Fungal diseases of fishes* 6, 1980), Willoughby in Roberts (Ed.) (*Microbial diseases of fish*, 1982; of salmon), Bruno & Wood in Wood & Bruno (Ed.) (*Fish Diseases & Disorders* 3: 599, 1999), Steciow (*FEMS Microbiol. Lett.* 219: 253, 2003; Argentina), Markovskaja (*Botanica Lithuanica* 12: 97, 2006; Lithuania).

Saprolegniaceae Kütz. ex Warm. (1884), Saprolegniales. 19 gen. (+ 4 syn.), 145 spp.

Saprolegniales E. Fisch. (1892). Saprolegniomyceti-

dae. 2 fam., 24 gen., 172 spp. 'water moulds'. Mycelium frequently stout and able to increase in diam., obvious cytoplasmic streaming. Asexual reproduction by sporangia; zoosporogenesis intrasporangial; zoospores released by papillate or operculate dehiscence or disintegration of sporangium, discharge vesicles not formed; zoosporangial formation sequential, percurrent or sympodial. Sexual reproduction by thick-walled, papillate or pitted oogonia, oosporogenesis centrifugal, periplasm absent or minimal and not persistent; oospores single or numerous, oospore wall almost always smooth. Freshwater, rarely marine, saprobic or parasitic; widespr. Fams:

(1) **Saprolegniaceae**

(2) **Leptolegniaceae**

Lit.: Coker (*The Saprolegniaceae with notes on other water molds*, 1923 [reprint 1968]), Fitzpatrick (1930), Cejp (1969), Seymour (1970), Dick (1973; in Margulis *et al.* (Eds), 1990: 661), Dick (2001).

Saprolegniomycetidae M.W. Dick (2001), see *Oomycota*.

Sapromyces Fritsch (1893), Rhipidiaceae. 3, widespread. See Dick (*Straminipilous Fungi*: 670 pp., 2001).

Schizochytrium S. Goldst. & Belsky (1964), Thraustochytriaceae. 2 (marine), widespread. See Raghu-Kumar (*TBMS* 90: 627, 1988; key), Leander *et al.* (*European Journal of Protistology* 40: 317, 2004; comparative morphology and molecular phylogeny), Cavalier-Smith & Chao (*J. Mol. Evol.* 62: 388, 2006; phylogeny).

Sclerophthora Thirum., C.G. Shaw & Naras. (1953), Peronosporaceae. 7, widespread. *S. macrospora* (crazy top downy mildew). See Williams (*Adv. Pl. Pathol.* 2: 1, 1984).

Sclerospora J. Schröt. (1879), Peronosporaceae. 3 (pathogens of *Poaceae*), widespread. See Narayanan (*Mycopathologia* 20: 315, 1963; India), Waterhouse (*Misc. Publ. CMI* 17, 1964; key), Williams (*Adv. Pl. Pathol.* 2: 1, 1984), Dick (*Straminipilous Fungi*: 670 pp., 2001), Geetha *et al.* (*Journal of Mycology and Plant Pathology* 32: 345, 2002; cellular fatty acid components in five pathotypes of *Sclerospora graminicola*), Göker *et al.* (*CJB* 81: 672, 2003; phylogeny).

Sclerosporaceae M.W. Dick (1984) = Peronosporaceae.

Sclerosporales M.W. Dick (1984) = Peronosporales.

Scoliolegnia M.W. Dick (1969), Saprolegniaceae. 5, Europe. See Dick (*J. Linn. Soc. Bot.* 62: 255, 1969), Dick (*Straminipilous Fungi*: 670 pp., 2001), Steciow *et al.* (*Mycotaxon* 91: 381, 2005; status, key).

Siphopodium Reinsch (1875) nom. dub., Chromista. 'phycomycetes'.

Sirolpidiaceae Sparrow ex Cejp (1959), Oomycota (inc. sed.). 1 gen. (+ 1 syn.), 7 spp.

Sirolpidium H.E. Petersen (1905), Sirolpidiaceae. 7 (marine), widespread. *S. zoophthorum* on clam and oyster larvae. See Dick (*Straminipilous Fungi*: 670 pp., 2001), Rand (*Biodiversity of Fungi Inventory and Monitoring Methods*: 577, 2004).

Skirgiellopsis A. Batko (1978) = Rozellopsis fide Longcore (*in litt.*).

Sommerstorffia Arnautov (1923), Saprolegniaceae. 1 (on rotifers), Europe; N. America. See Saikawa & Hoshino (*Mycol.* 78: 554, 1986; EM study), Dick (*Straminipilous Fungi*: 670 pp., 2001).

Sorodiplophrys L.S. Olive & Dykstra (1975), ? Laby-

rinthista. 1, Russia; USA. See Dykstra & Porter (*Mycol.* 76: 626, 1984; affinity to *Diplophrys*).

Sphaerita P.A. Dang. (1886), Pseudosphaeritaceae. 10, widespread. See Sparrow (*Bull. Torrey bot. Club* 99: 223, 1972), Dick (*Straminipilous Fungi*: 670 pp., 2001).

Sphaerosporangium Sparrow (1931) = *Phytophthora* fide Dick (*in litt.*).

Straminipila M.W. Dick (2001). Kingdom proposed by Dick to accommodate most organisms previously generally referred to the Kingdom *Chromista* (q.v.) and primarily characterized by the presence of tripartite tubular hairs on flagella or cysts. If this classification becomes generally accepted, the *Hyphochytriomycota* and *Oomycota* will need to be referred to it.

Synchaetophagus Apstein (1911) nom. dub., Chromista. See Vishniac (*Mycol.* 50: 74, 1958) See, Karling (*Holocarpic Biflagellate Phycomycetes*: 206, 1981), Dick (*Straminipilous Fungi*: 670 pp., 2001; position uncertain).

Syzygangia M.W. Dick (1997), Myzocytiopsidaceae. 8 (intracellular parasites of freshwater algae), widespread. See Dick (*MR* 101: 880, 1997), Dick (*Straminipilous Fungi*: 670 pp., 2001).

Tetradium Schldl. (1852) [non *Tetradium* Lour. 1790, *Rutaceae*] = *Bremia* fide Fischer (*Rabenh. Krypt.-Fl.* 4 2.1: 25, 1892).

Thanatostrea A. Franc & Arvy (1969) nom. inval., ? Labyrinthulales. 1, Portugal.

Thraustochytriaceae Sparrow ex Cejp (1959), Thraustochytriales. 7 gen., 36 spp.

Lit.: Sparrow in Ainsworth *et al.* (Eds) (*The Fungi* 4A: 69, 1973).

Thraustochytriales Sparrow (1973). Labyrinthulea. 1 fam., 8 gen., 38 spp. Fam.:

Thraustochytriaceae

For *Lit.* see under fam.

Thraustochytrium Sparrow (1936), Thraustochytriaceae. 16 (on marine algae), N. America. See Gaertner (*Encycl. Cinematogr.*, 1971; life cycle), Porter & Jennings (*MR* 92: 470, 1989), Ulken (*Bibliotheca Mycol.* 137, 1990), Dick (*Straminipilous Fungi*: 670 pp., 2001), Chen & Chien (*Taiwania* 47: 106, 2002; Taiwan), Leander *et al.* (*European Journal of Protistology* 40: 317, 2004; comparative morphology and molecular phylogeny), Cavalier-Smith & Chao (*J. Mol. Evol.* 62: 388, 2006; phylogeny).

Thraustotheca Humphrey (1893), Saprolegniaceae. 4, widespread. See Salvin (*Mycol.* 34: 48, 1942), Blackwell & Powell (*Inoculum* 43: 26, 1992; taxonomy), Blackwell & Powell (*Mycotaxon* 47: 183, 1993), Steciow & Eliades (*Nova Hedwigia* 75: 227, 2002; Argentina).

Trachysphaera Tabor & Bunting (1923), Pythiaceae. 1 (*T. fructigena*, mealy pod of cacao), Africa. See Dick (*Straminipilous Fungi*: 670 pp., 2001).

Trichothrauma Germ. (1850) nom. conf., ? Saprolegniales.

Ulkenia A. Gaertn. (1977), Thraustochytriaceae. 6, Europe. See Gaertner (*Veröffentlichungen des Instituts für Meeresforschung in Bremerhaven* 16: 141, 1977), Dick (*Straminipilous Fungi*: 670 pp., 2001), Cavalier-Smith & Chao (*J. Mol. Evol.* 62: 388, 2006; phylogeny).

Urophlyctidaceae Hadar (1982) = Physodermataceae.

Verrucalvaceae M.W. Dick (1984) = Saprolegniaceae.

Verrucalvus P. Wong & M.W. Dick (1985), Saprolegniaceae. 1, Australia. See Wong & Dick (*J. Linn.*

VIENNOTIA

Soc. Bot. **89**: 174, 1984), Belkhiri *et al.* (*Molec. Phylogeny & Evol.* **9**: 1089, 1992), Dick (*Straminipilous Fungi*: 670 pp., 2001).

Viennotia Göker, Voglmayr, Riethm., Weiss & Oberw. (2003), Peronosporaceae. 1. See Göker *et al.* (*CJB* **81**: 682, 2003), Thines *et al.* (*MR* **110**: 646, 2006; phylogeny; rel. of *Graminivora graminicola*), Thines *et al.* (*MR* **112**: 345, 2008; phylogeny).

Acrasiaceae Poche (1913), Acrasida (inc. sed.). 1 gen., 2 spp. [*Acrasidae* (orth. zool.)].

Acrasiales Tiegh. ex J. Schröt. (1885). See *Acrasida*.

Acrasida J. Schröt. (1886) [*Acrasiales* (orth. bot.)]. Percolozoa. 4 fam., 6 gen., 14 spp. The only 'fungal' order of *Percolozoa* (q.v.) comprising fams:

- (1) **Acrasiaceae**
- (2) **Copromyxaceae**
- (3) **Fonticulaceae**
- (4) **Guttulinaceae**

For *Lit.* see under fam.

Acrasiomycetes. See *Heterolobosea*.

Acrasiomycota. See *Percolozoa*.

Acrasis Tiegh. (1880), Acrasiaceae. 2 (on beer yeast), widespread. See Dykstra & Keller in Lee, Leedale & Bradbury (Eds) (*An Illustrated Guide to the Protozoa, Organism Traditionally Referred to as Protozoa, or Newly Discovered Groups* 2: 952, 2000), Spiegel *et al.* (*Biodiversity of Fungi Inventory and Monitoring Methods*: 547, 2004).

Acrocystis Ellis & Halst. ex Halst. (1890) = *Cystospora* fide Tabenhaus (*J. agric. Res.* 13: 437, 1918).

Acytosteliaceae Raper ex Raper & Quinlan (1958), Dictyostelida (inc. sed.). 1 gen., 16 spp. [*Acytosteliidae* (orth. zool.)].

Acytostelium Raper (1956), Acytosteliaceae. 16, widespread. See Cavender & Vadell (*Mycol.* 92: 992, 2000; monogr.), Cavender *et al.* (*Mycol.* 97: 493, 2005; USA).

Aethaliaceae Fr. (1825) = Physaraceae.

Aethaliopsis Zopf (1885) = *Fuligo* fide Martin & Alexopoulos (*Myxomycetes*: 263, 1969).

Aethalium Link (1809) = *Fuligo* fide Martin & Alexopoulos (*Myxomycetes*: 263, 1969).

Alacrinella Manier & Ormieres ex Manier (1968), Eccrinaceae. 2 (in *Isopoda*), France; USA. See Hibbets (*Syesis* 11: 213, 1978; morphology, development), Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986; key), Cafaro (*Mol. Phylogen. Evol.* 35: 21, 2005; phylogeny).

Alwisia Berk. & Broome (1873) = *Tubifera* fide Martin & Alexopoulos (*Myxomycetes*, 1969).

Amallocystis Fage (1936) = *Thalassomyces* fide Kane (*N.Z. J. Sci.* 7: 289, 1964).

Amaurochaetaceae Rostaf. ex Cooke (1877) = *Stemonitidaceae*.

Amaurochaete Rostaf. (1873), *Stemonitidaceae*. 4, widespread. See Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), Eliasson (*Karstenia* 40: 31, 2000), Lado *et al.* (*Taxon* 54: 543, 2005; nomencl.).

Amoebidiaceae J.L. Licht. ex P.M. Kirk, P.F. Cannon & J.C. David (2001), Amoebidiales. 2 gen., 15 spp.

Amoebidiales Léger & Duboscq (1929). Protozoa. 1 fam., 2 gen., 15 spp. Fam.:

Amoebidiaceae

Lit.: Manier (*Ann Sci. nat., Bot.* sér. 12, 10: 565, 1969; taxonomy), Trotter & Whisler (*CJB* 43: 869, 1965; wall structure), Whisler (*J. Protozool.* 13: 183, 1966; *Devel. Biol.* 17: 562, 1968; culture and development), Moss (*in* Batra (Ed.), *Insect-fungus symbiosis*: 175, 1979), Lichtwardt (1986).

Amoebidium Cienk. (1861), Amoebidiaceae. 5 (on *Crustacea* and *Insecta*), widespread. See Whisler (*Am. J. Bot.* 49: 193, 1962; life cycle, culture & nutrition), Trotter & Whisler (*CJB* 43: 869, 1965; wall chemistry), Whisler (*Devel. Biol.* 17: 562, 1968; development), Whisler & Fuller (*Mycol.* 60: 1068,

1968; ultrastr.), Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986; taxonomy, biology), Lichtwardt & Williams (*Mycol.* 84: 376, 1992), Cavalier-Smith in Coombs *et al.* (Eds) (*Evolutionary Relationships Among Protozoa*: 375, 1998), Benny in McLaughlin *et al.* (Eds) (*The Mycota A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research* 7A, 2000), Benny & O'Donnell (*Mycol.* 92: 1133, 2000) Cf. *Paramoebidium*, Tanabe *et al.* (*J. gen. appl. Microbiol.* Tokyo 51: 267, 2005; phylogeny), White *et al.* (*Mycol.* 98: 333, 2006; n.sp.).

Amoebophilidium Scherff. (1925), Protozoa. See monads.

Amoebosporus Ivimey Cook (1933), Protozoa. 2, West Indies.

Amoebozoa, Protozoa. 3 class., 7 ord., 20 fam., 82 gen., 1019 spp. A phylum of Protozoa (q.v.) containing the 'fungal' slime moulds [*Myxomycota* (orth. bot.)] and their allies.

Lit.: see under *Mycetozoa*.

Amphisporium Link (1815) = *Didymium* fide Martin & Alexopoulos (*Myxomycetes*: 383, 1969).

Amylotrogus Roze (1896) nom. dub., Myxogastria.

Ancyrophorus Raunk. (1888) = *Enerthenema* fide Torrend (*Brotéria sér. bot.* 7: 72, 1908).

Andohaheloa Manier (1955) = *Enterobryus* fide Manier & Lichtwardt (*Annls Sci. Nat. Bot.*, sér. 12 9: 519, 1968).

Angioridium Grev. (1827) = *Physarum* fide Saccardo (*Syll. Fung.* 7: 347).

Anisomyxa Němec (1913) = *Ligniera* fide Kirk (*in litt.*).

Antonigepia Kuntze (1898) = *Lycogala* fide Martin & Alexopoulos (*Myxomycetes*: 62, 1969).

Arcyodes O.F. Cook (1902), Trichiaceae. 1, N. America; Europe. See Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles).

Arcyrella (Rostaf.) Racib. (1884) = *Arcyria* fide Pando (*in litt.*).

Arcyria Hill ex F.H. Wigg. (1780), Arcyriaceae. c. 50, widespread. See Robbrecht (*Bull. Jard. bot. nat. Belg.* 44: 303, 1974; key 13 spp.), Dörfelt *et al.* (*MR* 107: 123, 2003; fossil), Yamamoto & Hagiwara (*Bull. natn. Sci. Mus. Tokyo, N.S.* 31: 79, 2005; Japan).

Arcyriaceae Rostaf. ex Cooke (1877), Trichiida (inc. sed.). 2 gen. (+ 4 syn.), 51 spp.

Arcyriatella Hochg. & Gottsb. (1989), Trichiaceae. 1, Brazil. See Hochgesand & Gottsberger (*Nova Hedwigia* 48: 485, 1989).

Arscyria, see *Arcyria*.

Arundinella L. Léger & Duboscq (1905) [non *Arundinella* Raddi 1823, *Gramineae*] = *Arundinula* fide Lichtwardt (*in litt.*).

Arundinula L. Léger & Duboscq (1906), Eccrinaceae. 6 (in *Decapoda*), widespread. See Lichtwardt (*Mycol.* 54: 440, 1962; morphology), Hibbets (*Syesis* 11: 213, 1978; development), Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986; key), van Dover & Lichtwardt (*Biol. Bull.* 171: 461, 1986), White *et al.* (*Mycol.* 98: 333, 2006).

Astreptonema, see *Astreptonema*.

Astreptonema Hauptfl. (1895), Eccrinaceae. 5 (in *Amphipoda*), Europe; USA. See Moss (*TBMS* 65: 115, 1975; ultrastr.), Hibbets (*Syesis* 11: 213, 1978; development), Lichtwardt (*The Trichomycetes. Fun-*

- gal associates of arthropods*, 1986; key), Cafaro (*Mol. Phylogen. Evol.* 35: 21, 2005; phylogeny).
- Bactridiopsis** Henn. (1904) = *Coccospora* Wallr. fide Damon & Downing (*Mycol.* 46: 209, 1954).
- Bactriexta** Preuss (1852) nom. dub., ? Protozoa.
- Badhamia** Berk. (1853), Physaraceae. c. 30, widespread. See Sekhon (*J. Indian bot. Soc.* 58: 56, 1979; key 8 Indian spp.), Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles).
- Badhamiopsis** T.E. Brooks & H.W. Keller (1976), Physaraceae. 3, Australia; Hawaii; Japan; British Isles. See Brooks & Keller (*Mycol.* 68: 835, 1976), Eliasson (*MR* 95: 257, 1991; Hawaii), Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), McHugh *et al.* (*N.Z. Jl Bot.* 41: 487, 2003; Australia).
- Barbeyella** Meyl. (1914), Clastodermataceae. 1 (montane), widespread. See Schnittler *et al.* (*Karstenia* 40: 159, 2000; ultrastr.), Schnittler *et al.* (*MR* 104: 1518, 2000; ecol.).
- Biomyxa** Leidy (1875), Protozoa. 2 or. Amoeboid protist. See Anderson & Hoefler (*J. Ultrastr. Res.* 66: 276, 1979; ultrastr.), Patterson (*Amer. Nat.* 154: S96, 1999; systematic posn).
- Brefeldia** Rostaf. (1873), Stemonitidaceae. 1, widespread. See Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), Crespo & Lugo (*Mycotaxon* 87: 91, 2003; Argentina).
- Brefeldiaceae** Rostaf. ex Cooke (1877) = Stemonitidaceae.
- Bursulla** Sorokīn (1876), Echinosteliopsidaceae. 1 (coprophilous), former USSR. See Olive (*The mycetozoans*: 111, 1975).
- Bursullaceae** Zopf ex Berl. (1888) = Echinosteliopsidaceae.
- Calomyxa** Nieuwl. (1916), Dianemataceae. 2, widespread. See Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), Mitchell (*Systematics and Geography of Plants* 74: 261, 2004; key).
- Calonema** Morgan (1893), Trichiaceae. 4, widespread. See Rammeloo (*Icones Mycologicae*: [1], 1984; *Calonema aureum*), Estrada Torres *et al.* (*Mycol.* 95: 354, 2003; Mexico sp.nov.), Mitchell (*Systematics and Geography of Plants* 74: 261, 2004; key).
- Calospeira** G. Arnaud (1949) nom. inval., ? Dictyostelida.
- Calyssosporium** Corda (1831) nom. dub., ? Myxogastria.
- Capillus** Granata (1908) = *Enterobryus* fide Manier & Lichtwardt (*Annl. Sci. Nat. Bot.*, sér. 12 9: 519, 1968).
- Carcerina** Fr. (1849) = *Diderma* fide Pando (*in litt.*).
- Cavosteliaceae** L.S. Olive (1964), Protostelida (inc. sed.). 4 gen., 8 spp.
Lit.: Spiegel (*Handbook of Protoctista*: 484, 1990).
- Cavostelium** L.S. Olive (1965), Cavosteliaceae. 2, widespread (tropical). See Olive & Stoianovitch (*Am. J. Bot.* 56: 979, 1969), Spiegel & Feldman (*Protoplasma* 163: 189, 1991).
- Ceratiomyxa** J. Schröt. (1889), Ceratiomyxaceae. 4, widespread. See Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), Stephenson (*Fungal Diversity Res. Ser.* 11, 2003; New Zealand), Lado *et al.* (*Taxon* 54: 543, 2005; nomencl.).
- Ceratiomyxaceae** J. Schröt. (1889), Protostelida (inc. sed.). 1 gen. (+ 3 syn.), 4 spp.
Lit.: Spiegel (*Handbook of Protoctista*: 484, 1990).
- Ceratiomyxales** G.W. Martin ex M.L. Farr & Alexop. (1977). See *Protostelida*.
- Ceratiomyxella** L.S. Olive & Stoian. (1971), Cavosteliaceae. 1, Brazil; Tahiti. See Olive & Stoianovitch (*Am. J. Bot.* 58: 32, 1971), Glushchenko & Leontiev (*Mikol. Fitopatol.* 36: 7, 2002; Ukraine).
- Ceratiomyxomycetes**. See *Protostelia*.
- Ceratiopsis** De Wild. (1896) = *Ceratiomyxa* fide Saccardo (*Syll. fung.* 14, 1899).
- Ceratium** Alb. & Schwein. (1805) [non *Ceratium* Schrank 1793, *Algae*] = *Ceratiomyxa*.
- Cercozoa**, Protozoa. 1 class., 1 ord., 2 fam., 15 gen., 50 spp. A phylum of Protozoa (q.v.) containing the 'fungal' plasmodiophorids [*Plasmodiophoromycota* (orth. bot.)] and their allies; included in the class *Phytomyxea*. Trophic phase intracellular in algal, fungal or plant host cells; plasmodia multinucleate, unwallled, cell division mitotic and cruciform (division producing a cross-like structure at metaphase), developing into either sporangia (forms zoospores or cytosori; resting structures); zoospores with two anteriorly directed whiplash flagella; flagellae smooth, lacking mastigonemes, equal in length. Obligate symbionts in soil or freshwater habitats; require coculturing with their hosts needed for laboratory studies. A single Ord.
- Plasmodiophorida** [*Plasmodiophorales* (orth. bot.)]
The placement of these fungi has varied. Dylewski (1990) kept them with the mastigomycete fungi (e.g. *Chromista*); they are retained in the *Protozoa* following Barr (1992) and Corliss (1994). Olive (1975) treated them as a separate class, while Corliss (1994) placed them as one of several orders in the phylum *Opalozoa*.
Lit.: Corliss (1994), Dylewski (*in Margulis et al.* (Eds), *Handbook of the Protoctista*: 399, 1990), Karling (*The Plasmodiophorales*, 1943; edn 2, 1968), Olive (1975), Waterhouse (*in Ainsworth et al.*, *The Fungi* 4B: 75, 1973; key gen.), and see under subordinate taxa.
- Cestodella** Tuzet, Manier & Jolivet (1957) = *Enterobryus* fide Manier & Lichtwardt (*Annl. Sci. Nat. Bot.*, sér. 12 9: 519, 1968).
- Chondrioderma** Rostaf. (1873) = *Diderma* fide Martin & Alexopoulos (*Myxomycetes*: 347, 1969).
- Cienkowskia** Rostaf. (1873) [non *Cienkowskia* Regel & Rach 1859, *Boraginaceae*] = *Willkommangea*.
- Cienkowskiaceae** Rostaf. ex Cooke (1877) = *Physaraceae*.
- Cionium** Link (1809) = *Didymium*.
- Clastoderma** A. Blytt (1880), Clastodermataceae. 2, widespread. See Eliasson & Keller (*MR* 100: 610, 1996).
- Clastodermataceae** Alexop. & T.E. Brooks (1971), Echinostelida (inc. sed.). 2 gen. (+ 2 syn.), 3 spp.
- Clastostelium** L.S. Olive & Stoian. (1977), Protosteliaceae. 1, Guam. See Olive & Stoianovitch (*TBMS* 69: 83, 1977), Spiegel & Feldman (*Mycol.* 80: 525, 1988; trophic cells).
- Clathrodastrum**, see *Clathroidastrum* P. Micheli ex Adans.
- Clathroidastrum** Kuntze (1891) = *Stemonitis* Gled.
- Clathroidastrum** P. Micheli ex Adans. (1763) = *Stemonitis* Gled.
- Clathroides** P. Micheli (1729) = *Arcyria* fide Pando (*in*

- litt.*).
- Clathroptychiaceae** Rostaf. ex Cooke (1877) = Reticulariaceae.
- Clathroptychium** Rostaf. (1875) = Dictydiaethalium fide Martin & Alexopoulos (*Myxomycetes*: 59, 1969).
- Clathrosorus** Ferd. & Winge (1920) = Spongospora fide Kirk (*in litt.*).
- Clatroidastron**, see *Clathroidastrum* P. Micheli ex Adans.
- Claustria** Fr. (1849) = Physarum fide Martin & Alexopoulos (*Myxomycetes*: 274, 1969).
- Coccospora** Wallr. (1833) nom. dub., Myxogastria. See Carris (*Sydowia* 45: 92, 1993).
- Coenonia** Tiegh. (1884), Dictyosteliaceae. 1, Europe. See Dykstra & Keller in Lee, Leedale & Bradbury (Eds) (*An Illustrated Guide to the Protozoa, Organism Traditionally Referred to as Protozoa, or Newly Discovered Groups* 2: 952, 2000).
- Collaria** Nann.-Bremek. (1975) = Comatracha fide Martin & Alexopoulos (*Myxomycetes*: 222, 1969).
- Colloderma** G. Lister (1910), Stemonitidaceae. 4, widespread. See Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), Stephenson (*Fungal Diversity Res. Ser.* 11, 2003; New Zealand), McHugh (*Mycotaxon* 92: 107, 2005; Ecuador), Yamamoto & Hagiwara (*Bull. natn. Sci. Mus. Tokyo, N.S.* 31: 79, 2005; Japan).
- Collodermataceae** Lister (1925) = Stemonitidaceae.
- Comatracha** Preuss (1851), Stemonitidaceae. c. 50, widespread. See Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), Camino *et al.* (*Mycotaxon* 88: 315, 2003; Cuba), Mitchell (*Systematics and Geography of Plants* 74: 261, 2004; key gen.).
- Comatrachoides** Hertel (1956) = Comatracha fide Martin & Alexopoulos (*Myxomycetes*: 222, 1969).
- Coniocephalum** Brond. (1828) nom. dub., Myxogastria. See Martin (*in litt.*).
- Copromyxa** Zopf (1884), Copromyxaceae. 2, Europe; N. America. See Nesom & Olive (*Mycol.* 64: 1359, 1972), Spiegel & Olive (*Mycol.* 70: 843, 1978), Raper (*The dictyostelids*, 1984), Dykstra & Keller in Lee, Leedale & Bradbury (Eds) (*An Illustrated Guide to the Protozoa, Organism Traditionally Referred to as Protozoa, or Newly Discovered Groups* 2: 952, 2000).
- Copromyxaceae** L.S. Olive & Stoian. (1975), Acrasida (inc. sed.). 2 gen., 6 spp. [*Copromyxidae* (orth. zool.)].
- Copromyxella** Raper, Worley & Kurzynski (1978), Copromyxaceae. 4, USA; Costa Rica. See Raper *et al.* (*Am. J. Bot.* 65: 1013, 1978), Dykstra & Keller in Lee, Leedale & Bradbury (Eds) (*An Illustrated Guide to the Protozoa, Organism Traditionally Referred to as Protozoa, or Newly Discovered Groups* 2: 952, 2000).
- Cornuvia** Rostaf. (1873), Arcyriaceae. 1, widespread. See Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles).
- Coscinium** Endl. [not traced] = Lamproderma fide Mussat (*Syll. fung.* 15: 397, 1901).
- Crateriachea** Rostaf. (1873) = Physarum fide Martin & Alexopoulos (*Myxomycetes*: 274, 1969).
- Craterium** Trentep. (1797), Physaraceae. 16, widespread. See Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), Stojanowska & Panek (*Acta Mycologica Warszawa* 38: 65, 2003; Poland).
- Cribraria** Pers. (1794) nom. cons., Cribrariaceae. c. 40, widespread. See Novozhilov (*Mikol. Fitopatol.* 27: 39, 1993), Lado *et al.* (*Mycol.* 91: 157, 1999; *Cribraria zonatispora*), Li (*Mycoscience* 43: 247, 2002; China), Lado *et al.* (*Taxon* 54: 829, 2005; nomencl.).
- Cribraria** Schrad. ex J.F. Gmel. (1792) nom. rej., Myxogastria.
- Cribrariaceae** Corda (1838), Liceida (inc. sed.). 2 gen. (+ 2 syn.), 41 spp.
- Cupularia** Link (1833) = Craterium fide Pando (*in litt.*).
- Cylichnium** Wallr. (1833) = Licea fide Martin & Alexopoulos (*Myxomycetes*: 47, 1969).
- Cystobacter** J. Schröt. (1886) = Polyangium fide Buchanan *et al.* (*Index Bergeyana*, 1966).
- Cystospora** J.E. Elliot (1916) nom. dub., Plasmodiophoraceae. See Karling (*Plasmodiophorales*, 1968).
- Cytidium** Morgan (1896) = Physarum fide Martin & Alexopoulos (*Myxomycetes*: 292, 1969).
- Daloala** Tuzet, Manier & Vog.-Zuber (1952) = Enterobryus fide Manier & Lichtwardt (*Annls Sci. Nat. Bot.*, sér. 12 9: 519, 1968).
- Demordium** Link (1809) nom. dub., Myxogastria. 1, Europe.
- Dermocystidium** Pérez (1908), Protozoa. *D. cochliopodii* on *Cochliopodium bilimbosum* (see Valkanov, *Nova Hedw.* 12: 393, 1967). See Dykova & Lom (*J. appl. Ichthyology* 8: 180, 1992; evidence of fungal nature) Now assigned to the DRIPs clade, q.v. *D. marinum* now belongs in the genus *Perkinsus*.
- Dermocystis** Pérez (1907) = Dermocystidium.
- Dermodium** Link (1809) nom. conf., Myxogastria.
- Dermodium** Rostaf. (1875) = Lycogala fide Martin & Alexopoulos (*Myxomycetes*: 61, 1969).
- Dermosporidium** Carini (1940) = Rhinosporidium fide Azevedo (*Rev. Cien. Biol.* 1: 97, 1963).
- Diachaeella** Höhn. (1909) = Diachea fide Martin & Alexopoulos (*Myxomycetes*: 177, 1969).
- Diachea** Fr. (1825), Stemonitidaceae. 10, widespread. See Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), Stephenson (*Fungal Diversity Res. Ser.* 11, 2003; New Zealand), Gaither & Keller (*Systematics and Geography of Plants* 74: 217, 2004; SEM).
- Diacheopsis** Meyl. (1930), Stemonitidaceae. 16, widespread. See Kowalski (*Mycol.* 67: 616, 1975; key), Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), Mitchell (*Systematics and Geography of Plants* 74: 261, 2004; key gen.), Moreno *et al.* (*Mycol. Progr.* 5: 129, 2006; *Diacheopsis metallica* and *Diacheopsis kowalskii*).
- Dianema** Rex (1891), Dianemataceae. 9, widespread. See Kowalski (*Mycol.* 59: 1080, 1968), Mitchell (*Systematics and Geography of Plants* 74: 261, 2004; key to corticolous spp.).
- Dianemataceae** T. Macbr. (1899), Trichiida (inc. sed.). 2 gen. (+ 3 syn.), 11 spp.
- Dianemina** A.R. Loeb. & Tappan (1961) = Dianema.
- Dichosporium** Nees (1816) nom. dub., Physaraceae.
- Dictydiaethaliaceae** Nann.-Bremek. ex H. Neubert, Nowotny & K. Baumann (1993), Liceida (inc. sed.). 1 gen. (+ 2 syn.), 2 spp.
- Dictydiaethalium** Rostaf. (1873), Dictydiaethaliaceae. 2, widespread. See Stephenson (*Fungal Diversity Res. Ser.* 11, 2003; NZ), Mitchell (*Systematics and Geography of Plants* 74: 261, 2004; key).

Dictydium Schrad. (1797) = *Cribraria* Pers. fide Lado & Pando (*Fl. Mycol. Iberica* 2, 1997).

Dictyostelia, Mycetozoa. 1 ord., 2 fam., 4 gen., 93 spp. [*Dictyosteliomycetes* (orth. bot.)]. Dictyostelid slime moulds, dictyostelids. Ord.:

Dictyosteliales

For *Lit.* see ord. and fam.

Dictyosteliaceae Rostaf. ex Cooke (1877), Dictyostelida (inc. sed.). 3 gen. (+ 1 syn.), 77 spp. [*Dictyosteliidae* (orth. zool.)].

Dictyosteliales L.S. Olive ex P.M. Kirk, P.F. Cannon & J.C. David (2001). See *Dictyostelida*.

Dictyostelida [*Dictyosteliales* (orth. bot.)]. Dictyostelia. 2 fam., 4 gen., 93 spp. An order of 'fungal' slime moulds of *Mycetozoa* (q.v.) comprising Fams:

(1) **Actyosteliaceae**

(2) **Dictyosteliaceae**

See Cavender (1990; key 15 spp. Ohio).

For *Lit.* see under fam.

Dictyosteliomycetes. See *Dictyostelea*.

Dictyosteliomycota = Mycetozoa. See *Amoebozoa*.

Dictyostelium Bref. (1870), Dictyosteliaceae. c. 60, widespread. See Raper (*Quart. Rev. Biol.* 26: 169, 1951; culture), Lee (*TMSJ* 12: 142, 1971; Japanese spp.), Loomis (*Dictyostelium discoideum: a developmental system*, 1975), Olive (*The mycetozoans*: 55, 1975; key), Waddell (*Nature* 298: 464, 1983; *D. caveatum* predacious on *Dictyostelium* spp.), Raper (*The dictyostelids*, 1984), Cavender *et al.* (*N.Z. Jl Bot.* 40: 235, 2002; New Zealand), Glöckner *et al.* (*Nature London* 417: 79, 2002; Sequence and analysis of chromosome 2 of *Dictyostelium discoideum*), Yeh (*Mycotaxon* 86: 103, 2003; Taiwan), Cavender *et al.* (*Mycol.* 97: 493, 2005; USA), Hagiwara (*Bull. natn. Sci. Mus. Tokyo*, N.S. 32: 47, 2006), Hagiwara & Hosono (*Bull. natn. Sci. Mus. Tokyo*, N.S. 32: 1, 2006; Japan).

Diderma Pers. (1794), Didymiaceae. c. 75, widespread. See Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), Lado (*Cuadernos de Trabajo de Flora Micológica Ibérica* 16, 2001; nomenclature), Stephenson (*Fungal Diversity Res. Ser.* 11, 2003; New Zealand).

Didymiaceae Rostaf. ex Cooke (1877), Physarida (inc. sed.). 7 gen. (+ 12 syn.), 166 spp.

Didymium Schrad. (1797), Didymiaceae. c. 75, widespread. See Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), Stephenson (*Fungal Diversity Res. Ser.* 11, 2003; New Zealand).

Diphtherium Ehrenb. (1818) = *Lycogala* fide Martin & Alexopoulos (*Myxomycetes*: 64, 1969).

Diplophysalis Zopf (1884), Protozoa. (Algal parasite). Heterotrophic amoeboid flagellate protist formerly included in the monads or proteomyxids. See Karling (*Am. J. Bot.* 17: 928, 1930).

Disporium Léman (1819) = *Didymium* fide Martin & Alexopoulos (*Myxomycetes*: 383, 1969).

Eccrina Leidy (1852) = *Enterobryus* fide Manier & Lichtwardt (*Annls Sci. Nat. Bot.*, sér. 12 9: 519, 1968).

Eccrinaceae L. Léger & Duboscq ex P.M. Kirk, P.F. Cannon & J.C. David (2001), Eccrinales. 14 gen. (+ 14 syn.), 53 spp.

Eccrinales Léger & Duboscq (1929). Protozoa. 3 fam., 17 gen., 63 spp. Thallus unbranched or branched only at the base, vegetatively coenocytic, with basal, secreted holdfast; asexual reproduction by endogenous

sporangiospores produced in basipetal succession from the thallus tip, (a) multinucleate, thin-walled sporangiospores germinating within the digestive tract of the same host, (b) usually uninucleate, thick-walled sporangiospores which in aquatic forms are frequently appendaged and on release function as re-infective spores; microthallus present in some genera; sexual reproduction known only in *Enteropogon*; endocommensals of aquatic and terrestrial *Crustacea*, *Diplopoda* and *Insecta*. Fams:

(1) **Eccrinaceae**

(2) **Palavasciaceae**

(3) **Parataeniellaceae**

Lit.: Lichtwardt (*Mycol.* 46: 564, 1954, 52: 410, 1960; taxonomy, 1986), Manier (1969, taxonomy), Hibbits (*Syesis* 11: 213, 1978; development, sexual repr.), Moss (1979).

Eccrinella L. Léger & Duboscq (1933) = *Astreptonema* fide Manier (*Annls Sci. Nat. Bot.*, sér. 12 5: 767, 1964).

Eccrinidus Manier (1970), Eccrinaceae. 1 (in *Diplopoda*), France. See Manier & Grizel (*C.R. Acad. Sci. Paris* 274: 1159, 1972; ultrastr.), Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986; key), Cafaro (*Mol. Phylogen. Evol.* 35: 21, 2005; phylogeny).

Eccrinoides L. Léger & Duboscq (1929), Eccrinaceae. 4 (in *Isopoda* and *Diplopoda*), Europe. See Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986).

Eccrinopsis L. Léger & Duboscq (1916) = *Enterobryus* fide Manier & Lichtwardt (*Annls Sci. Nat. Bot.*, sér. 12 9: 519, 1968).

Echinosteliaceae Rostaf. ex Cooke (1877), Echinostelida (inc. sed.). 1 gen. (+ 1 syn.), 15 spp.

Echinosteliales G.W. Martin (1961). See *Echinostelida*.

Echinostelida [*Echinosteliales* (orth. bot.)]. Myxogastria. 2 fam., 3 gen., 18 spp. Spore mass white, pale pink, or yellow, columella present, peridium fugaceous. Fams:

(1) **Clastodermataceae**

(2) **Echinosteliaceae**

Lit.: Alexopoulos & Brooks (*Mycol.* 63: 925, 1971).

Echinosteliopsidaceae L.S. Olive (1970), Protostelida (inc. sed.). 2 gen., 2 spp.

Echinosteliopsidales L.S. Olive (1970). See *Protostelida*.

Echinosteliopsis D.J. Reinh. & L.S. Olive (1967), Echinosteliopsidaceae. 1, widespread. See Reinhardt & Olive (*Mycol.* 58: 967, 1967), Olive (*The mycetozoans*: 110, 1975).

Echinostelium de Bary (1873), Echinosteliaceae. 15, widespread. *E. lunatum*, the smallest known myxomycete. See Olive & Stoianovitch (*Mycol.* 63: 1051, 1971), Whitney (*Mycol.* 72: 950, 1980; key), Lado & Pando (*Flora Mycologica Iberica* 2, 1997; Spain, Portugal), Mitchell (*Systematics and Geography of Plants* 74: 261, 2004; key to corticolous spp.), Adamonytė (*Acta Mycologica Warszawa* 41: 169, 2006; Lithuania).

Elaeomyxa Hagelst. (1942), Elaeomyxaceae. 2, widespread (north temperate). See Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles).

Elaeomyxaceae Hagelst. ex M.L. Farr & H.W. Keller (1982), Physarida (inc. sed.). 1 gen., 2 spp.

- Ellobiocystis** Coutière (1911) nom. dub., Protozoa. See Whisler in Margulis *et al.* (Eds) (*Handbook of Protoctista*: 715, 1990; systematic position).
- Ellobiopsis** Caullery (1910), Protozoa. 1 (parasite of marine copepods). See Whisler in Margulis *et al.* (Eds) (*Handbook of Protoctista*: 715, 1990; placed in the class *Ellobiopsida*).
- Embolus** Haller (1768) nom. dub., Mycetozoa.
- Endemosarca** L.S. Olive & Erdos (1971), Endemosarcaceae. 3, widespread. See Erdos (*Mycol.* 64: 423, 1972; nuclear cycle), Olive (*The mycetozoans*: 212, 1975), Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Endemosarcaceae** L.S. Olive & Erdos (1971), ? Plasmodiophorida (inc. sed.). 1 gen., 3 spp.
- Endodromia** Berk. (1841) nom. dub. ? = *Echinostelium* fide Höhnelt (*Sitzungsber. Kaiserl. Akad. Wiss. Math.-Naturwiss. Cl. Abt. 1* 123: 97, 1914).
- Endostelium** L.S. Olive, W.E. Benn. & Deasey (1984), Protosteliaceae. 1, Papua New Guinea. See Olive *et al.* (*Mycol.* 76: 884, 1984).
- Enerthenema** Bowman (1830), Stemonitidaceae. 3, widespread (north temperate). See Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles).
- Enerthenemataceae** Rostaf. ex Cooke (1877) = Stemonitidaceae.
- Enigma** G. Arnaud (1949) nom. inval., ? Protozoa.
- Enteridiaceae** M.L. Farr (1982) = Tubiferaceae.
- Enteridium** Ehrenb. (1819) nom. rej. = *Reticularia* Bull. fide Lado *et al.* (*Taxon* 47: 109, 1998; nomencl.).
- Enterobryus** Leidy (1850), Eccrinaceae. 24 (in *Colleoptera*, *Diplopoda* and *Decapoda*), widespread. See Lichtwardt (*Mycol.* 46: 564, 1954), Lichtwardt (*Mycol.* 49: 463, 1957), Lichtwardt (*Mycol.* 49: 734, 1957), Lichtwardt (*Mycol.* 50: 550, 1958), Lichtwardt (*Mycol.* 52: 248, 1960), Lichtwardt (*Mycol.* 52: 410, 1960), Lichtwardt (*Mycol.* 52: 743, 1960), Tuzet & Manier (*Protistologia* 3: 413, 1967; ultrastr.), Manier *et al.* (*Biol. Gabon.* 3-4: 305, 1972), Manier *et al.* (*Bull. Inst. Fund. Afrique Noire* 36: 614, 1974), Wright (*Proc. Helminthol. Soc. Wash.* 46: 213, 1979; ultrastr.), Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986; key), Gorter (*Bothalia* 23: 85, 1990), Cafaro (*Mol. Phylogen. Evol.* 35: 21, 2005; phylogeny), White *et al.* (*Mycol.* 98: 333, 2006).
- Enteromyces** Lichtw. (1961), Eccrinaceae. 1 (in *Decapoda*), widespread. See McCloskey & Caldwell (*J. Elisha Mitchell scient. Soc.* 81: 114, 1965), Hibbets (*Syesis* 11: 213, 1978), Cafaro (*Mol. Phylogen. Evol.* 35: 21, 2005; phylogeny).
- Enteromyxa** Cienk. (1884), Protozoa. Amoeboflagellate protist formerly included in the monads or proteomyxids.
- Enteropogon** Hibbets (1979), Eccrinaceae. 2 (in *Decapoda*), USA. See Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986), Chien & Hsieh (*Trichomycetes and Other Fungal Groups, Robert W. Lichtwardt Commemoration Volume*: 55, 2001; Taiwan), Cafaro (*Mol. Phylogen. Evol.* 35: 21, 2005; phylogeny).
- Erionema** Penz. (1898) = *Fuligo* fide Mitchell (*Systematics and Geography of Plants* 74: 261, 2004).
- Famintzinia** Hazsl. (1877) nom. rej. = *Ceratiomyxa* fide Martin & Alexopoulos (*The myxomycetes*, 1969).
- Fictoderma** Preuss (1852), ? Protozoa.
- Fonticula** Worley, Raper & M. Hohl (1979), Fonticulaceae. 1, USA. See Worley *et al.* (*Mycol.* 71: 746, 1979), Blanton in Margulis *et al.* (Eds) (*Handbook of Protoctista*: 75, 1990), Cavalier-Smith in Coombs *et al.* (Eds) (*Evolutionary Relationships Among Protozoa*: 375, 1998; placed in *Choanozoa*), Dykstra & Keller in Lee, Leedale & Bradbury (Eds) (*An Illustrated Guide to the Protozoa, Organism Traditionally Referred to as Protozoa, or Newly Discovered Groups* 2: 952, 2000).
- Fonticulaceae** Worley, Raper & M. Hohl (1979), Acrasida (inc. sed.). 1 gen., 1 spp.
- Frankiella** Maire & A. Tison (1909) ? = *Plasmodiophora* fide Hawker & Fraymouth (*J. gen. Microbiol.* 5: 369, 1951).
- Fuliginaceae** Chevall. (1826) = Physaraceae.
- Fuligo** Haller (1768), Physaraceae. 7, widespread. See Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), Stephenson (*Fungal Diversity Res. Ser.* 11, 2003; New Zealand).
- Galeperdon** Weber ex F.H. Wigg. (1780) = *Lycogala*.
- Galoperdon**, see *Galeperdon*.
- Guttulina** Cienk. (1874) [non *Guttulina* Orb. 1839, *Invertebrata*] = *Pocheina* fide Ing (*in litt.*).
- Guttulinaceae** Zopf ex Berl. (1888), Acrasida (inc. sed.). 2 gen. (+ 1 syn.), 5 spp.
- Guttulinopsidaceae** L.S. Olive (1970) = Guttulinaceae.
- Guttulinopsis** L.S. Olive (1901), Guttulinaceae. 2, N. America. See Raper *et al.* (*Mycol.* 69: 1016, 1977), Dykstra & Keller in Lee, Leedale & Bradbury (Eds) (*An Illustrated Guide to the Protozoa, Organism Traditionally Referred to as Protozoa, or Newly Discovered Groups* 2: 952, 2000).
- Gymnococcus** Zopf (1884), Protozoa. 2 (Algal parasite). Amoeboflagellate protist formerly included in the monads or proteomyxids.
- Gymnomycota**. See *Mycetozoa*.
- Gymnomyxa**. See *Mycetozoa*.
- Halterophora** Endl. (1836) nom. dub., ? Myxogastria.
- Heimerlia** Höhn. (1903) nom. dub., ? Echinosteliaceae. See Martin *et al.* (*The genera of Myxomycetes*, 1983).
- Heimerliaceae** G. Arnaud (1949) = Echinosteliaceae.
- Heliomycopsis** Arnaud (1949) nom. inval., ? Dictyostelida.
- Hemiarcyria** Rostaf. (1875) = *Hemitrichia*.
- Hemitrichia** Rostaf. (1873), Trichiaceae. 26, widespread. See Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), Kuhnt (*Z. Mykol.* 71: 165, 2005), Lado *et al.* (*Taxon* 54: 543, 2005; nomencl.), Liu *et al.* (*Collection and Research* 19: 27, 2006; Taiwan).
- Heterodictyon** Rostaf. (1873) = *Cribraria* Pers. fide Martin & Alexopoulos (*Myxomycetes*: 92, 1969).
- Heterolobosea**, Protozoa. 1 ord., 4 fam., 6 gen., 14 spp. [*Acrasiomycetes* (orth. bot.)]. An order of *Percolozoa* (q.v.) comprising the 'fungal' ord.:
Acrasida (syn. *Acrasiales*)
 For *Lit.* see fam.
- Heterotrichia** Masee (1892) = *Arcyria* fide Martin & Alexopoulos (*Myxomycetes*: 121, 1969).
- Hyalostilbum** Oudem. (1885) = *Dictyostelium* fide Saccardo (*Syll. fung.* 6: 1, 1888).
- Hymenobolina** Zukal (1893) = *Licea* fide Martin & Alexopoulos (*Myxomycetes*: 39, 1969).
- Hymenobolus** Zukal (1893) = *Hymenobolina*.
- Hyporhamma** Corda (1854) nom. rej. = *Hemitrichia* fide Lado *et al.* (*Taxon* 54: 829, 2005; nomencl.).

- Hystricapsa** Preuss (1851) nom. dub., ? Myxogastria. See Saccardo (*Syll. fung.* 18, 1906).
- Ichthyophonous** Plehn & Mulsow (1911), Protozoa. 2 or 3 (in fish). See Sprague (*Syst. zool.* 14: 110, 1965), Neish & Hughes (*Fungal diseases of fishes* 6, 1980), Rand & Whitney (*Mycol. Soc. Amer. Newsl.*: 43 [abstract], 1987; ultrastr.), Grabda (*Marine fish parasitology. An outline*: 43, 1991), Spanggaard *et al.* (*J. Fish Dis.* 18: 567, 1995; morphology), Ragan *et al.* (*Proc. natn Acad. Sci. U.S.A.* 93: 11907, 1996; phylogeny), Baker *et al.* (*Microbiology* 145: 1777, 1999; phylogeny), McVicar in Woo & Bruno (Eds) (*Fish Diseases & Disorders* 3: 261, 1999; biology, treatment).
- Ichthyosporea**, Protozoa. Formal name for the organisms included in the DRIPs clade (q.v.) introduced at class level. See Cavalier-Smith (In: Coombs *et al.*, *Evolutionary Relationships of the Protozoa*: 375, 1998).
- Iocraterium** E. Jahn (1904) = Craterium fide Martin & Alexopoulos (*Myxomycetes*: 269, 1969).
- Jundzillia** Racib. ex L.F. Čelak. (1893) = Amaurochaete fide Martin & Alexopoulos (*Myxomycetes*: 174, 1969).
- Kelleromyxa** Eliasson (1991), ? Physarida. 1, Europe; N. America. See Eliasson (*MR* 95: 1205, 1991).
- Kleistobolus** C. Lippert (1894) = Licea fide Martin & Alexopoulos (*Myxomycetes*: 39, 1969).
- Labyrinthorhiza** Chadeff. (1956) nom. dub., Protozoa. See Olive (*The mycetozoans*: 215, 1975).
- Lachnobolus** (Fr.) Fr. (1849) = Arcyodes fide Pando (*in litt.*).
- Lachnobolus** Fr. (1825) nom. rej. = Amaurochaete fide Pando (*in litt.*).
- Lactella** Maessen (1955) = Enterobryus fide Manier & Lichtwardt (*Annls Sci. Nat. Bot.*, sér. 12 9: 519, 1968).
- Lajassiella** Tuzet & Manier ex Manier (1968), Parataeniellaceae. 1 (in *Coleoptera*), France. See Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986).
- Lamproderma** Rostaf. (1873), Stemonitidaceae. c. 45, widespread. See Kowalski (*Mycol.* 62: 623, 1970; key), Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), Singer *et al.* (*Öst. Z. Pilzk.* 10: 25, 2001; nivicolous spp. Austria), Clark & Haskins (*Nova Hedwigia* 75: 237, 2002; reproductive systems), Poulain *et al.* (*BSMF* 119: 267, 2003; type studies).
- Lamprodermataceae** T. Macbr. (1899) = Stemonitidaceae.
- Lamprodermopsis** Meyl. (1910) = Dianema fide Martin & Alexopoulos (*Myxomycetes*: 104, 1969), Kowalski (*Mycol.* 67: 456, 1975).
- Leangium** Link (1809) = Diderma fide Martin & Alexopoulos (*Myxomycetes*: 347, 1969).
- Leidyomyces** Lichtw., M.M. White, Cafaro & Misra (1999), Eccrinaceae. 1, USA. See Lichtwardt *et al.* (*Mycol.* 91: 695, 1999).
- Leocarpus** Link (1809), Physaraceae. 1, widespread. See Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), Stephenson (*Fungal Diversity Res. Ser.* 11, 2003; New Zealand).
- Lepidoderma** de Bary (1873), Didymiaceae. 10 (nivicolous), widespread. See Kowalski (*Mycol.* 63: 492, 1971; key), Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), Stephenson (*Fungal Diversity Res. Ser.* 11, 2003; New Zealand).
- Lepidodermopsis** Höhn. (1909) = Didymium fide Martin & Alexopoulos (*Myxomycetes*: 376, 1969). Used by, Lakhanpal (*Norw. Jl Bot.* 25: 195, 1978).
- Lepidodermopsis** Wilczek & Meyl. (1934) nom. illegit. = Lepidoderma fide Martin & Alexopoulos 63: 492, 1971 (*Myxomycetes*: 403, 1969), Kowalski (*Mycol.* 63: 492, 1971).
- Leptoderma** G. Lister (1913), Stemonitidaceae. 2, Europe; N. America. See Martin *et al.* (*The genera of Myxomycetes*, 1983), Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles).
- Licaethalium** Rostaf. (1873) = Reticularia Bull. fide Martin & Alexopoulos (*Myxomycetes*: 66, 1969).
- Licea** Schrad. (1797), Liceaceae. c. 66, widespread. See Keller & Brooks (*Mycol.* 69: 669, 1977; key), Giler (*Nordic Jl Bot.* 16: 515, 1996; ultrastr.), Flatau (*Stapfia* 73: 63, 2000), Mitchell & McHugh (*Karstenia* 40: 103, 2000; UK), Li *et al.* (*Mycotaxon* 90: 437, 2004; China).
- Liceaceae** Chevall. (1826), Liceida (inc. sed.). 1 gen. (+ 9 syn.), 66 spp.
- Liceales** E. Jahn (1928). See *Liceida*.
- Liceida** [*Liceales* (orth. bot.)]. Myxogastria. 5 fam., 9 gen., 140 spp. Spore mass dingy or colourless, capillitium absent. Fams:
- (1) **Cribrariaceae**
 - (2) **Dictydiaethaliaceae**
 - (3) **Liceaceae**
 - (4) **Listerellaceae**
 - (5) **Tubiferaceae**
- Lit.*: Martin (*Brittonia* 13: 109, 1961; fam. key); Lado & Pando (*Flora Mycologica Iberica* 2, 1997; keys Spain, Portugal).
- Liceopsis** Torrend (1908) = Reticularia Bull. fide Martin & Alexopoulos (*Myxomycetes*: 66, 1969).
- Lignidium**, see *Lignydium*.
- Ligniera** Maire & A. Tison (1911), Plasmodiophoraceae. 7, widespread (north temperate). See Karling (*The Plasmodiophorales* edn 2, 1968; key), Braselton in McLaughlin *et al.* (Eds) (*The Mycota A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research* 7A: 81, 2001).
- Lignydium** Link (1809) = Fuligo fide Martin (*Univ. Iowa Stud. nat. Hist.* 20, 1966).
- Lignyota** Fr. (1849) nom. dub., Didymiaceae. See Martin & Alexopoulos (*Myxomycetes*: 416, 1969).
- Lindbladia** Fr. (1849), Cribrariaceae. 1, widespread (north temperate; Argentina; Sri Lanka). See Rex (*Bot. Gazette.* 17: 201, 1982), Hatano (*Mycol.* 88: 316, 1996).
- Listerella** E. Jahn (1906), Listerellaceae. 1 (on *Cladonia*), widespread. See Kowalski (*Mycol.* 59: 1078, 1968), Eliasson & Gilert (*Nordic Jl Bot.* 2: 249, 1982; SEM).
- Listerellaceae** E. Jahn ex H. Neubert, Nowotny & K. Baumann (1993) = Liceaceae.
- Lycogala** Pers. (1794), Tubiferaceae. c. 6, widespread. See Martin (*Mycol.* 59: 158, 1967; key), Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles).
- Lycogalaceae** Corda (1828) nom. inval. = Tubiferaceae.
- Lycoperdon** Tourn. ex L. (1753) = Lycogala.
- Macbrideola** H.C. Gilbert (1934), Stemonitidaceae. 13,

widespread. See Alexopoulos (*Mycol.* 59: 103, 1967; key), Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), Stephenson (*Fungal Diversity Res. Ser.* 11, 2003; New Zealand).

Margarita Lister (1894) [non *Margarita* Gaudin 1829, *Compositae*] = *Calomyxa*.

Margaritaceae Lister (1894) = *Dianemataceae*.

Matruchotia Skup. (1924) nom. illegit. = *Amaurochaete* fide Martin & Alexopoulos (*Myxomycetes*: 171, 1969).

Matruchotiella Skup. ex G. Lister (1925) nom. illegit. = *Amaurochaete* fide Martin & Alexopoulos (*Myxomycetes*: 171, 1969).

Maullinia I. Maier, E.R. Parodi, R. Westermeier & D.G. Müll. (2000), *Plasmodiophoraceae*. 1, France. See Maier *et al.* (*Protist* 151: 235, 2000).

Membranosorus Ostenf. & H.E. Petersen (1930), *Plasmodiophoraceae*. 1, USA. See Ostensfeld & Petersen (*Zeitschrift für Botanik* 23: 13, 1930), Dick (*Straminipilous Fungi*: 670 pp., 2001).

Mesenterica Tode (1790) nom. dub., *Protozoa*. Used for plasmodia fide Fries (1829).

Metatrichia Ing (1964), *Trichiaceae*. 7, Europe; tropical. See Lakhanpal & Mukerji (*Proc. Indian natn Sci. Acad. Part B. Biol. Sci.* 42: 125, 1977), Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles).

Microcarpon Schrad. ex J.F. Gmel. (1792) nom. dub., ? *Myxogastria*.

Microglomus L.S. Olive & Stoian. (1977), *Protosteliaceae*. 1, Hawaii. See Olive *et al.* (*TBMS* 81: 449, 1983), Spiegel (*Handbook of Protoctista*: 484, 1990).

Minakatella G. Lister (1921), *Trichiaceae*. 1, Japan; N. America. See Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), Mitchell (*Systematics and Geography of Plants* 74: 261, 2004).

Minakatellaceae Nann.-Bremek. ex H. Neubert, Nowotny & K. Baumann (1993) = *Trichiaceae*.

Minutularia P.A. Dang. (1891) [not traced] nom. dub., *Protozoa*. Based on a protozoan fide Dangeard [not traced].

Molliardia Maire & A. Tison (1911) = *Tetramyxa* fide Kirk (*in litt.*).

Mucilago Battarra (1755), *Didymiaceae*. 1, widespread. See Lado (*Cuad. Trab. Flora Micol. Ibér.* 7: 305 pp., 1993; Spain, Portugal), Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), Stephenson (*Fungal Diversity Res. Ser.* 11, 2003; New Zealand).

Mycetozoa, *Protozoa*. (*Myxomycota*, *Myxostelida*, *Myxobionta*, *Gymnomycota*, *Gymnomyxa*); plasmodial slime moulds; acellular slime moulds. 3 classes. Free-living, unicellular or plasmodial, non-flagellate in single- or multi-celled phagotrophic stages; mitochondrial cristae tubular; with uni- or multicellular sporocarps with single to many spores; spore walls cellulosic or chitinous; spores germinating to produce 1- or 2-flagellate cells.

The circumscription and ranking of the higher taxa of plasmodial slime moulds varies according to different authors. No formal name at all was used in Margulis *et al.* (1990), while Corliss (1994) used *Mycetozoa* inclusive of the dictyostelids (see *Dictyosteliomycota*). Three classes are recognized in this edition of the *Dictionary*:

(1) *Dictyostelea*

(2) *Myxogastrea*

(3) *Protostelea*

Corliss (1994) suggested that the taxon could be expanded to include the *Promycetozoida*, certain enigmatic marine protists with reticulopodia such as *Corallomyxa*, *Megamoebomyxa* and *Thalassomyxa* (see Grell, *Protistologica* 21: 215, 1985; *Arch. Protistenkunde* 140: 303, 1991); these taxa have not been studied by mycologists and are not treated elsewhere in this *Dictionary*.

Lit.: Corliss (*Acta Protozool.* 33: 1, 1994), Keller (*in* Parker (Ed.), 1: 165, 1982), Margulis *et al.* (1990), Teixeira (*Rickia* suppl. 3, 1970; gen. except *Myxomycetes*), Olive (*The mycetozoans*, 1975; *in* Parker, *Synopsis and classification of living organisms*: 521, 1982), Raper (*The dictyostelids*, 1994). See also *Protozoa*.

Myrosporium Corda (1831) nom. dub., ? *Trichiida*.

Myxogastres. See *Myxogastria*.

Myxogastria, *Mycetozoa*. 5 ord., 14 fam., 62 gen., 888 spp. [*Myxomycetes* (orth. bot.)]. True slime moulds. Trophic phase a free-living, multinucleate, coenocytic, saprobic plasmodium with a shuttle-movement of the protoplasm; plasmodium sometimes becoming a resting body or sclerodium under poor conditions, and the swarm spores of myxamoebae microcysts; sporangia sessile or stalked, often bright coloured; spores developed after meiosis, produced in masses with a persistent or evanescent peridium; swarm cells usually with two-anterior flagellae and no cell wall, forming myxamoebae directly or after loss of the flagella, sometimes undergoing division before capulation; reproduction usual, the resultant zygote becoming the plasmodium. Esp. on old wood or other plant material undergoing decomposition (see Madelin, *TBMS* 83: 1, 1984; ecological significance).

The chief diagnostic characters are the type of sporocarp, the structure of the peridium and capillitium of the sporangium, calcium carbonate ('lime'), if present, and the size, colour and ornamentation of the spores. Ords:

(1) *Echinosteliales*

(2) *Liceales*

(3) *Physarales*

(4) *Stemonitales*

(5) *Trichiales*

Frederick (1990) and Newbert *et al.* (1993) include the *Ceratiomyxaceae* in this class, but see under *Protostelea*.

Lit.: *General*: Lister & Lister (*Mycetozoa*, edn 3, 1925), Jahn (*Nat. PflFam.* 2 (Aufl. 2), 1928), MacBride & Martin (*Myxomycetes*, 1934), Gray & Alexopoulos (*Biology of myxomycetes*, 1968), Martin (*Univ. Iowa Studies nat. Hist.* 20(8), 1966; gen. list) Martin & Alexopoulos (*The myxomycetes*, 1969), Martin *et al.* (*The genera of Myxomycetes*, 1983), Olive (*Bot. Rev.* 36: 59, 1970; keys, *The mycetozoans*, 1975), Teixeira (*Rickia* suppl. 4, 1971; gen.), Alexopoulos (*in* Subramanian (Ed.), *Taxonomy of the fungi* 1: 1, 1978; evolution), Mitchell (*Bull. BMS* 12: 18, 90, 13: 42, 1978-79; key corticolous spp.), Collins (*Bot. Rev.* 45: 145, 1979; biosystematics), Eliasson & Lundqvist (*Bot. Notiser* 132: 551, 1979; fimicolous spp.), Chassain (*Myxomycetes* 1, 1979), Martin *et al.* (*The genera of Myxomycetes*, 1983), Frederick (*in* Margulis *et al.* (Eds) 1990: 467), Corliss (1994), Stephenson & Stempen (*Myxomycetes, A handbook of slime molds*, 1994).

- Regional:** **Argentina**, Deschamps (*Physis* Sect. C 34: 159, 35: 319, 1975-77). **Australia**, Mitchell (*Nova Hedw.* 60: 269, 1995; list). **British Isles**, Ing (*A census catalogue of British myxomycetes*, 1968; revised, *Bull. BMS* 14: 97, 16: 26, 1980-82; 19: 109, 1985). **Central & S. America**, Farr (*Rickia* 3: 45, 1968; key, *Flora neotropica* 16, 1976). **Costa Rica**, Alexopoulos & Sáenz (*Mycotaxon* 2: 223, 1975). **Denmark**, Bjornekaer & Klinge (*Friesia* 7: 149, 1964). **Germany**, etc. Neubert *et al.* (*Die Myxomyceten* 1, 1993; keys, col. pls), Schinz (*Rabenh. Krypt.-Fl.* 1 (10), 1920). **Hawaii**, Eliasson (*MR* 95: 257, 1991). **India**, Thind (*The myxomycetes of India*, 1977), Lakhanpal & Mukerji (*Indian myxomycetes*, 1981). **Italy**, Pirola & Credaro (*Giorn. bot. Ital.* 105: 157, 1971). **Japan**, Emoto (*The myxomycetes of Japan*, 1977). **Korea**, Nakagawa (*Jl Chosen Nat. Hist. Soc.* 17: 17, 1934). **Mexico**, Braun & Keller (*Mycotaxon* 3: 297, 1976). **Netherlands**, Nannenga-Bremekamp (*De Nederlandse Myxomyceten*, 1975; *A guide to temperate myxomycetes* [Engl. transl.], 1992). **Nigeria**, Ing (*TBMS* 47: 45, 1964). **N. America**, Hagelstein (*The Mycetozoa of North America*, 1944), Martin (*N. Am. Fl.* 1(1), 1949). **Sierra Leone**, Ing (*TBMS* 50: 549, 1967). **Spain**, Lado & Pando (*Flora Mycologica Iberica* 2, 1997). **Sweden**, Santesson (*Svensk bot. Tidskr.* 58: 113, 1964; list). **Tierra del Fuego**, Arambarri (*Fl. cript. Tierra del Fuego* 2, 1975). **Uruguay**, Garcia-Zorron (*Mixomycetos del Uruguay*, 1967). See also *Mycetozoa*.
- Myxomycetes.** See *Myxogastria*.
- Myxomycota.** See *Mycetozoa*.
- Myxothallophyta.** See *Myxogastria*.
- Nassula** Fr. (1849) = *Arcyria* fide Martin & Alexopoulos (*Myxomycetes*: 121, 1969).
- Nematostelium** L.S. Olive & Stoian. (1970), Protosteliaceae. 2, widespread. See Olive & Stoianovitch (*Bot. Rev.* 36: 68, 1970).
- Nidularia** With. (1787) nom. rej. prop. ≡ *Craterium* fide Martin & Alexopoulos (*Myxomycetes*: 172, 1969).
- Nodocrinella** D. Scheer (1977) nom. dub., Parataeniellaceae.
- Octomyxa** Couch, J. Leitm. & Whiffen (1939), Plasmodiophoraceae. 2 (on *Achlya* and other *Saprolegniales*), USA. See Sherwood (*J. Elisha Mitchell scient. Soc.* 84: 52, 1968), Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Oligonema** Rostaf. (1875), Trichiaceae. 7, widespread. See Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), Haan *et al.* (*Systematics and Geography of Plants* 74: 251, 2004; Belgium).
- Ophiotheca** Curr. (1854) = *Perichaena* fide Martin & Alexopoulos (*Myxomycetes*: 109, 1969).
- Ophiuridium** Hazsl. (1877) = *Dictydiaethalium* fide Martin & Alexopoulos (*Myxomycetes*: 59, 1969).
- Orcadella** Wingate (1889) = *Licea* fide Martin & Alexopoulos (*Myxomycetes*: 39, 1969).
- Orcadellaceae** T. Macbr. (1899) = *Liceaceae*.
- Orthotricha** Wingate (1886) = *Clastoderma* fide Martin & Alexopoulos (*Myxomycetes*: 204, 1969).
- Ostenfeldiella** Ferd. & Winge (1914) = *Plasmodiophora* fide Kirk (*in litt.*).
- Ostracococcum** Wallr. (1833) nom. dub., ? *Myxogastria*.
- Palavascia** Tuzet & Manier ex Lichtw. (1964), Palavasciaceae. 3 (in *Isopoda*), widespread. See Lichtwardt (*Mycol.* 56: 318, 1964), Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*: 256, 1986; key), Cafaro (*Mycol.* 92: 361, 2000; n.sp. Patagonia), Cafaro (*Mol. Phylogen. Evol.* 35: 21, 2005; phylogeny).
- Paradiachea** Hertel (1956), Stemonitidaceae. 5, Europe, N. America, Australasia. See Nannenga-Bremekamp (*Temperate myxomycetes*, 1991; key, icon. desc.).
- Paradiacheopsis** Hertel (1954) = *Macbrideola* fide Pando (*in litt.*).
- Parallobiopsis** Collin (1913), Protozoa. 1 (on invertebrate), Europe. See Whisler in Margulis *et al.* (Eds) (*Handbook of Protoctista*: 715, 1990; systematic position).
- Paramacrinella** Manier & Grizel (1971), Eccrinaceae. 1 (in *Amphipoda*), France. See Manier *et al.* (*Annls Sci. Nat. Bot.*, sér. 12 12: 1, 1971), Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986).
- Paramoebidium** L. Léger & Duboscq (1929), Amoebidiaceae. 10 (in *Diptera*, *Ephemeroptera*, *Plecoptera*), widespread. See Dang & Lichtwardt (*Am. J. Bot.* 66: 1093, 1979; ultrastr.), Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986; taxonomy), Williams & Lichtwardt (*CJB* 68: 1045, 1990), Lichtwardt *et al.* (*Mycol.* 83: 389, 1991), Lichtwardt & Williams (*Mycol.* 84: 376, 1992), Lichtwardt & Arenas (*Mycol.* 88: 844, 1996), Lichtwardt *et al.* (*Mycol.* 91: 1060, 1999), Benny in McLaughlin *et al.* (Eds) (*The Mycota A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research* 7A, 2000), Tanabe *et al.* (*J. gen. appl. Microbiol.* Tokyo 51: 267, 2005; phylogeny), Strongman & White (*CJB* 84: 1478, 2006; n.sp. Canada).
- Parataeniella** R.A. Poiss. (1929), Parataeniellaceae. 6 (in *Isopoda*), widespread. See Lichtwardt & Chen (*Mycol.* 56: 163, 1964), Scheer (*Arch. Protistenk.* 118: 202, 1976), Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986; key), Lichtwardt & Williams (*CJB* 68: 1057, 1990), Chien & Hsieh (*Trichomycetes and Other Fungal Groups, Robert W. Lichtwardt Commemoration Volume*: 55, 2001; Taiwan).
- Paratrichella** Manier (1947) = *Enterobryus* fide Manier & Lichtwardt (*Annls Sci. Nat. Bot.*, sér. 12 9: 519, 1968).
- Passalomyces** Lichtw., M.M. White, Cafaro & Misra (1999), Eccrinaceae. 1, Dominica. See Lichtwardt *et al.* (*Mycol.* 91: 695, 1999).
- Pecila** Lepell. (1822) nom. dub., *Myxogastria*.
- Peltomyces** L. Léger (1909), ? Plasmodiophoraceae. 3, Europe.
- Percolozoa**, Protozoa. 1 class., 1 ord., 4 fam., 6 gen., 14 spp. An order of *Protozoa* (q.v.) comprising the acrasid cellular slime moulds; acrasids. Trophic phase amoeboid, pseudopodia lobose; aggregating without streaming; nuclei with a compact centrally placed nucleolus; sporocarp sessile, independent and dividing when vegetative, some with simple supportive stalks; multispored, in chains of delimited sori; flagellate cells usually absent; sexual reproduction unknown. On dung and isolated from a wide range of decaying plant materials and macromycetes, and also soil.
- Raper (1973) included the dictyostelids and protostelids (see *Mycetozoa*) in the class *Acrasiomycetes*,

later excluding the protostelids as a separate class (Raper, 1984). Molecular data show these three groups to be allied only at the phylum level.

Lit : Olive (1975), Raper (*in* Ainsworth *et al.* (Eds), *The fungi* 4B: 9, 1973; keys gen.; *The dictyostelids*, 1984), and under Families.

Perichaena Fr. (1817), Trichiaceae. 17, widespread. See Cavalcanti (*Rickia* 6: 99, 1974; key), Keller & Eliasson (*MR* 96: 1095, 1992; key), Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), Moreno *et al.* (*Rivista di Micologia* 43: 5, 2000; sp. nov.), Stephenson (*Fungal Diversity Res. Ser.* 11, 2003; New Zealand).

Perichaenaceae Rostaf. ex Cooke (1877) = Trichiaceae.

Perkinsus Levine (1978), Protozoa. 1 (parasitic on oysters (*Crassostrea virginica*)), Gulf of Mexico. *P. marinus*, formerly *Dermocystidium marinum*, recognized in its own class (Levine, *J. Parasitol.* 64: 549, 1978) in the *Apicomplexa* but see Siddall & *al.* (*Parasitology* 115: 165, 1997) where it considered to be closer to the dinoflagellates. See Levine (*J. Shellfish Res.* 15: 67, 1996; taxonomy, phylogeny), Siddall *et al.* (*Parasitology* 115: 165, 1997) where it considered to be closer to the dinoflagellates.

Phagomyxa Karling (1944), Plasmodiophorida. 3 (algal parasite), USA. See Cavalier-Smith & Chao (*Arch. Protistenk.* 147: 227, 1997; order *Phagomyxida* proposed), Schnepf *et al.* (*Helgoland Mar. Res.* 54: 237, 2000; new spp.), Bulman *et al.* (*Protist* 152: 43, 2001; systematic position).

Phlebomorpha Pers. (1822) nom. dub., Mycetozoa. Based on myxomycete plasmodia fide Martin (1966).

Physaraceae Chevall. (1826), Physarida (inc. sed.). 9 gen. (+ 18 syn.), 195 spp.

Physarales T. Macbr. (1922). See *Physarida*.

Physarella Peck (1882), Physaraceae. 1, widespread. See Shi & Li (*Mycosystema* 23: 381, 2004; life cycle).

Physarida [*Physarales* (orth. bot.)]. Myxogastria. 3 fam., 18 gen., 364 spp. Spore mass dark-coloured, peridium or capillitium calcareous. Fams:

- (1) **Didymiaceae**
- (2) **Elaeomyxaceae**
- (3) **Physaraceae**

For *Lit.* see under fam.

Physarina Höhn. (1909), Didymiaceae. 3, pantropical. See Höhnel (*Sber. Akad. Wiss. Wien Math.-naturw. Kl., Abt. 1* 118: 431, 1909; nomencl.).

Physarum Pers. (1794), Physaraceae. c. 135, widespread. See Anon. *in* Hutterman (Ed.) (*Physarum polycephalum*, 1973; use in cell-biology), Anon. *in* Aldrich & Daniel (Eds) (*Cell biology of Physarum and Didymium*, 1982), Chen *et al.* (*Mycosystema* 18: 77, 1999; China), Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), Clark & Stephenson (*Mycotaxon* 85: 85, 2003), Stephenson (*Fungal Diversity Res. Ser.* 11, 2003; New Zealand).

Phytoceratiomyxa Sawada (1929) nom. dub., ? Myxogastria.

Phytomyxa J. Schröt. (1886) nom. dub., ? Plasmodiophoraceae.

Phytomyxaceae J. Schröt. (1886) = Plasmodiophoraceae.

Phytomyxea, Cercozoa. 1 ord., 2 fam., 15 gen., 50 spp. See *Cercozoa*.

Phytosarcodina. See *Myxogastria*.

Pistillaria Jeekel, Tuzet, Manier & Jolivet (1959) = *Enterobryus* fide Manier & Lichtwardt (*Annls Sci. Nat. Bot.*, sér. 12 9: 519, 1968).

Pittocarpium Link (1815) ? = *Fuligo* fide Martin (*Univ. Iowa Stud. nat. Hist.* 20, 1966).

Planoprotostelium L.S. Olive & Stoian. (1971), Cavosteliaceae. 1, Brazil. See Olive & Stoianovitch (*J. Elisha Mitchell scient. Soc.* 87: 115, 1971), Fiore-Donno & Berney (*J. Eukary. Microbiol.* 52: 201, 2005; phylogeny).

Plasmodiophora Woronin (1877), Plasmodiophoraceae. 6 (obligate endoparasites of plants), widespread. *P. brassicae* (club root of crucifers). See Colhoun (*Phytopath. Pap.* 3, 1958), Karling (*The Plasmodiophorales* edn 2, 1968; key), Ingram & Tommerup (*Proc. R. Soc. Lond. B. Biol. Sci.* 180: 103, 1972; life history), Buczaki *et al.* (*TBMS* 65: 295, 1975; specialization), Jousson *et al.* (*Acta Agric. Scand.* 25: 261, 1975; bibliogr., 612 refs), Braselton *in* McLaughlin *et al.* (Eds) (*The Mycota A Comprehensive Treatise on Fungi as Experimental Systems for Basic and Applied Research* 7A: 81, 2001), Bulman *et al.* (*Protist* 152: 43, 2001; phylogeny), Braselton *in* Lee, Leedale & Bradbury (Eds) (*An Illustrated Guide to the Protozoa, Organism Traditionally Referred to as Protozoa, or Newly Discovered Groups* 2: 1342, 2000).

Plasmodiophoraceae Zopf ex Berl. (1888), Plasmodiophorida (inc. sed.). 13 gen. (+ 7 syn.), 44 spp.

Plasmodiophorales F. Stevens (1919). See *Plasmodiophorida*.

Plasmodiophorida [*Plasmodiophorida* (orth. zool.)]. Phytomyxea. 2 fam., 15 gen., 50 spp. Obligate endoparasites of flowering plants (*Plasmodiophora*, *Spongospora*), algae (*Woronina* *in* *Vancheria*; *Sorodiscus* *in* *Chara*), and fungi (*Woronina* *in* *Saprolegniales*); frequently inducing hypertrophy of the infected cells. Fams:

- (1) **Endemosarcaceae**
- (2) **Plasmodiophoraceae**

For *Lit.* see under fam.

Plasmodiophoromycetes. See *Phytomyxea*.

Plasmodiophoromycota Whittaker (1969), see *Cercozoa*.

Pleiomorpha (Nann.-Bremek.) Dhillon (1978) = *Licea* fide Pando (*in litt.*).

Pocheina A.R. Loeb. & Tappan (1961), Guttulinaceae. 3, widespread. See Mitchell (*Systematics and Geography of Plants* 74: 261, 2004; key).

Polymyxa Ledingham (1933), Plasmodiophoraceae. 2, Europe; N. America. See Karling (*The Plasmodiophorales* edn 2, 1968), Legrève *et al.* (*MR* 106: 138, 2002; phylogeny).

Polyschismium Corda (1842) = *Diderma* fide Martin & Alexopoulos (*Myxomycetes*: 419, 1969).

Polysphondylium Bref. (1884), Dictyosteliaceae. 16, widespread. See Harper (*Bull. Torrey bot. Club* 59: 49, 1932), Traub & Hohl (*Am. J. Bot.* 63: 664, 1976), Raper (*The dictyostelids*, 1984), Cavender *et al.* (*N.Z. Jl Bot.* 40: 235, 2002; New Zealand), Kawakami & Hagiwara (*Mycoscience* 43: 453, 2002; mating groups), Cavender *et al.* (*Systematics and Geography of Plants* 74: 243, 2004; Caribbean).

Promycetozoida. See *Mycetozoa*.

Protochytrium Borzí (1884) nom. dub., ? Protozoa.

Protoderma Rostaf. (1874) [non *Protoderma* Kütz. 1854, *Algae*] = *Licea*.

Protodermataceae Rostaf. ex Cooke (1877) =

Liceaceae.

Protodermium Rostaf. ex Berl. (1888) ≡ Licea.

Protodermidium Kuntze (1891) ≡ Licea.

Protomonas Cienk. (1865), Protozoa. 1. Amoeboflagellate protist formerly included in the monads or proteomyxids.

Protomyxa Haeckel (1870), Protozoa. Amoeboflagellate protist formerly included in the monads or proteomyxids.

Protophysaraceae A. Castillo, Illana & G. Moreno (1998) = Physaraceae.

Protophysarum M. Blackw. & Alexop. (1975), Physaraceae. 1, northern subtropical. See Blackwell & Alexopoulos (*Mycol.* 67: 33, 1975), Castillo *et al.* (*MR* 102: 838, 1998), Lizárraga *et al.* (*Mycotaxon* 88: 409, 2003; Mexico), Mitchell (*Systematics and Geography of Plants* 74: 261, 2004; key gen.).

Protosporangium L.S. Olive & Stoian. (1972), Cavosteliaceae. 4, USA. See Raper (*The dictyostelids*, 1984), Bennett (*Mycol.* 78: 857, 1986).

Protostelia, Amoebozoa. 1 ord., 4 fam., 16 gen., 38 spp. [*Protosteliomycetes* (orth. bot.)]. Protostelid slime moulds, protostelids. Trophic phase of simple amoeboid cells with filose pseudopodia, plasmodia not with a shuttle movement of the protoplasm; ± flagellate cells (present in 'amoeboflagellates'); sporulation not proceeding by the long grex action of myxamoebae; sporocarps stalked, stalks simple and often very delicate; spores formed singly or several together in some spp. germinating to produce 8 haploid flagellate spores). Isolated mainly by moist-chamber culture of aerial dead or decaying plant parts, especially bark; also on dung. Ord.:

Protostelida

The *Ceratiomyxaceae* were recognized as the basis of a separate class (*Ceratiomyxomycetes*) in the ninth edition of this *Dictionary*, but Spiegel (1990) did not distinguish any rank above family.

Spiegel (1990) noted that the protostelid genera could be placed in five more natural groups, based on the number of kinetoids per cell, the presence/absence and nature of the nuclear attachments, and the type of cell coats in addition to colonial morphology and other macroscopic features; these were not given formal names.

Lit.: Corliss (1994), Olive (1975, 1982), Raper (1973), Spiegel (*in* Margulis *et al.* (Eds), *Handbook of the Protoctista*: 484, 1990).

Protosteliaceae L.S. Olive (1962), Protostelida (inc. sed.). 9 gen. (+ 1 syn.), 24 spp.

Lit.: Spiegel (*Handbook of Protoctista*: 484, 1990).

Protosteliales L.S. Olive & Stoian. ex P.M. Kirk, P.F. Cannon & J.C. David (2001). See *Protostelida*.

Protostelida [*Protosteliales* (orth. bot.)]. Protostelia. 4 fam., 16 gen., 38 spp. Fams:

- (1) **Cavosteliaceae**
- (2) **Ceratiomyxaceae**
- (3) **Echinosteliopsidaceae**
- (4) **Protosteliaceae**

Lit.: see *Protostelia*.

Protostelidaceae, see *Protosteliaceae*.

Protosteliomycetes. See *Protostelia*.

Protosteliopsis L.S. Olive & Stoian. (1966), Protosteliaceae. 1, widespread (subtropical). See Olive & Stoianovitch (*Mycol.* 58: 452, 1966), Spiegel (*Handbook of Protoctista*: 484, 1990).

Protostelium L.S. Olive & Stoian. (1960), Protosteliaceae. 8, widespread. See Olive & Stoianovitch (*Bull.*

Torrey bot. Club 87: 12, 1960), Spiegel *et al.* (*Mycol.* 98: 144, 2006; ballistosporous n.sp.).

Prototrichia Rostaf. (1876), Trichiaceae. 1, widespread (temperate). See Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), Stephenson (*Fungal Diversity Res. Ser.* 11, 2003; New Zealand).

Prototrichiaceae T. Macbr. (1899) = Trichiaceae.

PROTOZOA. 6 class., 11 ord., 30 fam., 122 gen. (+ 118 syn.), 1161 spp. Kingdom of *Eukaryota*. Predominantly unicellular, plasmodial, or colonial phagotropic, wall-less in the trophic state; ciliary hairs never rigid or tubular; chloroplasts, where present lacking starch and phycobilisomes, with stalked thylakoid and 3 membranes; multicellular species with minimal cell differentiation and lacking collagenous connective tissue sandwiched between dissimilar epithelia.

The *Protozoa* have been included with the *Chromista* in a broader kingdom *Protoctista* (syn. *Protista*) by some (e.g. Margulis *et al.*, 1990) but the classification has been rejected by recent authors on both molecular and non-molecular grounds (Cavalier-Smith, 1993; Corliss, 1994).

Cavalier-Smith (1993) accepts 18 phyla in the *Protozoa* and Corliss (1994) 14; however, only one has been traditionally studied by mycologists: *Mycetozoa* (incl. 3 classes *Protostelea*, *Myxogastrea* and *Dictyostelea*). Other protozoan phyla are not treated further in this account or elsewhere in this edition of the *Dictionary*. Olive (1975) arranged the slime moulds into four classes and three subclasses; that system was adapted (using fungal terminations) in the seventh edition of the *Dictionary* which accepted *Acrasiomycetes*, *Ceratiomyxomycetes*, *Dictyosteliomycetes*, *Myxomycetes* and *Protosteliomycetes*. The eighth edition of the *Dictionary* recognized four phyla: *Acrasiomycota*; *Dictyosteliomycota*; *Myxomycota* (incl. *Ceratiomyxomycetes*, *Myxomycetes*, *Protosteliomycetes*); *Plasmodiophoromycota*. The ninth edition of the *Dictionary* recognized three phyla: *Acrasiomycota*; *Myxomycota* (incl. *Ceratiomyxomycetes*, *Dictyosteliomycetes*, *Myxomycetes*, *Protosteliomycetes*); *Plasmodiophoromycota*. More recent molecular and ultrastructural evidence has shown that the slime moulds and similar organisms are polyphyletic and appear to belong in five separate lineages:

(1) **Ramicristates** A group comprising the naked lobose amoebas, the filose and lobose testate amoebas, defined by the presence of branched mitochondrial cristae. Included are three slime mould classes: *Protostelea* (Protosteliomycetes), *Myxogastrea* (Myxomycetes) and *Dictylostelea* (Dictyosteliomycetes).

(2) **Heterolobosea** A group defined by flattened mitochondrial cristae and the mitochondria being associated with the endoplasmic reticulum. This group includes the schizopyrenid amoebae and the cellular slime moulds, now treated at the level of order, *Acrasida* (Acrasiales).

(3) **Copromyxa** *Copromyxa* was formerly included in the *Acrasiales* but the trophic phase lacks flagella and the mitochondrial cristae are tubular. For these reasons they are now regarded as distinct.

(4) **Fonticulida** *Fonticula*, also formerly included in the *Acrasiales*, has plate-like mitochondrial cristae, no flagella and the pseudopodia have subpseudopodia and are thus also distinct.

(5) **Plasmodiophorids** A group uniquely defined by the cruciate profile of the chromosomes and nucleus at mitosis. One class included, *Plasmodiophorea* (Plasmodiophoromycetes).

The Heterolobosea are sometimes grouped with the Euglenozoa and some other smaller groups as the Excavates whilst the remaining four are grouped as the Amoebozoa. There are many further protozoan organisms that have been studied or mentioned by mycologists and are listed in the *Dictionary*, some of which still await investigation using modern techniques. Larger groups include the Ellobiopsids, Nucleariids and Vampyrellids.

Lit.: Bonner (*The cellular slime molds*, 1959; edn 2, 1967), Cavalier-Smith (*Microbiol. Rev.* 57: 953, 1993; *Biol. Rev.* 73: 203, 1998), Coombs *et al.* (eds) [*Evolutionary Relationships Among Protozoa*. Systematics Association Special Volume 56, 1998], Corliss (*Acta Protozool.* 33: 1, 1994), Heywood & Rothschild (*Biol. J. Linn. Soc.* 30: 91, 1987; nomencl. higher taxa), Olive (*The mycetozoans*, 1975), Patterson, *Amer. Nat.* 154: S96, 1999; Teixeira (*Rickia*, suppl. 3, 1970; gen. except *Myxomycetes*).

See Classification, Kingdoms of fungi, Phylogeny.

Pseudospora Cienk. (1865), Protozoa. Amoeboflagellate protist formerly included in the monads or protoemyxids and listed by Saccardo (*Syll. Fung.* 7: 453). See Canter & Lund (*Proc. Linn. Soc. Lond.* 179: 203, 1968; biol.), Swale (*Arch. Mikrobiol.* 67: 71, 1969; ultrastr.), Patterson (*Amer. Nat.* 154: S91, 1999; current knowl.).

Pseudosporopsis Scherff. (1925), ? Protozoa.

Pygmomyces Arnaud (1949) nom. inval., Dictyostelida.

Pyxidium Gray (1821) = *Perichaena* fide Martin & Alexopoulos (*Myxomycetes*: 109, 1969).

Raciborskia Berl. (1888) = *Comatricha* fide Martin & Alexopoulos (*Myxomycetes*: 222, 1969).

Raciborskiaceae Berl. (1888) = *Stemonitidaceae*.

Ramacrinella Manier & Ormières (1962), *Eccrinaceae*. 1 (in *Amphipoda*), France. See Manier *et al.* (*Annls Sci. Nat. Bot.*, sér. 12 2: 625, 1961), Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986).

Recticoma D. Scheer (1935) = *Enterobryus* fide Manier & Lichtwardt (*Annls Sci. Nat. Bot.*, sér. 12 9: 519, 1968).

Reticularia Bull. (1788) nom. cons., *Tubiferaceae*. 10, widespread. See Lado & Pando (*Fl. Mycol Iberica* 2, 1997; Spain (as *Enteridium*)), Lado & Pando (*Taxon* 47: 453, 1998; nomencl.), Lado *et al.* (*Taxon* 47: 109, 1998; nomencl.), Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles (as *Enteridium*)).

Reticulariaceae Chevall. (1826) = *Tubiferaceae*.

Reticulomyxa Nauss (1949), Protozoa. 1 (aquatic), USA. Amoeboid protist. See Patterson (*Amer. Nat.* 154: S96, 1999, systematic position).

Rhabdocystis Arnaud (1949) nom. inval., ? Dictyostelida.

Rhinosporidium Minchin & Fantham (1905), Protozoa. 1 (on humans and other animals causing rhinosporidiosis, q.v.), widespread. See Ashworth (*Trans. R. Soc. Edinb.* 53: 301, 1923), Stoddart *et al.* (*J. Med. Microbiol.* 20: 'x', 1985), Herr *et al.* (*J. Clin. Microbiol.* 37: 2750, 1999; phylogeny).

Rhizellobiopsis Hovasse (1926), Protozoa. See Whisler in Margulis *et al.* (Eds) (*Handbook of Protoctista*:

715, 1990; systematic position).

Rhizomyxa Borzí (1884) ? = *Ligniera* fide Karling (*The Plasmodiophorales* edn 2, 1968).

Rostafinskia Racib. (1884) = *Raciborskia*.

Schizoplasmodiopsis L.S. Olive (1967), *Protosteliaceae*. 6, widespread. See Olive & Stoianovitch (*Mycol.* 67: 1088, 1975; key), Olive & Stoianovitch (*Am. J. Bot.* 63: 1385, 1976), Spiegel & Feldman (*Mycol.* 85: 894, 1993; ultrastr. *S. vulgare*), Glushchenko & Leontiev (*Mikol. Fitopatol.* 36: 7, 2002; Ukraine).

Schizoplasmodium L.S. Olive & Stoian. (1966), *Protosteliaceae*. 3, widespread. See Olive & Stoianovitch (*Am. J. Bot.* 63: 1385, 1976; ballistosporic), Whitney (*Mycol.* 77: 848, 1985; ultrastr.).

Scoriomyces Ellis & Sacc. (1885) nom. dub., *Mycetozoa*. Based on myxomycete sclerotia fide Carris (*Sydowia* 45: 92, 1993).

Scyphium Rostaf. (1874) = *Craterium* fide Martin & Alexopoulos (*Myxomycetes*: 257, 1969).

Semimorula E.F. Haskins, McGuinn. & C.S. Berry (1983), *Myxogastria*. 1, USA. See Haskins *et al.* (*Mycol.* 75: 153, 1983), Clark *et al.* (*Mycol.* 96: 36, 2004; culture and reproductive systems).

Siphoptychium Rostaf. (1876) = *Tubifera* fide Martin & Alexopoulos (*Myxomycetes*: 54, 1969).

Soliformovum Spiegel (1994) nom. inval. = *Protostelium* fide Hawksworth *et al.* (*Dictionary of the Fungi* edn 8, 1995).

Sorodiscus Lagerh. & Winge (1913), *Plasmodiophoraceae*. 5 (in *Chara*), widespread. See Karling (*The Plasmodiophorales* edn 2, 1968; key), Dick (*Straminipilous Fungi*: 670 pp., 2001).

Sorolpidium Némec (1911) = *Ligniera* fide Karling (*The Plasmodiophorales* edn 2, 1968).

Sorophorae. See *Acrasiomycota*.

Sorosphaera J. Schröt. (1886), *Plasmodiophoraceae*. 3, Europe; N. America. See Dick (*Straminipilous Fungi*: 670 pp., 2001), Preece (*Mycologist* 16: 27, 2002; *Sorosphaera veronicae* in UK), Kirchmair *et al.* (*Sydowia* 57: 223, 2005; *Sorosphaera viticola*).

Sphaerocarpa Schumach. (1803) = *Craterium* fide Fries (*Syst. mycol.* 3, 1829).

Sphaerocarpus Bull. (1791) [non *Sphaerocarpus* Adans. 1763, *Hepaticae*] = *Physarum* fide Martin (*Univ. Iowa Stud. nat. Hist.* 20, 1966).

Spongospora Brunch. (1887), *Plasmodiophoraceae*. 3 (obligate endoparasites of plants), widespread. *S. subterranea* (potato powdery scab), *S. nasturtii* (crook root of watercress). See Tomlinson (*TBMS* 41: 491, 1958; *S. nasturtii*, crook root of watercress), Karling (*The Plasmodiophorales* edn 2, 1968), Dick (*Straminipilous Fungi*: 670 pp., 2001), Down *et al.* (*MR* 106: 1060, 2002; phylogeny).

Sporigastrum Link [not traced] nom. dub., ? *Mycetozoa*.

Sporomyxa L. Léger (1908), ? *Plasmodiophoraceae*. 2, Europe; Africa. See Karling (*The Plasmodiophorales* edn 2: 101, 1968).

Spumaria Pers. (1792) = *Mucilago* fide Martin & Alexopoulos (*Myxomycetes*: 374, 1969).

Spumariaceae Rostaf. ex Cooke (1877) = *Didymiaceae*.

Squamuloderma Kowalski (1973) = *Didymium* fide Martin *et al.* (*The genera of Myxomycetes*, 1983).

Staphylocystis Coutière (1911) = *Thalassomyces* fide Kane (*N.Z. Jl Sci.* 7: 289, 1964).

Stegasma Corda (1843) = *Perichaena* fide Martin & Alexopoulos (*Myxomycetes*: 109, 1969).

- Stemonaria** Nann.-Bremek., R. Sharma & Y. Yamam. (1984), Stemonitidaceae. 12, widespread. See Nannenga-Bremekamp *et al.* (*Proc. K. Ned. Akad. Wet. Ser. C, Biol. Med. Sci.* **87**: 450, 1984), Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles).
- Stemonitidales** T. Macbr. (1922). See *Stemonitida*.
- Stemonitida** [*Stemonitales* (orth. bot.)]. Myxogastria. 1 fam., 15 gen., 201 spp. Spore mass dark-coloured, peridium and capillitium non-calcareous. Fam.: Stemonitidiaceae
For *Lit.* see under fam.
- Stemonitidaceae** Fr. (1829), Stemonitida (inc. sed.). 15 gen. (+ 16 syn.), 201 spp.
- Stemonitis** Gled. (1753), Stemonitidaceae. 16, widespread. See Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), Mitchell (*Systematics and Geography of Plants* **74**: 261, 2004; key gen.).
- Stemonitis** Roth (1787) nom. illegit. = *Stemonitis* Gled. fide Farr & Alexopoulos (*Taxon* **30**: 357, 1981), Gams (*Taxon* **41**: 100, 1992).
- Stemonitopsis** (Nann.-Bremek.) Nann.-Bremek. (1975), Stemonitidaceae. 11, widespread. See Nannenga-Bremekamp (*Nederlandse Myxomyceten*: 203, 1974), Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles).
- Strongylium** Ditmar (1809) = *Reticularia* Bull. fide Martin & Alexopoulos (*Myxomycetes*: 172, 1969).
- Stylonites** Fr. (1848) nom. dub., Physarida. See Martin & Alexopoulos (*Myxomycetes*: 420, 1969).
- Symphytocarpus** Ing & Nann.-Bremek. (1967), Stemonitidaceae. 9, widespread (north temperate). See Ing & Nannenga-Bremekamp (*Proc. K. Ned. Akad. Wet. Ser. C, Biol. Med. Sci.* **70**: 218, 1967), Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), Adamonyte (*Botanica Lithuanica* **9**: 55, 2003; Lithuania).
- Taeniella** L. Léger & Duboscq (1911), Eccrinaceae. 1 (in *Decapoda*), widespread. See Hibbets (*Syesis* **11**: 213, 1978), Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986), Cafaro (*Mol. Phylogen. Evol.* **35**: 21, 2005; phylogeny).
- Taeniellopsis** R.A. Poiss. (1927), Eccrinaceae. 3 (in *Amphipoda*), Europe. See Manier (*Annls Sci. Nat. Bot.*, sér. 12 **10**: 565, 1969), Lichtwardt (*The Trichomycetes. Fungal associates of arthropods*, 1986; key).
- Tetramyxa** K.I. Goebel (1884), Plasmodiophoraceae. 5, widespread (north temperate). See Karling (*The Plasmodiophorales* edn 2, 1968; key), Dick (*Straminipilous Fungi*: 670 pp., 2001).
- Thalassomyces** Niezab. (1913), Protozoa. See Kane (*N.Z. Jl Sci.* **7**: 289, 1964), Karling (*Holocarpic Biflagellate Phycomycetes*: 204, 1981), Whisler in Margulis *et al.* (Eds) (*Handbook of Protoctista*: 715, 1990; placed in class *Ellobiopsida*).
- Tilmadoche** Fr. (1849) = *Physarum* fide Martin & Alexopoulos (*Myxomycetes*: 274, 1969).
- Tipularia** Chevall. (1822) [non *Tipularia* Nutt. 1818, *Orchidaceae*] = *Halterophora*.
- Trabrooksia** H.W. Keller (1980), Didymiaceae. 1, USA; Ecuador. See Keller (*Mycol.* **72**: 396, 1980), Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), McHugh (*Mycotaxon* **92**: 107, 2005; Ecuador).
- Trichamphora** Jungh. (1838) = *Physarum* fide Pando (*in litt.*).
- Trichella** Léger & Duboscq (1929) = *Enterobryus* fide Manier & Lichtwardt (*Annls Sci. Nat. Bot.*, sér. 12 **9**: 519, 1968).
- Trichellopsis** Maessen (1955) = *Enterobryus* fide Manier & Lichtwardt (*Annls Sci. Nat. Bot.*, sér. 12 **9**: 519, 1968).
- Trichia** Haller (1768), Trichiaceae. c. 35, widespread. See Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), Adamonyte (*Mycotaxon* **87**: 379, 2003; coprophilous sp.), Stephenson (*Fungal Diversity Res. Ser.* **11**, 2003; New Zealand).
- Trichiaceae** Chevall. (1826), Trichiida (inc. sed.). 10 gen. (+ 8 syn.), 100 spp.
- Trichiales** T. Macbr. (1922). See *Trichiida*.
- Trichidium** Raf. (1815) = *Trichia*.
- Trichiida** [*Trichiales* (orth. bot.)]. Myxogastria. 3 fam., 14 gen., 162 spp. Spore mass bright coloured, columella absent, peridium persistent. Fams:
(1) **Arcyriaceae**
(2) **Dianemataceae**
(3) **Trichiaceae**
Lit.: Blackwell & Busard (*Mycotaxon* **7**: 61, 1978; pigments in spp. separation).
- Trichodermataceae** Fr. (1825) = *Hypocreaceae*.
- Trichulius** Schmidel ex Corda (1842) ? = *Trichia* fide Mussat (*Syll. fung.* **15**: 425, 1901).
- Tripotrichia** Corda (1837) = *Leocarpus* fide Martin & Alexopoulos (*Myxomycetes*: 245, 1969).
- Tubifera** J.F. Gmel. (1792) nom. cons. prop., Tubiferaceae. 7, widespread. See Nelson *et al.* (*Mycol.* **74**: 541, 1982; key).
- Tubiferaceae** T. Macbr. (1899), Liceida (inc. sed.). 4 gen. (+ 14 syn.), 30 spp.
- Tubulifera** O.F. Müll. ex Jacq. (1778) = *Tubifera* fide Kirk (*in litt.*).
- Tubulina** Pers. (1794) = *Tubifera* fide Pando (*in litt.*).
- Tubulinaceae** Lister (1894) = *Reticulariaceae*.
- Tychosporium** Spiegel (1995), Protosteliaceae. 1, USA. See Spiegel *et al.* (*Mycol.* **87**: 265, 1995).
- Vampyrella** Cienk. (1865), Protozoa. 21 or. Filose amoeboid protist formerly treated as a proteomyxid or monad. See Patterson (*Amer. Nat.* **154**: S96, 1999, systematic position).
- Vampyrellidium** Zopf (1885), Protozoa. 1. Amoeboid protist formerly treated as a proteomyxid or monad. See Patterson (*Amer. Nat.* **154**: S96, 1999, systematic position).
- Vampyrelloides** Schepotieff (1911), Protozoa. Filose amoeboid protist formerly treated as a proteomyxid or monad. See Patterson (*Amer. Nat.* **154**: S96, 1999, systematic position).
- Verrucosia** Teng (1932) = *Lycogala* fide Martin & Alexopoulos (*Myxomycetes*: 62, 1969).
- Wilczekia** Meyl. (1925) = *Diderma* fide Kowalski (*Mycol.* **67**: 448, 1975).
- Willkommlangea** Kuntze (1891), Physaraceae. 1, widespread (north temperate). See McHugh & Reed (*MR* **94**: 710, 1990; plasmocarp formation), Ing (*The Myxomycetes of Britain and Ireland, An Identification Handbook*, 1999; British Isles), Stephenson (*Fungal Diversity Res. Ser.* **11**, 2003; New Zealand).
- Wingina** Kuntze (1891) = *Orthotricha*.
- Woronina** Cornu (1872), Plasmodiophoraceae. 4 (in *Vaucheria*, *Saprolegniales*), widespread (north temperate). See Karling (*The Plasmodiophorales* edn 2, 1968; key), Dick (*Straminipilous Fungi*: 670 pp., 2001).

Woroninaceae H.E. Petersen (1909) = Plasmodiophoraceae.

Xyloidium Czern. (1845) nom. dub., ? Myxogastria.
See Streinz (*Nom. fung.*, 1862).

Xyloon, see *Xyloidium*.